DuPont Pompton Lakes Works
2000 Cannonball Road
Pompton Lakes, NJ 07442

March 18, 2014

Mr. Philip D. Flax
USEPA REGION 2
290 Broadway
Mail Code: 22ND FL
New York, NY 10007-1866

RE: 2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Dear Mr. Flax:

Enclosed are two copies of the *2013 Pompton Lake Ecological Investigation Report*. This report summarizes results of the program presented in the scopes of work submitted to USEPA starting in April 2013 and discussed with technical resources from USEPA and USFWS in subsequent meetings.

If you have any questions regarding the report please call me at 973-492-7733 or Maryann Nicholson at 610-918-0481.

Sincerely,

David E. Epps, P.G.
Project Director, Pompton Lakes Works
DuPont Corporate Remediation Group

cc: Anthony Cinque, NJDEP (1 copy)
PLW Central File

2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Date: March 2014 Project No.: 18986472.00007

URS

URS Corporation
335 Commerce Drive
Fort Washington, Pennsylvania

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Acronym List

Acronym	Explanation
µg/g	Micrograms per Gram
ABD	Acid Brook Delta
ADQM	Analytical Data Quality Management
AFDW	Ash Free Dry Weight
ANSP	Academy of Natural Sciences - Philadelphia
AUF	Area Use Factor
AVS	Acid Volatile Sulfides
BFC	Benthic Flux Chamber
BW	Body Weight
CBR	Critical Body Residue
CCC	Criteria Continuous Concentration
CF	Conversion Factor
cm	Centimeter
CMC	Criteria Maximum Concentration
CMI WP	Corrective Measures Implementation Work Plan
COPEC	Constituent of Potential Ecological Concern
CRG	Corporate Remediation Group
CSA	Critical Study Approach
CSM	Conceptual Site Model
DDR	DuPont Data Review
DMIR	Daily Mercury Intake Rate
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
D-Rs	Dose-Response Relationships
DuPont	E.I. du Pont de Nemours and Company
DW	Dry Weight
ECSM	Ecological Conceptual Site Model
EDD	Estimated Daily Dose
ELS	Early Life Stages
EMA	Eastern Manufacturing Area
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
FIR	Food Ingestion Rate
FMR	Field Metabolic Rate
HgCl2	Mercuric Chloride
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments
IDW	Inverse Distance Weighting
IHg	Inorganic Mercury
kg/yr	Kilograms per Year
LER	Low Effect Residue
LOAEL	Lowest Observable Adverse Effects Level
LOE	Line-of-Evidence
LOEC	Lowest Observable Effects Concentration
LRC	Lower Ramapo River Channel
ME	Measurement Endpoints
MeHg	Methylmercury

Acronym	Explanation
mm	Millimeter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NER	No Effect Residue
ng/L	Nanograms per Liter
NHP	Natural Heritage Program
NJDEP	New Jersey Department of Environmental Protection
NJSWQS	New Jersey Surface Water Quality Standards
NOAEL	No Observed Adverse Effects Level
NOEC	No Observed Effects Concentration
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criterion
PLSA	Pompton Lake Study Area
PLW	Pompton Lakes Works
POTW	Publically-Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
QEA	Quantitative Environmental Analysis, LLC
RCRA	Resource Conservation and Recovery ActAct
REV	Reference Envelope Value
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
SCV	Secondary Chronic Value
SEL	Severe Effect Level
SEM	Simultaneously Extractable Metals
SIR	Sediment Ingestion Rate
SOW	Scope of Work
SQB	Sediment Quality Benchmark
SQT	Sediment Quality Triad
SVOC	Semi-Volatile Organic Compound
SWAC	Surface-Weighted Average Concentration
SWQS	Surface Water Quality Standards
TAC	Test Acceptability Criteria
TAL	Target Analyte List
TCL	Target Compound List
THg	Total Mercury
TL	Total Length
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRA	Tissue Residue Approach
TRV	Toxicity Reference Value
TSI	Trophic State Index
TSS	Total Suspended Solids
UCL	Upper Confidence Limit
UF	Uncertainty Factor
URC	Upper Ramapo River Channel
URS	URS Corporation
USFWS	United States Fish and Wildlife Service
WIR	Water Intake Rate
WOE	Weight-of-Evidence
WQG	Canadian Water Quality Guidelines
WW	Wet Weight
YOY	Young-of-Year

Executive Summary

This report presents the results of the ecological investigations conducted during 2013 in Pompton Lake located in Pompton Lakes (Passaic County), New Jersey. The overall purpose of the investigations was to confirm or refine the ecological conceptual site model (ECSM) for potential exposures to mercury outside of the area referred to as the Acid Brook Delta (ABD) remedial action area and to provide data to support risk-based remedial decision-making for sediment.

Mercury concentrations measured in sediments within the ABD portion of Pompton Lake are associated with historical manufacturing processes at the E.I. du Pont de Nemours and Company (DuPont) Pompton Lakes Works (PLW). A remedial approach was presented to remove approximately 26 acres of sediment within the ABD and additional removal of soils from adjacent wetland and upland areas surrounding the ABD to reduce potential mercury exposure to ecological receptors (ARCADIS et al., 2011).

Previous ecological investigations of Pompton Lake evaluated exposure and potential ecological risks in the ABD relative to an upstream reference area. The 2013 Ecological Investigation was designed to evaluate exposure and potential ecological risks in Pompton Lake outside of the ABD removal area. Specifically, the proposed investigations were designed to satisfy the following study objectives:

- Evaluate potential direct contact and dietary exposure pathways for mercury to ecological receptors to confirm or refine the ECSM for Pompton Lake.
- Provide data to support risk-based remedial decision-making for sediment regarding mercury exposure outside of the ABD remedial action area.

The investigation approach was presented to the U.S. Environmental Protection Agency (EPA), United States Fish and Wildlife Service (USFWS), and New Jersey Department of Environmental Protection (NJDEP) in the *Pompton Lake Ecological Investigations Framework Document* submitted on June 26, 2013 and a series of scoping documents submitted between May and August 2013. Data collection activities were conducted on Pompton Lake between June and September 2013 using the following study elements:

- Surface-Water Characterization
- Sediment Quality Triad Investigation and Sediment/Pore Water Characterization
- Aquatic and Emergent Invertebrate Tissue Evaluation
- Fish Tissue Survey
- Amphibian Tissue Survey
- Avian Receptor Survey
- Invertivorous Songbird Exposure Pathway Evaluation

The findings of the 2013 Ecological Investigations support the following conclusions regarding potential ecological risk associated with mercury exposure in the Pompton Lake Study Area (PLSA):

- Mercury exposure in surface water is not likely to result in adverse effects to aquatic receptors given that surface water concentrations in the PLSA were similar to reference area and below surface water quality benchmarks.
- Benthic macroinvertebrate communities in the PLSA are not adversely impacted by mercury concentrations in sediments and pore water when compared to reference communities.
- Mercury residues in young-of-year (YOY) and adult fish tissue sampled within the PLSA are not likely to result in adverse effects at the individual or population scales; whole body concentrations were below critical body residues associated with potential adverse effects.
- Based on the available toxicity data in the literature, amphibian exposure to mercury in the PLSA is not likely to result in adverse effects based on comparisons of mercury concentrations in abiotic exposure media and whole body tissue samples.
- Dietary exposure to mercury in the PLSA is not likely to result in adverse effects to avian wildlife receptors representing multiple feeding categories; dietary exposures for multiple avian receptors [e.g., tree swallow (*Tachycineta bicolor*), Carolina wren (*Thryothorus ludovicianus*), and avian piscivores] resulted in only minimal incremental risks relative to reference exposures.
- Dietary exposure to mercury in the PLSA is not likely to result in adverse effects to mammalian wildlife receptors; dietary exposures for mammals in the PLSA resulted in only minimal incremental risks relative to reference exposures.

The overall findings of the 2013 Ecological Investigation indicate that mercury concentrations measured in abiotic and biotic exposure media within the PLSA are not likely to result in adverse effects to ecological receptors through direct contact or dietary exposure pathways. These findings are consistent with the existing ECSM, which indicates that the greatest exposure to mercury, particularly methylmercury (MeHg), in abiotic and biotic media within Pompton Lake is associated with nearshore areas of the ABD. Mercury concentrations in some abiotic and biotic media are elevated in the PLSA relative to the reference area; however, this minimal incremental increase in exposure does not result in an unacceptable risk. Based on the finding of this investigation, no further investigations or actions are warranted in the PLSA on the basis of ecological risk associated with mercury exposure.

1.0 Introduction

This report presents the results of investigations conducted during 2013 in Pompton Lake located in Pompton Lakes (Passaic County), New Jersey (see Figure 1-1). The overall purpose of the investigations was to confirm or refine the ecological conceptual site model (ECSM) for potential exposures to mercury outside of the area referred to as the Acid Brook Delta (ABD) remedial action area and to provide data to support risk-based remedial decision-making for sediment.

Mercury concentrations measured in ABD sediments are associated with historical manufacturing processes at the E.I. du Pont de Nemours and Company (DuPont) Pompton Lakes Works (PLW). The Eastern Manufacturing Area (EMA) of the PLW is located in a valley drained by Acid Brook, which discharges to Pompton Lake in the ABD (see Figure 1-1). Historical migration of site-related constituents from the PLW via Acid Brook resulted in mercury accumulating in sediments within the ABD.

Since the early 1990s, extensive environmental investigations and evaluations have been completed within Pompton Lake under the Resource Conservation and Recovery Act (RCRA) program, with direct oversight by the U.S. Environmental Protection Agency (EPA) and New Jersey Department of Environmental Protection (NJDEP). Environmental data were collected to achieve the following objectives:

- Evaluate the nature and extent of site-related constituents resulting from historical operations.
- Understand the fate and transport of these constituents (physical, chemical, and biological processes).
- Identify potential receptors and evaluate potential exposure pathways to site-related constituents.

Collectively, these data form the basis for the conceptual site model (CSM) that was developed to provide an understanding of the distribution of mercury in lake sediments. A summary of the CSM based on data collected to date was provided to EPA and NJDEP in a draft technical memorandum dated June 2013 (ARCADIS et al., 2013); an updated technical memorandum was submitted to EPA and NJDEP in March 2014 (ARCADIS et al., 2014).

The findings of these investigations, as summarized in the CSM, provided the basis for designing a remedial action plan to remove mercury-impacted sediments from a specific area within the ABD. The remedial approach was presented in the *Corrective Measures Implementation Work Plan* (CMI WP) that was initially submitted to EPA in 2010 and revised in September 2011 (ARCADIS et al., 2011). The remedial approach included the removal of sediment from approximately 26 acres within the ABD remedial action area and additional removal of soils from adjacent wetland and upland areas surrounding the ABD.

Investigations were conducted in 2013 to evaluate ecological exposure and potential ecological risk in Pompton Lake outside of the ABD remedial action area previously defined in the 2011 CMI WP. The investigation approach was presented to the EPA, United States Fish and Wildlife Service (USFWS), and NJDEP in the *Pompton Lake Ecological Investigations Framework Document* (Framework Document) submitted on June 26, 2013 and a series of scoping documents submitted between May and August 2013:

- Scope of Work #2: Avian Receptor Survey (Submitted on May 24, 2013)
- Scope of Work #3: Invertivorous Songbird Exposure Pathway Evaluation (Submitted on May 24, 2013)
- Scope of Work #4: Surface Water Characterization (Submitted on July 3, 2013)
- Scope of Work #5: Amphibian Tissue Survey (Submitted on July 3, 2013)
- Scope of Work #6: Fish Tissue Survey (Submitted on July 3, 2013)
- Scope of Work #7: Sediment Quality Triad Investigation and Sediment/Pore Water Characterization (Submitted on August 13, 2013)
- Scope of Work #8: Aquatic and Emergent Invertebrate Tissue Evaluation (Submitted on August 20, 2013)

Between April and July 2013, three meetings were convened between DuPont, EPA, USFWS, and NJDEP to discuss the scope of ecological investigations[1]. Verbal comments from these meetings were incorporated into Framework Document and individual scoping documents prior to submission to the agencies. A field implementation schedule was also provided to show that work would be completed by September 2013. Written comments from the agencies on the Framework Document and individual scoping documents were provided to DuPont in a letter dated November 5, 2013.

In accordance with the Framework Document and scoping documents, data collection activities to support the 2013 Ecological Investigation were conducted on Pompton Lake between June and September 2013. This report presents the findings of those investigations and evaluates the ECSM for ecological exposures and associated potential ecological risk in Pompton Lake outside of the ABD removal area defined by the 2011 CMI WP. The conclusions of the 2013 Ecological Investigation will be used to support remedial-decision making for sediments in Pompton Lake outside of the ABD. This report has been prepared in accordance with EPA and NJDEP guidance on ecological risk assessment (EPA, 1997a; NJDEP; 2012).

1.1 Investigation Objectives and Scope

The overall objective of the 2013 Pompton Lake Ecological Investigation was to collect ecological data to confirm or refine the ECSM for potential mercury exposures outside of the ABD remedial action area that has been established in previous investigations [Exponent and The Academy of Natural Sciences – Philadelphia (ANSP), 2003; DuPont Corporate Remediation Group (CRG), 2006]. Specifically, the proposed investigations were intended to satisfy the following study objectives:

[1] Meeting dates were April 11, 2013; June 10, 2013, and July 16, 2013.

- Evaluate potential direct contact and dietary exposure pathways for mercury to ecological receptors to confirm or refine the ECSM for Pompton Lake.
- Provide data to support risk-based remedial decision-making for sediment regarding mercury exposure outside of the ABD remedial action area.

1.2 Report Organization

The Ecological Investigation Report is organized into the following sections:

- Section 1.0 presents the introduction and regulatory investigation objectives.
- Section 2.0 describes the investigation background.
- Section 3.0 describes the problem formulation that establishes the goals, breadth, and focus of the investigations.
- Section 4.0 summarizes 2013 lake investigation activities.
- Section 5.0 presents an evaluation of ecological effects.
- Section 6.0 presents the exposure analysis.
- Section 7.0 presents the ecological risk characterization.
- Section 8.0 summarizes uncertainty in the investigation.
- Section 9.0 presents the conclusions of the investigation.
- Section 10.0 lists the references cited in this report.

2.0 Investigation Background

This section presents background information on Pompton Lake pertaining to the environmental setting, the nature and extent of site-related constituents in environmental media, and a summary of the findings of previous ecological investigations of the ABD. Information presented in this section is summarized from other documents that may be referenced for further detail (ARCADIS et al., 2013; CRG, 2006; CRG, 2008; CRG, 2010a).

2.1 Environmental Setting

This section summarizes the environmental setting of Pompton Lake, specifically the physical setting, hydrology, and ecological resources, including special status species.

2.1.1 Physical Setting

Pompton Lake is a 196-acre impoundment of the Ramapo River that was originally formed in 1858 when the Pompton Lake Dam was constructed by the U.S. Army Corps of Engineers at the southern end of the lake (see Figure 1-1). In 1908, a larger dam was constructed, and the size of the lake was increased to include the area currently referred to as the ABD. The mean depth of Pompton Lake is approximately 7 feet, and the maximum depth is approximately 25 feet. Within the ABD area, water depths range from 1.3 to 4.8 feet. The bathymetry of the lake is characterized primarily by the ABD located along the central western shoreline and the original channel of the Ramapo River, which runs along the eastern shoreline of the lake at water depths greater than 6 to 8 feet. Approximately 1.5 miles downstream of the Pompton Lake Dam, the Ramapo and Pequannock Rivers join to form the Pompton River. The Pompton River flows into the Passaic River, which eventually discharges to Newark Bay.

Acid Brook is a tributary of Pompton Lake that originates in the Ramapo Mountain State Forest north-northeast of the PLW. Acid Brook is an intermittent stream that flows through the EMA portion of the PLW and continues off-site for approximately one-half mile to its discharge into the ABD (see Figure 1-1).

2.1.2 Hydrology

The hydrology of Pompton Lake is predominantly influenced by flows from the Ramapo River. Surface water inflow to Pompton Lake varies seasonally but is predominately attributed to Ramapo River inputs, which comprise from 59.3 percent (August) to 90.8 percent (April) of total flow (Exponent and ANSP, 2003). Acid Brook, the transport pathway from the PLW to the ABD, contributes between 0.2 percent (June) to 0.6 percent (April) of the total flow to Pompton Lake (Exponent and ANSP, 2003). The results of hydrodynamic modeling indicate that the dominant flow pattern of water in the Pompton Lake system is from the mouth of the Ramapo River to the Pompton Lake Dam [Quantitative Environmental Analysis, LLC (QEA), 2007; see Figure 1-1].

2.1.3 Ecological Resources

Pompton Lake is a shallow, freshwater lake that is classified as eutrophic based on the trophic state index[2] (Exponent and ANSP, 2003). Despite its eutrophic state, thermal stratification is not observed in the ABD due to its shallow water depth. Thermal stratification in Pompton Lake has only been observed in August in the deeper portion of the lake known as the Deep Hole, located upstream of the ABD and the Lakeside Avenue Bridge. Lake water anoxia has not been observed in the ABD; however, anoxia has been observed in the hypolimnion in August in the Deep Hole (Exponent and ANSP, 2003).

Substrates in the ABD are generally characterized as fine-grained, organic sediments. The percentage of fine-grained sediments within the ABD ranges from 50 to 95 percent, with most values between 80 to 90. Coarser-grained material is observed mostly in shallow nearshore areas of the ABD where wave energy is greater and fine-particles remain in suspension. Total organic carbon (TOC) concentrations in ABD sediments ranged from 1.4 to 3.8 percent, with relatively patchy spatial distribution.

Major Biological Assemblages

Major biological assemblages in Pompton Lake and an upstream reference area in Pompton Lake were inventoried during the Phase I Ecological Investigation (PTI Environmental Services et al., 1997). The major characteristics of the aquatic biological assemblages and common representative taxa are summarized in Table 2.1.

As described in detail in Section 4.1.6, an avian use survey was conducted in June 2013 to document the presence or absence, use, and relative abundance of birds using habitats associated with Pompton Lake and reference areas. Table 2-2 provides a summary of the species observed during the three-day survey period by feeding guild.

Special Status Species

In a letter dated August 15, 2011, the NJDEP Natural Heritage Program (NHP) provided the results of a query of the NHP and Landscape Project databases for records of state or federally listed threatened or endangered species occurring in the vicinity of the ABD and adjacent upland/wetland areas. The results of the database query did not identify any records of rare wildlife species within the ABD and adjacent upland/wetland areas. However, the NHP identified the following state or federally listed threatened or endangered species and wildlife habitat occurring within one mile of the area.

Common Name	Scientific Name	Status
Barred owl	*Strix varia*	State Threatened
Bobcat	*Lynx rufus*	State Endangered
Triangle floater	*Alasmidonta undulata*	State Threatened
Great blue heron forage	*Ardea herodias*	Special Concern

[2] The trophic state index (TSI) evaluates the trophic state of lake systems based on an evaluation of water quality parameters including Secchi depth, total phosphorus concentrations, and chlorophyll *a* concentrations in surface water.

None of the state threatened or endangered species identified within one mile of the ABD and adjacent upland/wetland areas are associated with habitats present within or adjacent to Pompton Lake; therefore, exposure pathways associated with Pompton Lake study areas are not complete for these species. Barred owl and the bobcat are not generally associated with aquatic exposure pathways and the size and existing condition of the woodland habitat associated with shoreline areas around Pompton Lake are not sufficient to support these species. Occurrences of the triangle floater within one mile of the site were recorded in the Wanaque River watershed, which has no hydrologic connectivity to Pompton Lake.

In addition to the NHP request submitted in 2011, the New Jersey GeoWeb (February 2012 version) database was reviewed on June 20, 2013 and February 26, 2014 to identify any updated records of special concern species. In addition to the special concern species listed above, the New Jersey GeoWeb identified breeding sighting records of two state special concern species in the vicinity of Pompton Lake: brown thrasher (*Toxostoma rufum*) and cliff swallow (*Petrochelidon pyrrhonota*; NJDEP, 2013). Updated records also indicated that foraging habitat for great blue heron is mapped within the ABD.

2.2 Nature and Extent of Site-Related Constituents

Extensive investigations have been conducted in Pompton Lake to characterize the nature and extent of site-related constituents in environmental media (CRG, 2006; CRG, 2008; CRG, 2009; CRG, 2010a). In addition, ecological investigations have been conducted to evaluate potential exposure to site-related constituents in environmental media (Exponent and ANSP, 2003; CRG, 2006). Site-related constituents consisted of several metals, including lead, mercury, copper, selenium, barium, and zinc, which were used as part of the manufacturing process at the PLW. Previous investigations concluded that mercury was the primary constituent of concern; therefore, it was the focus of subsequent investigations. The following subsections summarize the findings of investigations to characterize the nature and extent of mercury in environmental media and to evaluate ecological exposures in the ABD.

2.2.1 Sediment

The following subsections summarize the findings of sediment investigations that are relevant to ecological exposures in Pompton Lake; further details regarding sediment investigations are provided in other documents (ARCADIS et al., 2013; CRG, 2006; CRG, 2008; ARCADIS, 2014).

Sediment data have been collected or compiled from the following areas of Pompton Lake and the Ramapo River (Figure 2-1):

- Pompton Lake within the ABD
- Pompton Lake Outside of the ABD – Upper Ramapo River Channel
- Pompton Lake Outside of the ABD – Lower Ramapo River Channel
- Ramapo River Downstream of Pompton Lake Dam (Figure 1-1).

Acid Brook Delta

Sediment delineation data collected between 2003 and 2007 were evaluated within the ABD based on distance from the mouth of Acid Brook. As part of these sampling events, the ABD was divided into two areas – the area within an 800-foot radius of the mouth of Acid Brook and the area outside of the 800-foot radius (CRG, 2008). A summary of the sediment THg results for sampling within the 800-foot radius is provided below; further detail may be found in CRG (2008):

- THg concentrations generally decrease with distance from the mouth of Acid Brook.
- Average [115 micrograms per gram (µg/g)] and maximum (1,486 µg/g) surface (0 to 0.5 foot) THg concentrations within the 800-foot radius are higher than average surface and subsurface (9.2 and 50.1 µg/g, respectively) and maximum surface and subsurface (367 and 754 µg/g, respectively) THg concentrations outside the 800-foot radius.
- Highest concentrations of THg (greater than 100 µg/g) were generally found in the ABD near Acid Brook.

Analyses of vertical sediment cores sampled within the ABD indicate a relatively stable sediment environment with greater THg and methylmercury (MeHg) concentrations in nearshore surface sediments (CRG, 2006). Radioisotope dating of deep core samples indicates distinct THg profiles in sediment cores with maxima at comparable depths that are consistent with the known history of mercury use at the PLW. These maxima represent the period of active THg input, followed by significant decreases in THg inputs to the sediment. The preservation of the THg concentration maxima in the sediment cores indicates a stable sediment environment within the ABD with little or no large-scale mixing. Analyses of surficial samples [top 1 centimeter (cm)] from cores indicate that nearshore surficial sediments within the ABD had greater THg and MeHg concentrations and typically greater organic carbon content than sediments found at stations farther away from the shore in the ABD. TOC and MeHg concentrations were positively correlated in surficial sediments (CRG, 2006).

Pompton Lake Outside of the ABD

Sediment cores were collected outside of the ABD from 2004 through 2007 to delineate THg concentrations in sediment along several transects radiating outward from the 800-foot radius and along east, west, and north shore transects into the Upper Ramapo Channel of Pompton Lake. Samples were also collected in the Lower Ramapo River channel along several transects (CRG, 2008).

At the request of EPA, additional sediment sampling and analysis for THg were conducted in August 2013 to 1) validate historical data outside the 26-acre remedial area (ARCADIS et al., 2012); and 2) improve dataset adequacy by characterizing current THg concentrations in areas with potential changes in sediment elevation and supplementing the existing sediment dataset within the lower Ramapo River channel (ARCADIS, 2013).

The overall results of the 2013 sampling were consistent with historical characterizations of THg concentrations in sediment outside of the ABD, as summarized below by mean and median concentrations (ARCADIS et al., 2014).

Sampling Area	Surface Concentration (0 to 0.5 feet)		Subsurface Concentration (>0.5 feet)	
	Historical (Mean/Median µg/g)	2013 (Mean/Median µg/g)	Historical (Mean/Median µg/g)	2013 (Mean/Median µg/g)
Upper Ramapo River Channel	4.3 / 3.3	3.4 / 1.9	12.8 / 8.0	12.8 / 8.7
Lower Ramapo River Channel	2.4 / 1.7	4.0 / 2.2	14.1 / 13.6	14.3 / 13.5

Comparisons of 2013 sampling results to historical datasets did not indicate major changes in THg concentrations in surface or subsurface sediments between sampling events (ARCADIS et al., 2014). Surface THg concentrations in 2013 samples collected from the Upper Ramapo River Channel portion of the lake indicated very little change since historical sampling. As shown above, a minor overall increase in mean and median THg concentrations was observed in surface sediments in the Lower Ramapo River Channel. In subsurface sediments, overall concentrations measured in 2013 were similar throughout the lake, despite some station-specific changes (ARCADIS et al., 2014).

Ramapo River Downstream of Pompton Lakes Dam

Sediment data collected during multiple sampling events in the Ramapo River downstream of the Pompton Lake Dam indicate relatively low mercury concentrations in surface sediment intervals when compared to concentrations in the ABD and other areas of Pompton Lake.

Sampling was performed below the Pompton Lake Dam in 2010 to evaluate whether sediments from the ABD Area were being transported downstream and deposited in overbank areas after flooding events (CRG, 2010b). THg concentrations in samples collected from an area commonly inundated during high water events immediately below the dam were relatively low compared to concentrations in the ABD and other areas of Pompton Lake, ranging from below the limit of detection to 1.4 µg/g (CRG, 2010b).

The State of New Jersey, Division of Property Management and Construction sampled sediment upstream of the Pompton Dam on the Ramapo River, which is located approximately 1.7 miles downstream of the Pompton Lake Dam (see Figure 2-2). Concentrations of THg in surficial sediments (sampled by a ponar grab sampler) were low relative to the ABD and Pompton Lake with concentrations ranging from 0.11 to 0.34 µg/g in samples collected in 2012; the 2004 sample result for THg was 2.4 µg/g (Civil Dynamics, Inc., 2012). Further detail regarding these samples, including other physical and analytical parameters is provided in Civil Dynamics, Inc. (2012).

2.2.2 Pore Water

Analyses of THg and MeHg in pore water are important to understanding environmental fate and ecological exposure of mercury in sediment. Pore water data collected as part of the Phase 2 Ecological Investigation indicated that concentrations of MeHg varied vertically within the sediment column and seasonally, with greater concentrations observed in surface sediment intervals during warmer summer sampling periods (Exponent and ANSP, 2003). MeHg concentrations in sediment pore water in the ABD were greater in samples collected during August relative to April, consistent with increasing microbial activity during the warmer summer months (Exponent and ANSP, 2003). The range of greatest MeHg concentrations in pore water (1.32 to 2.65 ng/L) was observed in the surface sediment interval (0 to 2 cm) of the ABD during the August sampling event (Exponent and ANSP, 2003).

2.2.3 Surface Water

Consistent with the evaluation of MeHg concentrations in surface sediments, surface water data indicate that nearshore location compared to profundal location are more important than underlying sediment THg concentrations in influencing surface water MeHg concentrations (CRG, 2006). Surface water data collected from the ABD and other locations in Pompton Lake in May and August 2004 and January and April 2005 indicated consistently greater concentrations of dissolved THg and MeHg in nearshore areas of the ABD that decreased with increasing distance from the shoreline. Sample locations in the ABD farthest from the shore typically had dissolved MeHg concentrations that were comparable to or less than concentrations observed in areas of the lake outside of the ABD. In addition, dissolved MeHg concentrations in the lake were comparable to dissolved MeHg concentrations measured at stations in the Ramapo River upstream of the Lakeside Avenue Bridge (CRG, 2006).

2.3 Summary of Previous Ecological Investigations

Ecological investigations were conducted to evaluate potential exposure to site-related constituents in environmental media within the ABD portion of Pompon Lake (Exponent and ANSP, 2003; CRG, 2006):

- 1997-1998 Ecological Investigation: Between 1995 and 1998, an ecological investigation was conducted in Pompton Lake and the ABD to evaluate the potential for adverse effects to ecological receptors (Acid Brook Delta Ecological Investigation Reference Area Evaluation and Phase 1 Data Report, PTI Environmental Services et al., 1997, and Acid Brook Delta Ecological Investigation - Phase 2 Report (Phase 2 Ecological Investigation), Exponent and ANSP, 2003).
- 2005 Supplemental Biological Investigation: A supplemental biological investigation was conducted in 2005 to support the Ecological Investigation by providing a more current understanding regarding the health and condition of aquatic communities in the ABD (CRG, 2006).

The integrated findings of previous ecological investigations did not identify unacceptable risk to primary receptors resulting from exposure to site-related constituents in environmental media in the ABD. A concise summary of the key findings of previous risk evaluations is provided below for the predominant exposure pathways evaluated [Exponent and ANSP, 2003; CRG, 2006; URS Corporation (URS), 2010].

- Comparisons of surface water data to chronic water quality standards (e.g., NJDEP water quality standards and chronic EPA ambient water quality criteria) indicated that direct contact exposure of aquatic receptors to mercury and other site-related constituents in surface water is not likely to result in adverse ecological effects.

- An evaluation of sediment-associated impacts to benthic macroinvertebrate communities based on the Sediment Quality Triad (SQT) approach did not identify the potential for sediment toxicity or impacts to benthic macroinvertebrate communities (Exponent and ANSP, 2003); Supplemental benthic macroinvertebrate community analyses conducted in 2005 supported similar conclusions, indicating that benthic community structure in the ABD was not altered by mercury concentrations in sediment [see Appendix D in the Remedial Action Proposal (CRG, 2006)].
- Based on mercury residues in fish tissue, potential risk to fish in the ABD was not significant. Although mercury concentrations in fish tissue were elevated in the ABD relative to reference areas, mercury concentrations measured in fish tissue in the ABD during the Phase 2 EI and 2005 supplemental ecological investigations were below an effects benchmark concentration for juvenile and adult fish, with the exception of larger [> 35 cm total length (TL)] largemouth bass (*Micropterus salmoides*) (URS, 2010).
- When normalized by length, mercury concentrations in largemouth bass tissue from Pompton Lake were similar to or lower than mercury concentrations in largemouth bass tissue from other lakes and reservoirs in northern New Jersey. Exponent and ANSP (2003) concluded that, with the exception of two largemouth bass samples from the ABD, which were older (i.e., larger) than typical samples included in the NJDEP monitoring data, mercury concentrations in largemouth bass were not elevated above concentrations typically found in lakes and reservoirs in northern New Jersey (Exponent and ANSP, 2003). Further comparisons of length-normalized largemouth bass tissue samples from Pompton Lake and other northern New Jersey lakes and reservoirs included in the NJDEP *Routine Monitoring Program for Toxics in Fish* indicated that length-normalized mercury concentrations in adult largemouth bass tissue measured in Pompton Lake were comparable to length-normalized concentrations measured in the 10 nearest New Jersey lakes and reservoirs (ARCADIS, 2013; URS, 2013a).
- The results of probabilistic food-web modeling concluded that exposure to MeHg concentrations in water, sediment, and prey from the ABD did not pose a significant potential for adverse effects to avian wildlife. Hazard quotients for mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), double-crested cormorant (*Phalacrocorax auritus*), and bald eagle (*Haliaeetus leucocephalus*) were less than 1.0 at the 95th percentile exposure level modeled. When evaluating resident belted kingfisher (*Megaceryle alcyon*), which potentially forage exclusively within the ABD, the probabilistic model calculated hazard quotients of 1.1 to 1.2 at the 95th percentile exposure level. The resultant risk from this exposure would equal a rate of exceedance of a hazard quotient of 1.0 for a female kingfisher every 6 to 10 years. This level of risk was considered insignificant to the resident breeding population supported by Pompton Lake (Exponent and ANSP, 2003).

Previous ecological investigations of Pompton Lake focused on evaluating exposure and potential ecological risks in the ABD relative to the reference areas. Consistent with the objectives stated in Section 1.1, the 2013 Ecological Investigation was designed to evaluate exposure and potential ecological risks in Pompton Lake outside of the portion of the ABD included in the 2011 CMI WP removal area.

3.0 Problem Formulation

Based on the background information presented in the previous sections, a problem formulation was developed to inform the design of ecological investigations to address uncertainties in the CSM regarding ecological exposure outside of the 2011 CMI WP removal area. A preliminary problem formulation was provided in the Framework Document and presented to the EPA, USFWS, and NJDEP during a meeting on July 16, 2013. This section presents the refined problem formulation based on input received from the agencies.

Problem formulation is a systematic planning process that identifies the factors to be addressed in an ecological risk assessment (EPA, 1997a). The problem formulation for the ecological investigation of Pompton Lake includes the following elements (EPA, 2004):

- Definition of the spatial scope of the investigation
- Identification of constituents of potential ecological concern (COPECs)
- Development of an ECSM that evaluates:
  - Environmental fate and effects of COPECs
  - Key exposure pathways
  - Receptors potentially at risk
- Selection of assessment endpoints
- Articulation of risk questions
- Identification of measurement endpoints
- Development of a plan for analyzing risk and evaluating uncertainty.

The following sections discuss these elements of the problem formulation.

3.1 Spatial Scope of Investigations

The spatial scope of ecological investigations includes areas within Pompton Lake and an upstream reference area. The following study areas were defined relative to the areal limits of the 2011 CMI WP removal area and upstream reference areas (see Figure 3-1):

- Pompton Lake Study Area (PLSA): Investigations within the Pompton Lake study area focused primarily on areas outside of the areal limits of the 2011 CMI WP removal area and extended upstream to the Lakeside Avenue Bridge and downstream to a safety buffer area upstream of the Pompton Lake Dam (see Figure 2-1). For selected endpoints, the study area was further divided into sub areas for the investigation:
  - PLSA – Upper Ramapo River Channel (URC): Includes areas of the PLSA to the east of the 2011 CMI WP removal area limit, extending from the Lakeside Avenue Bridge downstream to where the Ramapo River channel narrows below the ABD.

  - PLSA – Lower Ramapo River Channel (LRC): Includes areas of the PLSA from where the Ramapo River channel narrows below the ABD to the safety buffer area upstream of the Pompton Lake Dam.
- Pompton Lake within the ABD: Data for select endpoints were collected from within the 2011 CMI WP removal area limit to provide a point of reference for data collected in the PLSA and the reference area.
- Upstream Ramapo River and Potash Lake Reference Area: Reference areas for ecological investigations in Pompton Lake extended from the Lakeside Avenue Bridge approximately 1.5 miles upstream to Potash Lake.

3.2 Identification of COPECs

The 2013 Ecological Investigation focused on evaluating potential ecological exposure to mercury within the PLSA based on previous investigations of Acid Brook and the ABD that identified mercury as the primary COPEC. Consistent with site history and use, several other site-related metals including barium, copper, lead, selenium, and zinc, were also detected in environmental media sampled within the ABD and adjacent upland/wetland areas.

The Phase 2 Ecological Investigation concluded that the greatest concentrations of mercury and other site-related metals in sediment generally were distributed in nearshore areas of the ABD and decreased within increasing distance lakeward from the mouth of Acid Brook (Exponent and ANSP, 2003). Based on the findings of the SQT investigation conducted during the Phase 2 Ecological Investigation, exposure to mercury or other site-related metals was not associated with sediment toxicity or alterations in benthic community structure within the ABD (Exponent and ANSP, 2003). These findings were further supported by an evaluation of acid-volatile sulfide (AVS) and simultaneously extracted metals (SEM), which indicated that a sufficient amount of sulfide was available in ABD sediments to bind divalent metals (e.g., copper, lead, zinc) as insoluble metal-sulfide complexes that are not expected to be toxic. Based on these results, exposure to other metals in sediment is not likely to result in adverse ecological effects; therefore, the current ecological investigation focused on potential ecological exposure to mercury in the PLSA.

3.3 Other Stressors of Potential Concern

Sources of potential environmental degradation other than mercury are present within Pompton Lake. In 2006, Pompton Lake was listed on the NJDEP 303 (d) list for not supporting the Aquatic Life designated use by failing to meet NJDEP Surface Water Quality Standards (NJSWQS) for dissolved oxygen (DO), pH, and phosphorous (EPA, 2014a). In response to phosphorous impairment, NJDEP developed a Total Maximum Daily Load (TMDL) for Pompton Lake and the Ramapo River (NJDEP, 2008). Additionally, during the 2008 water quality monitoring cycle, Pompton Lake did not support the fish consumption designated use due to fish tissue concentrations of chlordane, dichlorodiphenyltrichloroethane (DDT), and DDT metabolites (e.g., DDE, DDD); in 2010 polychlorinated biphenyls (PCBs) and mercury were included in the list of constituents in fish tissue resulting in consumption impairments (EPA, 2014a).

Eutrophic conditions within Pompton Lake caused by elevated nutrient loading have promoted algal blooms, as well as growth of submerged and emergent aquatic vegetation. Eutrophication has resulted in decreased dissolved oxygen concentration through reduced light penetration of the water column, as well as an increased biological oxygen demand due to bacterial decomposition of organic material. Vegetative growth and algal blooms have increased to the extent that Pompton Lake is regularly treated throughout the spring and summer with aquatic herbicides including copper sulfate and diquat dibromide. Increased turbidity and suspended particulate matter (decomposing vegetation) was observed during August 2013 field efforts shortly after herbicide treatments. Additionally, a mat of decomposing vegetation was observed overlying sediments at several sampling locations. This dense vegetative mat may alter sediment physicochemical properties, as well as benthic community composition.

3.4 Ecological Conceptual Site Model

A draft technical memorandum was prepared in June 2013 to summarize the overall CSM for Pompton Lake based on the environmental investigations conducted to date (ARCADIS et al., 2013). The overall CSM presented in ARCADIS et al. (2013) details investigation findings regarding the nature and extent of site-related constituents in environmental media, mercury fate and transport mechanisms, potential receptors and exposure pathways, and areas of uncertainty. This section presents an ECSM that summarizes the pertinent elements of the CSM regarding mercury sources, fate, and transport, and provides additional detail regarding ecological receptors and exposure pathways. The ECSM is intended to provide a representational understanding of the exposure pathways between mercury in environmental media and ecological receptors inhabiting the PLSA. The ECSM provides the basis for identifying assessment endpoints, generating risk questions, and selecting measurement endpoints in the preliminary problem formulation. The ECSM discussed in the sections below includes the following elements:

- Summary of mercury sources to Pompton Lake identified in the CSM (ARCADIS et al., 2013)
- Summary of mercury fate and transport mechanisms within Pompton Lake (ARCADIS et al., 2013)
- Description of the potential ecotoxicity of mercury in the environment
- Identification of complete exposure pathways to ecological receptors
- Identification of relevant ecological receptors for further evaluation

Figure 3-1 presents the ECSM for Pompton Lake, illustrating the key relations between mercury sources and ecological receptors via fate, transport, and exposure pathways. The following subsections provide further detail for each element of the ECSM.

3.4.1 Sources of Mercury to Pompton Lake

The following section summarizes the historical and on-going sources of mercury to Pompton Lake as identified in the CSM (ARCADIS et al., 2013).

Pompton Lakes Works

The primary source of site-related metals to the ABD was historical inputs from the PLW site via Acid Brook. Remediation was completed in Acid Brook and its floodplain from the PLW site to Lakeside Avenue between 1991 and 1997; further remediation of the Acid Brook channel and adjacent upland/wetland areas from Lakeside Avenue to Pompton Lake are proposed as part of the 2011 CMI WP (ARCADIS et al., 2011). An evaluation of mercury input via Acid Brook indicated that Acid Brook surface water will not represent a significant source of mercury to ABD sediments following the proposed remediation (CRG, 2010a). Metals are not constituents of interest in groundwater; therefore, groundwater is not considered a significant source of mercury or other metals to Pompton Lake.

The historical nature of site-related inputs to the lake are reflected in sediment coring data collected within the ABD, which indicate maximum concentrations of mercury at sediment depths consistent with the known history of mercury at the site (CRG, 2006). Mercury concentrations are substantially lower in shallower sediment intervals. These findings indicate that site-related sources of mercury to the ABD are primarily associated with historical transport mechanisms via Acid Brook.

Ramapo River Surface Water

Mercury contributions to Pompton Lake may be associated with inputs from the Ramapo River. As previously stated in Section 2.1.2, the Ramapo River is the predominant source of surface water flow to Pompton Lake. The following sources of mercury to the Ramapo River were identified in the CSM (ARCADIS et al., 2013):

- Atmospheric deposition: An annual input to the Ramapo River of 1.1 kilograms per year (kg/yr) can be attributed to atmospheric deposition. In comparison, the annual mercury input of Ramapo River surface water to Pompton Lake is 1.6 kg (CRG 2010a). Inputs of mercury via atmospheric deposition may have been higher historically in New Jersey (Kroenke et al., 2002).
- Water treatment works: Publicly owned treatment works (POTWs) and other water treatment and waste management systems are widely recognized as potential sources of mercury to surface water. The six POTWs located on the upper Ramapo River Watershed that were identified as sources of phosphorous loading in a recent TMDL assessment for the area (NJDEP, 2008) are also potential low-level sources of mercury to Ramapo River surface water (CRG, 2010a).
- Contaminated sites at upstream locations: The EPA National Priority List (NPL) (http://www.epa.gov/superfund/sites/query/queryhtm/nplfin.htm) was used to identify contaminated sites located in the upper Ramapo River watershed in which mercury may have been a constituent of concern. Although these sites may not be current sources of mercury to Ramapo River surface water, they are potential historical sources (CRG, 2010a).

3.4.2 Mercury Fate and Transport

Ecological exposure to mercury in Pompton Lake is dependent on fate and transport processes, which provide potential exposure pathways to ecological receptors. As described in the CSM, predominant fate and transport pathways in Pompton Lake include the physical relocation of sediments (sediment stability), methylation processes, and bioaccumulation. A summary of these fate and transport mechanisms is provided below; further detail is provided in the CSM (ARCADIS et al., 2013; ARCADIS et al., 2014).

Physical Mechanisms

Physical mechanisms associated with mercury fate and transport include the potential movement of mercury-containing sediment within the ABD, Pompton Lake, and the Ramapo River. The potential for sediment transport was evaluated based on comparisons of surface sediment elevation over time as measured during multiple bathymetric survey events (i.e., 1993, 2003, 2007, and 2011).

Comparisons of the initial bathymetric surveys (1993/2003 and 2007) generally indicated very little change in the sediment surface elevation (ARCADIS et al., 2013). Between the 2007 and 2011 survey, two general areas of apparent decrease in sediment bed elevation were observed within the Ramapo River channel (approximately 5 to 10 percent of surveyed area) along with some larger areas of apparent increase in sediment bed elevation (15 to 20 percent of surveyed area). The remaining portion of the surveyed area (approximately 75 percent) indicated little, if any, change in surface elevation. Potential areas of decreased sediment bed elevation were located downstream of the Lakeside Avenue Bridge and downstream of the ABD where the Ramapo River channel narrows (ARCADIS et al., 2013).

Further evaluations of lake bed stability and sediment depositional patterns over a wide range of flow conditions, including the approximately 100-year flood that occurred during Hurricane Irene in 2011, were conducted for Pompton Lake using hydrodynamic and sediment transport modeling and sediment data analyses. The results of the analyses are presented in detail in ARCADIS et al. (2014); key findings of the hydrodynamic and sediment transport modeling pertaining to bed stability and sediment transport are summarized below:

- Hydrodynamic modeling indicates that flow rates exceeding the critical bed shear stress occur less than one percent of the time over a multi-year period, with all portions of the lake being depositional at least 99 percent of the time.
- Sediment aggrades during long periods of low to moderate flow rates that occur between episodic floods. Significant episodic erosion may occur during floods with return periods of 10 to 25 years or greater.

Overall, the findings of the hydrodynamic and sediment transport modeling indicate that lake bed is stable and depositional over 99 percent of the time. Episodic erosion that occurs during floods with return periods of 10 to 25 years or greater may be observed in erosional areas identified based on comparisons with bathymetric surveys from 2007 and 2011.

As summarized in Section 2.2.1, the evaluation of 2013 sediment THg data relative to historical sediment data did not indicate major changes in THg concentrations as a result of hydrodynamic events, including Hurricane Irene, that have occurred between sampling events (ARCADIS et al., 2014). Collectively, these findings indicate that physical transport through hydrodynamic events, including approximately a 100-year flood, has not resulted in major changes in exposure conditions for mercury in sediments throughout the PLSA.

Mercury Methylation

Mercury methylation and bioaccumulation are important transport and exposure pathways for mercury within the ABD and Pompton Lake (ARCADIS et al., 2013). Benthic flux chamber (BFC) studies conducted in the ABD indicated high spatially variability in mercury methylation and low correlation between methylation and sediment THg concentrations (CRG, 2006). However, the greatest measurements of MeHg flux and production, as well as measured MeHg concentrations in sediment and surface water, were reported at nearshore stations within the ABD. Microcosm studies concluded that mercury in ABD sediments was largely unavailable for methylation, even when subjected to conditions that should be highly favorable for MeHg production (CRG, 2006).

An evaluation of surface water and sediment MeHg concentrations in the ABD indicates a greater potential for mercury methylation in the nearshore ABD area compared to areas more distant from the mouth of Acid Brook. Concentrations of dissolved THg and MeHg were typically greater in the water column overlying nearshore sediments than in the water column overlying sediments more distant from the shoreline and at reference locations. Dissolved MeHg concentrations measured in surface water samples collected outside of the ABD were similar to reference concentrations measured upstream of the Lakeside Avenue Bridge. A similar pattern of decreasing concentrations with increasing distance from the mouth of Acid Brook was observed for MeHg in surficial sediments, suggesting that water column MeHg may be related to sediment efflux of MeHg; however, as indicated by the BCF and microcosm studies summarized above, MeHg flux measured in the ABD was highly variable (CRG, 2006).

Mercury Bioaccumulation

Mercury bioaccumulation was evaluated as part of Phase 2 Ecological Investigation studies and 2005 supplemental ecological investigations. In the Phase 2 Ecological Investigation, THg and MeHg concentrations measured in representative organisms were generally greater in the ABD relative to reference areas (Exponent and ANSP, 2003). MeHg concentrations in fish tissue samples collected in the ABD and reference areas generally increased with fish size. Similar results were observed in supplemental ecological investigations conducted in 2005, where THg and MeHg concentrations in benthic invertebrates, young-of-year (YOY) fish, and algal mats were greater in samples collected from the ABD relative to samples collected from reference areas. In general, tissue concentrations measured in the ABD in 2005 did not indicate an increased accumulation of mercury by chironomids and YOY fish tissue relative to 1998 tissue concentrations.

While mercury concentrations in fish tissue samples from the ABD were elevated compared to the reference locations, length-normalized THg concentrations in adult largemouth bass from Pompton Lake were comparable to length-normalized adult largemouth bass tissue concentrations from other lakes and reservoirs in northern New Jersey (see Section 2.3).

3.4.3 Ecotoxicity of Mercury

Mercury exists in several forms in the environment, each of which has different toxicological characteristics. The primary species of mercury of environmental concern are inorganic mercury (IHg) and MeHg. Inorganic mercury is generally found as complexes of the divalent mercuric ion [Hg(II)] complexed with ligands [e.g., oxygen, chloride, dissolved organic carbon (DOC)]. Inorganic mercury can be converted to MeHg by a diverse array of anaerobic microbial organisms through the process of methylation (Compeau and Bartha, 1985; Fleming et al., 2006).

The adverse effects of mercury depend on its speciation and exposure pathway. Inorganic mercury is primarily nephrotoxic in wildlife; but, in some laboratory exposures, other effects, including enzyme inactivation and genotoxicty have been observed (Wolfe et al., 1998). Exposure to IHg is primarily via ingestion or direct contact (Wolfe et al., 1998).

MeHg is the mercury species of greatest concern for wildlife exposure since MeHg is bioaccumulated to a greater extent than IHg (Mason et al., 1996) and biomagnifies in food webs, reaching high concentrations in larger, predatory organisms. As a result, exposure via ingestion of food items is the primary exposure route for MeHg. The toxiciokinetics and biotransformation of MeHg differs from IHg; MeHg is slower to depurate than other mercury species (Scheuhammer et al., 2007) and forms complexes with free amino acids and other sulfhydryl-containing blood components that are transported through the body and across placental and blood-brain barriers (Burger and Gochfield, 1997; EPA, 1997b; Basu et al., 2005). In contrast, IHg partitions evenly in blood between protein and plasma, is poorly transported across the blood-brain barrier, and is stored primarily in the kidney and liver. Exposure to MeHg is thought to adversely affect a wide range of effects in upper trophic level organisms, including neurotoxicity and alterations and/or impairments to blood and serum chemistry, histology, growth and development, metabolism, behavior, vision, hearing, motor coordination, and reproduction (Eisler, 1987; Colborn et al., 1993; Wolfe et al., 1998).

3.4.4 Ecological Exposure Pathways

Potentially complete ecological exposure pathways are identified in Figure 3-1 for representative ecological receptor categories that may be exposed to mercury in abiotic and biotic media within Pompton Lake. The following subsections discuss relevant exposure media, exposure routes, and complete exposure pathways identified for the PLSA.

Exposure Media

As summarized in Section 2.2, MeHg and THg are present in environmental media within the PLSA as a result of the conceptual fate and transport pathways described in the Section 3.4.2.

Ecological receptors may be exposed to MeHg and THg in the following primary exposure media in Pompton Lake:

- Sediment
- Pore water
- Surface water
- Biological tissues

Ecological receptors may encounter these media through their use of certain habitats, through direct feeding habits, or indirectly via their feeding behavior. These exposure routes are discussed below.

Exposure Routes

Ecological receptors in Pompton Lake may be exposed to mercury through three primary routes of exposure (see Figure 3-1):

- Direct contact exposure to abiotic media (surface water, sediment, and pore water)
- Ingestion of aquatic and terrestrial biota
- Incidental ingestion of sediment particles or surface water during foraging

The inhalation exposure route is associated with the elemental form of mercury, which is not likely present in the aquatic environment and is, therefore, not considered relevant to ecological investigations in Pompton Lake.

Complete Exposure Pathways

Figure 3-1 illustrates complete exposure pathways identified for general ecological receptor categories that may be exposed to mercury in the PLSA. A summary of the complete pathways for each receptor category is provided below:

- Benthic invertebrates: Benthic invertebrates may be exposed via direct contact exposure routes to surface water (epifaunal taxa), sediment, and pore water (infaunal taxa). Benthic invertebrates may also contact exposure media through ingestion pathways, including direct ingestion of biota and incidental ingestion of sediment and pore water.
- Fish: Pelagic fish are primarily exposed to surface water through direct contact exposure routes and biota through direct ingestion. Demersal fish may be exposed through direct contact to surface water, sediment, and pore water, in addition to the direct ingestion of biota and the incidental ingestion of sediment and pore water.
- Amphibians: Amphibians may be exposed through direct contact with surface water, sediment, and pore water, as well as direct ingestion of biota and incidental ingestion of sediment and sediment pore water.
- Reptiles: Reptiles may be exposed through direct contact with surface water, sediment, and pore water, as well as direct ingestion of biota and incidental ingestion of sediment and sediment pore water.
- Semi-aquatic piscivorous birds: Direct ingestion of biota is the primary exposure pathway for piscivorous birds. Direct contact exposure to sediment and surface

water is considered to be complete, but limited for wildlife relative to dietary pathways.

- Semi-aquatic invertivorous/omnivorous birds: Exposure of invertivorous/ omnivorous birds is predominantly through the direct ingestion of biota and surface water and the incidental ingestion sediment during while foraging for invertebrates in sediment.
- Semi-aquatic aerial insectivorous birds: Direct ingestion of insects emerging from sediments is the primary exposure pathway for aerial insectivorous birds. Exposure pathways to surface water are complete, but limited relative to dietary pathways. Exposure pathways to sediment and pore water are incomplete.
- Terrestrial invertivorous songbirds: A complete exposure pathway for terrestrial invertivorous songbirds is associated with the direct ingestion of predatory terrestrial invertebrates (e.g., spiders) as a component of their diet; spiders forage on insects emerging from lake sediments, thereby completing the exposure pathway to exposure media in the PLSA. Other pathways to exposure media are incomplete for terrestrial invertivorous songbirds.
- Semi-aquatic aerial insectivorous mammals: Direct ingestion of insects emerging from sediments is the primary exposure pathway for aerial insectivorous mammals (i.e., bats). Exposure pathways to surface water are complete, but limited relative to dietary pathways. Exposure pathways to sediment and pore water are incomplete.
- Semi-aquatic piscivorous mammals: Direct ingestion of biota and incidental ingestion of sediment was identified as potentially complete exposure pathways for piscivorous mammals.

3.4.5 Identification of Ecological Receptors

The ecological investigation cannot specifically evaluate the potential for adverse effects to each plant, animal, and microbial species that may be present and potentially exposed in the PLSA. Therefore, representative receptor species of concern were identified for each of the trophic categories and feeding behaviors presented in the ECSM (see Figure 3-1). Representative species for each receptor were selected based on the following criteria (EPA, 1997a):

- Receptors include resident species or communities exposed to the highest chemical concentrations in environmental media
- Receptors include species or functional groups that are essential to, or indicative of, the normal functioning of the affected habitat
- Receptors that are federal or state threatened or endangered species or otherwise highly valued by society (i.e., species of cultural importance)

A list of candidate ecological receptors was provided in the Framework Document (URS, 2013a) and reviewed with EPA, USFWS, and NJDEP in a meeting on July 16, 2013. Based on input provided by EPA during this meeting, additional receptors were identified and included in the ECSM. As a result, the following receptors were selected to represent each receptor category identified in the ECSM for evaluation in the ecological investigation:

- Benthic invertebrates: community- and population-level;
- Fish: population-level evaluation of focal species representing primary trophic groups in the fish community;
- Amphibians: American bullfrog (*Rana catesbeiana*) based on its availability and abundance within the PLSA and reference areas;
- Semi-aquatic piscivorous birds: belted kingfisher, great blue heron, and double-crested cormorant;
- Semi-aquatic invertivorous/omnivorous birds: mallard;
- Semi-aquatic aerial insectivorous birds: tree swallow (*Tachycineta bicolor*);
- Terrestrial invertivorous songbirds: Carolina wren (*Thryothorus ludovicianus*) based on the relatively high proportion of spiders as a dietary item;
- Piscivorous mammals: Mink (*Mustela vison*) and river otter (*Lontra canadensis*); and
- Aerial insectivorous mammals: little brown bat (*Myotis lucifugus*).

No receptors were selected to evaluate potential reptilian exposure to MeHg and THg through dietary and direct contact pathways in the PLSA. Most reptilian species likely to occur in substantial populations in Pompton Lake study areas, with the possible exception of snapping turtles (*Chelydra serpentina*), will likely occupy lower trophic levels within the lake food web (e.g., herbivores, omnivores) than the higher order avian piscivores selected as receptors (Bergeron et al., 2007). The lower trophic level of most reptiles will result in lower dietary exposure to mercury and, thus lower subsequent mercury toxicity relative to higher order piscivores. Focusing the assessment of mercury risk on exposure to higher trophic consumers is consistent with other efforts to develop target MeHg criterion concentrations in fish tissue for consumption by wildlife (USFWS, 2005).

Although complete exposure pathways likely exist for snapping turtles in Pompton Lake study areas, it is assumed that potential mercury associated risks to this species through the consumption of fish will not be greater than the risk for the range of avian piscivores included in the investigation. Toxicological data related to mercury-associated effects in reptiles are limited. In one of the first studies to evaluate the effects of mercury on snapping turtle reproduction, Hopkins et al. (2013) indicated that exposure to mercury does not appear to be as consequential to turtle reproduction as it is in birds. THg concentrations in snapping turtle eggs exceeded concentrations reported for birds; however, a less severe effect on embryonic survival was observed in turtles relative to birds. Given that more sensitive piscivorous species have been identified as receptors, in addition to the limited availability of toxicological data to evaluate reptilian exposure to mercury, quantitative exposure evaluations are not included in the ecological investigation. Potential exposure to reptiles is addressed qualitatively as an uncertainty in the exposure evaluation.

3.5 Assessment Endpoints, Risk Questions, and Measurement Endpoints

Assessment endpoints, risk questions, and measurement endpoints used to evaluate potential ecological exposure in the PLSA are presented in this section. An assessment endpoint is an “explicit expression of the environmental value that is to be protected” (EPA, 1997a). Assessment endpoints were selected for ecological exposure to mercury based on the following considerations (EPA, 1997a):

- Identification of mercury as the primary COPEC and its mechanism of toxicity
- Potential ecological receptor groups present in the PLSA that are potentially sensitive to, or highly exposed to mercury
- Potentially complete exposure pathways, as identified in the ECSM

Given that no threatened or endangered resources were identified in the Pompton Lake study areas (see Section 2.1.3), assessment endpoints were selected for the protection of local populations and communities of representative ecological receptors, consistent with the objectives of EPA (1997a) and EPA *Principles for Ecological Risk Assessment and Risk Management* (EPA, 1999). Assessment endpoints focused on survival, growth, and reproduction endpoints because these endpoints are the primary lines of evidence used in the evaluation of ecological effects for risk-management decision-making (EPA, 1994). A summary of assessment endpoints selected for each receptor category is provided in Table 3-1.

Risk questions were formulated to identify specific measurable ecological characteristics that could be used to evaluate the selected assessment endpoints. These measurement endpoints represent numerical observations that were measured in the PLSA and compared to similar observations measured at reference sites or reported in the literature (e.g., effects thresholds). The selected measurement endpoints were used in a weight-of-evidence (WOE) assessment of risk to each representative receptor based on the identified assessment endpoints. A summary of the risk questions and measurement endpoints selected for each assessment endpoint is provided in Table 3-1.

4.0 2013 Lake Investigation Activities

This section summarizes the data collection activities conducted from June to September 2013 to provide data to support the Ecological Investigation.

4.1 Summary of Data Collection Activities

Data collection activities were designed to provide the necessary information to evaluate the assessment and measurement endpoints developed in the problem formulation (see Section 3.5). The approach for data collection was presented to EPA, USFWS and NJDEP in a series of scoping documents submitted between May and August 2013. Table 4-1 summarizes the scopes of work for data collection and the associated endpoints and exposure pathways evaluated using the collected data. The following subsections provide a summary of data collection activities.

4.1.1 Surface-Water Characterization

Surface water samples were collected to evaluate potential ecological exposure and mercury bioavailability in surface water within the PLSA. As described in SOW #4 *Surface Water Characterization*, the surface water sampling design was developed based on existing data pertaining to the distribution of THg and MeHg in surface water and sediment in Pompton Lake (URS, 2013b). As illustrated in Figure 4-1, surface water samples were collected at 20 stations: five stations in the within the ABD, 10 stations within the PLSA, and five stations within the reference area.

Surface water samples were collected approximately 1 foot below the water surface (near surface) at each station using a diaphragm pump. At five selected locations, near bottom samples were also collected within approximately 1 foot of the sediment to surface water interface to evaluate exposure to demersal and benthic-dwelling organisms. Samples were collected in accordance with the guidance and principles outlined in EPA Method 1669 *Sampling Ambient Water for Determination of Metals at EPA Water Quality Criteria Levels* (July 1996). In accordance with EPA Method 1669, samples for THg and MeHg analysis were collected using the “clean hands-dirty hands” technique. THg and MeHg analyses were conducted on unfiltered and 0.45 μm-field filtered surface water samples. Analyses were conducted by Brooks Rand Labs (Brooks Rand; in Seattle, Washington) using EPA Methods 1631 and 1630 for THg and MeHg, respectively. Because mercury species adsorb strongly to suspended sediment in fresh water (Meili, 1997), unfiltered samples were also analyzed for total suspended solids (TSS) to quantify the amount of suspended solids in the sample and to enable the calculation of particulate THg and MeHg concentrations in surface water.

Water quality parameters were measured *in situ* during surface water sample collection to characterize the range of physical and chemical conditions of Pompton Lake surface water. *In situ* water quality parameters included temperature, dissolved oxygen, pH, and specific conductivity. At near bottom sampling stations, vertical profiles of water quality parameters were developed to assess potential stratification of the water column; water quality parameters at these stations were measured in 1-foot intervals from the water surface to approximately above 1 foot above the sediment-surface water interface to develop vertical profiles.

4.1.2 Sediment Quality Triad Investigation and Sediment/Pore Water Characterization

This section describes sediment and pore water sampling activities conducted in accordance with SOW #7 *Sediment Quality Triad Investigation and Sediment/Pore Water Characterization* (URS, 2013c). As presented in the SOW, sediment sampling stations were categorized based on the types of data or lines-of-evidence (LOEs) that were collected to evaluate potential impacts to benthic macroinvertebrate receptors. Category 1 stations included data collection to support a sediment quality triad (SQT) investigation and invertebrate tissue analyses. Category 2 stations included bulk sediment, pore water, and invertebrate tissue analyses; Category 3 stations included only bulk sediment and pore water analyses.

Lines of Evidence	Station Category		
	1	2	3
Benthic community analyses	●		
Sediment toxicity testing	●		
Bulk sediment analyses[1]	●[2]	●[3]	●[3]
Pore water analyses – THg and MeHg	●	●	●
Aquatic/emergent invertebrate tissue analyses	●	●	

Notes:
1. Bulk sediment analyses included analyses of grain size distribution and total organic carbon
2. Bulk sediment analytical suite included analyses of THg/MeHg, metals, acid volatile sulfides (AVS), simultaneously extractable metals (SEM), pesticides/herbicides, and semi-volatile organic compounds (SVOCs)
3. Bulk sediment analytical suite included only analyses of THg and MeHg

The following subsections describe the approach for collecting samples to support the SQT investigation and additional sediment and pore water characterization. The approach for collecting and analyzing aquatic and emergent invertebrate tissue samples is discussed in Section 4.1.3.

Sediment Quality Triad

An SQT investigation was conducted to evaluate potential adverse effects to benthic macroinvertebrate communities exposed to mercury in sediments within the PLSA. Specific study objectives for the SQT investigation were to evaluate potential mercury-associated toxicity across a gradient of THg concentrations in sediment in representative habitats within study and reference area based on the following:

- *In situ* evaluations of potential differences in benthic macroinvertebrate community structure
- *Ex situ* evaluations of sediment toxicity to freshwater invertebrate test organisms in long-term sediment toxicity tests

- Comparisons of measured THg and MeHg concentrations in sediment and pore water to literature-derived benchmarks for sediment and aqueous exposures, respectively

A detailed report of the data collection and analyses associated with the SQT investigation is provided as Appendix A. A brief summary of the data collection activities is provided below.

As illustrated in Figures 4-2a to 4-2c, the SQT investigation included 22 stations (Category 1) within the PLSA (n=17) and reference area (n=5). The number and distribution of SQT stations within the PLSA were selected to reflect a gradient of sediment THg concentrations and to provide adequate spatial coverage within representative habitat types. The selection of SQT stations presented in SOW #7 was based on existing sediment THg and habitat information. However, additional sediment THg data obtained in August and September 2013 following the submittal of the SOW were used to evaluate the adequacy of the sampling design. Based on this evaluation, the following supplemental SQT stations were added to enhance the sampling design:

- PLSA-C1-40: An additional station was located within the ABD to capture the upper range of the THg concentration gradient within the PLSA. Expedited analyses of the six SQT stations located adjacent to the 2011 CMI WP removal limit indicated a maximum THg concentration of 12.4 µg THg/g (PLSA-C1-22) within the PLSA, which was lower than the intended maximum concentration targeted in the initial sampling design (URS, 2013c). The THg concentration of 23.5 µg THg/g measured at the additional station (PLSA-C1-40) represents the maximum concentration evaluated in the SQT study; this maximum concentration is within the upper concentration range of 20 to 30 µg THg/g proposed by EPA in the November 5, 2013 comment letter on SOW #7 (EPA, 2013a).
- PLSA-C1-39: An additional SQT station was added to the lower Ramapo River channel portion of Pompton Lake based on the results of additional sediment characterization sampling conducted in August 2013 (see Figure 4-2b; ARCADIS, 2013). The THg concentration measured in the surficial sampling interval (0 to 0.5 feet) at this station during the August 2013 sampling event was 19.6 µg/g, which was greater than concentrations evaluated for this area during the design of the SQT investigation.

Five SQT stations were sampled upstream of the Lakeside Avenue Bridge to provide reference data for comparisons with SQT results from stations within the PLSA (see Figure 4-2c).

A systematic sampling approach was implemented to collect data to support the multiple LOEs evaluated in the SQT investigation. The following sediment samples were collected from the surface sediment interval (0 to 0.5 feet) at each SQT station:

- Discrete grab samples (*n* = 5)[3] for benthic macroinvertebrate community analysis
- Discrete grab sample for *ex situ* extraction of pore water
- Composite grab samples to obtain at least 8 liters of sediment for toxicity testing and 1 liter of sediment for bulk sediment analysis

As described in further detail in Appendix A, spatially- and temporally-matched, biological, chemical, and toxicological data were obtained from each SQT station. Benthic community samples were submitted to EcoAnalysts, Inc. (EcoAnalysts; Moscow, Idaho) for taxonomic identification to the lowest practicable taxon, typically genus. Bulk sediment samples were submitted to Brooks Rand for THg and MeHg analyses in sediment and pore water extraction via centrifugation and subsequent THg and MeHg analyses. In addition to THg and MeHg, bulk sediment samples were analyzed for target analyte list (TAL) metals, AVS-SEM, target compound list (TCL) pesticides/herbicides, semi-volatile organic compounds (SVOCs), TOC, and grain size distribution by Eurofins Lancaster Laboratories in Lancaster, Pennsylvania.

In addition, bulk sediment was submitted for chronic sediment toxicity testing at EnviroSystems, Inc. (EnviroSystems; Hampton, New Hampshire) based on the following protocols:

- 28-day *Hyalella azteca* test for survival and growth (EPA Method 100.4; EPA, 2000)
- 20-day *Chironomus dilutus* test for survival and growth (EPA Method 100.5; EPA, 2000)

At the request of EPA, additional surrogate test chambers were established in the sediment toxicity test and sampled for pore water analyses on Day 7 of the sediment toxicity test. Bulk sediment from the surrogate test chambers was submitted for *ex situ* pore water extraction and mercury analyses, consistent with the methods used to extract and analyze pore water from field samples. The results of the Day 7 pore water analyses were used to evaluate exposure conditions in the toxicity test relative to exposure conditions measured from field samples. Further detail regarding SQT data collection activities is provided in Appendix A.

Additional Sediment/Pore Water Characterization

In addition to SQT stations, sediment and pore water characterizations were conducted at additional stations (Categories 2 and 3) to evaluate potential mercury-associated toxicity to benthic macroinvertebrate communities in a broader spatial extent within the PLSA. Selection criteria for the additional characterization stations were similar to the selection criteria for SQT stations, as detailed in Appendix A. As illustrated in Figures 4-2a and 4-2b, 23 stations were selected for additional sediment and pore water characterization within the PLSA, and three stations were selected for additional sediment and pore water characterization in the Upstream Ramapo River/Potash Lake Reference Area (see

[3] SOW #7 specified the collection of three replicate samples for benthic community analyses; however, two additional replicate samples were collected and archived for potential future analysis if the intra-station variability of the initial three replicates precluded meaningful interpretation of the community results.

Figure 4-2c). PLSA-C3-36, PLSA-C3-37, and PLSA-C3-38 were added following the submittal of SOW #7 based on the results of additional sediment sampling conducted in August 2013 (ARCADIS, 2013).THg concentrations in surface sediments in the vicinity of these added stations were greater than existing data used in the development of the sampling design.

Sediment and pore water samples were collected from the additional characterization stations and analyzed using consistent methodologies, as summarized in the preceding section and detailed in Appendix A.

4.1.3 Invertebrate Tissue Evaluation

Mercury bioaccumulation in aquatic- and emergent-life stage invertebrates was evaluated based on the analysis of THg and MeHg in tissues of larval and emergent adult non-biting midges (Family: Chironomidae) and adult crayfish in Pompton Lake study and reference areas. Chironomids were selected as the target species to evaluate mercury bioaccumulation in larval and adult emergent insects because previous investigations indicated that this family represented the greatest relative abundance of insects collected in benthic samples from the ABD and reference areas (Exponent and ANSP, 2003; CRG, 2006). Chironomids are important in the transfer of energy within aquatic systems and to adjacent terrestrial systems due to their relatively short life cycles and large total biomass (Merritt et al., 2008). Chironomids emerge throughout the year, with greater emergence in mid-May and July-September; therefore, chironomids emerging from lake sediments provide a continued source of forage and potential mercury exposure to aerial insectivores (e.g., tree swallow and little brown bat) and predatory terrestrial invertebrates (e.g., spiders).

Crayfish tissue samples were also collected to further evaluate mercury bioaccumulation in invertebrates within the Pompton Lake study and reference areas. Crayfish are useful indicators of potential mercury exposure because they are widely distributed and are relatively large and long-lived (Headon and Hall, 2007). Further, crayfish may represent an important food source to fish and upper trophic wildlife receptors, including birds (e.g., great blue heron) and mammals (e.g., mink and river otter). The following subsections describe the sampling and analysis methods used to evaluate mercury bioaccumulation in invertebrates, consistent with SOW #8 *Aquatic- and Emergent-Stage Invertebrate Tissue Evaluation* (URS, 2013d).

Larval Insects

Composite larval chironomid tissue samples were collected from 13 SQT stations (Category 1) and four additional sediment and pore water characterization stations (Category 2) within the PLSA (see Figures 4-2a and 4-2b); additionally, a composite larval chironomid tissue sample was also collected at station PLSA-C1-40 located within the ABD. Composite larval chironomid samples were collected from four SQT stations within the reference area (see Figure 4-2c). Attempts were made to collect larval chironomid tissue samples at two additional PLSA stations (PLSA-C1-28 and PLSA-C2-35) and one additional reference station (REF-C1-04); however, insufficient sample mass was obtained at these stations for analysis.

Composite larval chironomid tissue samples were collected from sieved sediment grab samples in accordance with procedures outlined in SOW #8 (URS, 2013d). Larval chironomid samples were depurated for a minimum of six hours in distilled water to allow for clearance of the digestive tract prior to shipment to the analytical laboratory (ASTM, 2008). Depuration times ranged from a minimum of six hours to a maximum of approximately 21 hours.

Larval chironomid tissue samples were prepared as composited whole body homogenates at Brooks Rand. Analytical methods were performed following EPA Method 1631 for THg in solids and Brooks Rand Method BR-0011[4]. Insufficient sample mass of larval chironomids was obtained to enable a site-specific measurement of total solids for potential comparisons of data on a dry weight basis.

Emergent Adult Insects

Emerging adult chironomids were collected using floating emergence traps similar to those described in other studies (Davies, 1984; LeSage and Harrison, 1979; Tweedy, et al., 2012). Emergent adult chironomids were sampled from traps deployed at 15 SQT stations (Category 1) and five additional sediment and pore water characterization stations (Category 2) within the PLSA (see Figures 4-2a and 4-2b) and five SQT stations within the reference areas (see Figure 4-2c).

Emergence traps were monitored once every two to four days for approximately 30 days to collect sufficient sample mass for mercury analyses. During trap monitoring, predators (spiders, dragonflies, damselflies, etc.) were removed from the inside of the trap to minimize incidental mortality of target organisms. Adult emergent chironomids within the collection container of the trap or attached to the mesh on the inside of the trap were removed using a vacuum aspirator with a dedicated station-specific collection chamber. Emergent insects collected in the aspirator were removed and placed on dry ice in the field. Following each day of collection, adult chironomids were carefully removed from each collection chamber, counted, weighed, and placed in clearly labeled dedicated sample vials. These sample vials were held in a secure on-site freezer until the end of the sampling period. Sample vials collected during the individual monitoring events were composited into one sample per station at Brooks Rand prior to analysis.

Adult emergent chironomid tissue samples were prepared as composited whole body homogenates and analyzed for THg using EPA Method 1631 and MeHg using Brooks Rand Method BR-0011.One composite sample was obtained from emergent-stage invertebrates collected from each sampling station to obtain sufficient sample mass for analysis of total solids[5]; the results of this analysis provide a site-specific measurement of

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[4] MeHg was analyzed in solids according to Brooks Rand Labs Method BR-0011, which is a modification of EPA Method 1630 for the analysis of MeHg in solids. This method is based on cold-vapor atomic fluorescence spectrometry (CV-AFS) technology and is widely accepted and used for the analyses of MeHg in solid samples (e.g., Bloom, 1992).

[5] The analysis of total solids requires a minimum sample mass of approximately 2 – 3 grams. Obtaining this minimum sample mass at each station was not feasible; therefore, a composite sample of individuals collected from each station was used to provide a representative, site-specific measurement of total solids for the study.

total solids for adult chironomid samples collected during the study that may be used to compare concentrations on a dry weight basis.

Crayfish

Crayfish were collected by manual capture with a long-handled dip net in limited areas of the Pompton Lake study and reference areas with suitable shoreline habitats for crayfish. Suitable shoreline habitats that yielded crayfish samples were generally characterized by small cobble, gravel or sandy substrates with woody debris, aquatic vegetation or overhanging root masses (undercut banks); few crayfish were captured in fine-grained substrates, which are predominant along the shoreline of the lake. Samples for tissue analyses were collected based on the availability of crayfish in the PLSA; individual samples of crayfish within sampling areas may have represented different genera of crayfish within the Family Cambaridae, likely *Cambarus*, *Procambarus*, and/or *Orconectes* (Francois, 1959).

Twenty-five crayfish samples (i.e., individual crayfish) were collected from Pompton Lake study and reference areas: 10 samples from the PLSA (see Figures 4-2a and 4-2b), 10 samples from the reference area (see Figure 4-2c), and five samples from the ABD (see Figure 4-2a). Carapace length (mm) and weight (g) of each sample was recorded. Samples were rinsed with deionized or distilled water, blotted using lint-free wipes to remove excess water, and placed into individual sample containers. Crayfish samples were prepared as individual whole body samples at Brooks Rand and analyzed using EPA Method 1631 for THg in solids and Brooks Rand Method BR-0011for MeHg in solids.

4.1.4 Fish Tissue Evaluation

Consistent with SOW #6, a fish tissue survey was conducted to evaluate exposure to fish and piscivorous wildlife that may be exposed to mercury through the consumption of fish in the PLSA (URS, 2013e). Mercury bioaccumulation into fish was evaluated based on the analyses of whole body tissue samples of representative species from the following feeding groups identified in the ECSM:

- Omnivorous fish: Golden shiner (*Notemigonus crysoleucas*) foraging on invertebrates and phytoplankton
- Invertivorous fish: Including yellow perch (*Perca flavescens*) and bluegill sunfish (*Lepomis macrochirus*) foraging on benthic invertebrates and microcrustacean plankton
- Demersal invertivores: Brown bullhead (*Ameiurus nebulosus*) and yellow bullhead (*Ameiurus natalis*) foraging on benthic invertebrates
- Piscivorous fish: Largemouth bass (*Micropterus salmoides*) foraging on other fish

Table 4-2 presents a summary of the typical home range and foraging behavior of fish species targeted for THg and MeHg analyses, as identified in literature studies.

Fish samples were collected from various size classes to represent mercury concentrations in tissues over a range of exposure durations (i.e., larger and older fish have a greater exposure duration) and to provide data for the range of size classes that may be preferentially consumed by piscivorous wildlife. YOY fish samples were collected to evaluate short-term (less than one year), localized exposure to mercury in Pompton Lake. Home ranges of YOY fish tend to be restricted; therefore, analyses of mercury concentrations in YOY fish tissue are indicative of the bioavailability and bioaccumulation within or near the area where the samples are collected. Fish tissue samples for adult species were collected from two size classes based on prey selection characteristics of avian piscivores: samples less than 130 millimeters (mm) TL (TL) and samples between 130 and 350 mm TL. No fish tissue samples greater than 350 mm TL were collected due to the limited ability of piscivorous receptors (e.g., great blue heron and double-crested cormorant) to consume fish larger than 350 mm TL. Dietary doses of fish to piscivorous wildlife were calculated based on the relative dietary composition of fish within each size class based on literature-derived size range preferences (see Sections 5.4 and 5.5).

Fish samples were collected from available habitat within defined sampling locations within the PLSA and the reference area (see Figure 4-3). Three sampling locations were established within the PLSA: URC, LRC-01, and LRC-02. Attempts were made in the field to distribute sample collection equitably throughout the sampling areas to provide spatially representative datasets of fish tissue mercury concentrations throughout the PLSA. Each category of fish tissue samples was collected within the PLSA and reference area. Only YOY fish were sampled within the ABD; adult fish were not sampled from the ABD study area because mercury concentrations in target species have been previously documented in the ABD (Exponent and ANSP, 2003).

The numbers of samples collected for each target feeding group within each study area are summarized in Table 4-3; sample identifications for fish tissue samples are summarized in Table 4-4 by study area. Actual sample sizes of select target fish species were increased from the sample sizes proposed in SOW #6 based on EPA comments during a meeting on July 16, 2013. The numbers of target samples for select species were increased within the conditions of the NJDEP Freshwater Fish Scientific Collection Permit (NJDEP #13-402) to maximize the power of statistical comparisons (URS, 2013f).

Fish samples were collected using methods specified in SOW #6 (URS, 2013e). Targeted electrofishing using an 18-foot boat-mounted Smith-Root GPP 5.0 electrofishing unit (pulsed direct current) along shorelines and shallow water habitats with structure was the predominant method of fish capture for most species and lifestages. Gill nets using experimental mesh with varying sized panels (1/2-inch x 1-inch x 2-inch x 3-inch) were primarily used in the PLSA and reference area to collect golden shiner. Direct capture (dip net) techniques were used in the PLSA and reference area to collect YOY brown bullhead catfish.

Fish tissue samples were processed in the field and submitted to Brooks Rand for mercury analysis (URS, 2013e). TL (mm) and weight (g) of each fish sample were measured and recorded on field datasheets. As indicated in Table 4-3, target species and life stages (YOY, invertivores, and omnivores) were composited into samples of three to five similarly-sized individuals (i.e., smallest fish is >/= 75 percent of the TL of the largest fish in the composite); adult benthic invertivores and piscivores were analyzed as individual whole body samples. Fish tissue samples were prepared as whole body homogenates and analyzed for THg by EPA Method 1631 and MeHg by Brooks Rand Method BR-0011.

4.1.5 Amphibian Tissue Evaluation

Adult American bullfrog (*Rana catesbeiana*) samples were collected to evaluate mercury bioaccumulation in amphibians that may serve as a dietary component of upper trophic consumers (e.g., great blue heron, mink). A secondary objective of the amphibian tissue data was to evaluate potential exposure to amphibians based on the tissue residue approach (TRA).

Adult American bullfrog samples were collected using methods consistent with SOW #5 *Amphibian Tissue Evaluation* (URS, 2013g) under conditions specified in the NJDEP Non Game Scientific Collection Permit (NJDEP #SC 2013169). Terrestrial drift fence/funnel trap arrays were deployed from August 12 to August 29, 2013 within the following study areas to capture adult frogs:

- PLSA: 26 funnel traps (seven drift fence arrays, four traps per array at six arrays and two traps at one array)
- Reference area: 12 funnel traps (three drift fence arrays, four traps per array)
- ABD: Six funnel traps (two fence arrays, two and four traps per array)

Sampling was conducted within the ABD to provide a point of reference for amphibian tissue concentrations from within the 2011 CMI WP removal limit.

Due to a low capture rate in the drift fence/funnel trap arrays, the sampling approach was modified in the field to include active capture with long-handled dip nets. This active method proved more effective than the passive sampling techniques and resulted in the capture of all but two samples submitted to the laboratory for tissue analyses.

Captured individuals were measured and processed for submittal to Brooks Rand for mercury analyses. Individuals rinsed with tap water to remove debris and then rinsed with deionized water; samples were not depurated prior to submittal to the analytical laboratory. The snout-vent length (SVL) and field mass were measured and recorded on datasheets. The following samples were submitted for analyses from the study areas (see Figure 4-4):

- Pompton Lake outside of the ABD: 14 individual adult samples
- Pompton Lake within the ABD: Seven individual adult samples
- Upstream Ramapo River/Potash Lake Reference Area: Five individual adult samples

Individual whole body American bullfrog tissue samples with intact gut tracts were analyzed for THg by Method 1631 and MeHg by Brooks Rand Method BR-0011; total solids were measured for each sample.

4.1.6 Avian Use Survey

An avian receptor survey was conducted in June 2013 to document the presence/absence, use, and relative abundance of birds that forage on aquatic/terrestrial invertebrates and fish (URS, 2013h). The survey methodology was based primarily on New Jersey Audubon Society *Piedmont Bird Survey Protocol*[6] and the U.S. Geological Survey *Instructions for Conducting the North American Breeding Bird Survey*[7]. Study-specific modifications were made to these protocols to achieve the overall objective of evaluating potential exposure to avian receptors associated with the PLSA and the reference area.

Avian surveys were conducted on June 11, 19, and 23, 2013 during fair weather conditions. In accordance with SOW #2 *Avian Receptor Survey*, two survey methodologies were employed:

- Avian community surveys: Conducted by continuous surveying around Pompton Lake and the reference area from a half hour before sunrise to three hours after sunrise (approximately 5:30 AM to 9:00 AM). Surveys were conducted by boat by traveling around the lake and watching and listening for bird activity.
- Avian lake use surveys: Use surveys were conducted throughout the day following the morning community surveys to document aerial insectivore, piscivore, and omnivore use of Pompton Lake and the reference area.

Data generated from the avian surveys included species name, number of individuals, type of detection (fly over, seen, heard, and seen and heard). It is important to note that the methodologies used in the avian receptor survey were not intended to estimate quantitative species densities or other population-level estimates.

4.1.7 Invertivorous Songbird Pathway Evaluation

In accordance with SOW #3 *Invertivorous Songbird Pathway Evaluation*, dietary exposure pathways were evaluated for invertivorous songbirds that potentially forage on predatory terrestrial invertebrates (e.g., spiders) present within the riparian zone surrounding the lake (URS, 2013i). The pathway evaluation included the following:

- A review of the findings of the avian receptor survey (see Section 4.1.6) to evaluate the presence/absence and relative abundance of invertivorous songbirds that may forage on predatory terrestrial invertebrates
- Analyses of THg and MeHg in spider tissue to assess potential dietary exposure to invertivorous songbirds

The following section summarizes the methods for the collection of spider tissue for mercury analyses.

Two families of predatory spiders (Family: Tetragnathidae and Lycosidae) were selected for tissue sampling based upon their use of riparian habitats, feeding habits, and available literature documenting mercury uptake through trophic transfer of aquatic-based prey items. Tetragnathidae, specifically, long-jawed orb weaving spiders inhabit overhanging tree branches, twigs and snags in riparian habitats and forage almost entirely on emerging aquatic insects (Gillespie, 1987; Sanzone 2001, Sanzone et al., 2003). Ground-dwelling spiders of the Family Lycosidae are opportunistic (generalist predator) vagrant wanderers

[6] http://www.njaudubon.org/SectionCitizenScience/PiedmontBirdSurveys.aspx
[7] http://www.pwrc.usgs.gov/bbs/participate/instructions.html

that are known to forage on both terrestrial and aquatic-based prey items, as encountered (Nyffeler and Benz, 1988, Paetzold and Tockner, 2005).

Composite samples of each predatory spider family were collected from each of the three study areas: ABD, PLSA, and the reference area (see Figure 4-5). Ten composite samples of each family were collected in each study area, with the exception of Lycosid spiders in the ABD. Only nine composite samples of Lycosid spiders were obtained for tissue analyses from sampling areas within the ABD.

Tetragnathid spiders were collected by active hand capture. Likely habitats along the lake shoreline, including overhanging branches, vegetation and deadfall woody debris were inspected for target spiders. Tetragnathid spiders were collected by hand or dip net and composited into a single sample for a sampling reach. Sampling reaches ranged from 50 to 980 feet in shoreline length, depending on the available habitat and number of target spiders present. Sampling continued within a given reach until approximately 20 to 40 individuals were collected in order to satisfy laboratory sample mass requirements.

Lycosid spiders were collected using dry pitfall trapping techniques. Four to six dry pitfall traps consisting of two, nested polystyrene cups (3.5-inch diameter) were installed flush with the ground surface within 10 meters of the water at each sampling station (see Figure 4-5). Trap locations were generally monitored daily and individual spiders collected at each trap location were composited into one sample per station. Composite samples were submitted for analyses when sufficient sample mass for analysis was obtained for the trapping location. The trapping effort ranged from 85 to 185 trap-nights[8].

Tetragnathid and Lycosid samples were processed in a field laboratory. Specimens were rinsed with de-ionized water to remove any residual soil/detritus, blotted dry with lint free wipes. Combined abdomen-cephalothorax length (mm) was recorded for the first 25 specimens per location; composite group weight for spiders collected at each location/day was also measured. Following processing, spider tissue samples were frozen and submitted to Brooks Rand for THg analysis by EPA Method 1631 and MeHg analysis by Brooks Rand Method BR-0011. Due to sample mass limitations, percent solids could not be analyzed for each spider sample submitted for mercury analysis; however, a single representative percent solids sample was analyzed for each taxon from a composite sample of individuals collected from sampling locations throughout the study area.

4.2 Reliability of Analytical Data

In addition to field samples, quality assurance/quality control (QA/QC) samples were analyzed for each matrix, consistent with the data quality objectives established in the scoping documents. QA/QC samples included duplicate analyses of submitted sample volumes and matrix spike/matrix spike duplicate (MS/MSD) analyses.

The DuPont Analytical Data Quality Management (ADQM) Group conducted data validation on the electronic data deliverable using the DuPont data review (DDR) process. This process reviews and evaluates laboratory data including hold time criteria,

[8] Trap-nights were calculated as the number of traps per station multiplied by the number of nights the traps were deployed.

blank contamination, MS/MSD recoveries, duplicate sample relative percent difference (RPD), laboratory control sample/control sample duplicate (LCS/LCSD) recoveries, and surrogate recoveries. Based on the DDR process, the following qualifiers were assigned to the supplemental sediment data, as applicable:

Qualifier	Definition
B	Not detected substantially above the level reported in the laboratory or field blanks.
R	Unusable result. Analyte may or may not be present in the sample.
J	Analyte present. Reported value may not be accurate or precise.
UJ	Not detected. Reporting limit may not be accurate or precise.

The results of the DDR data review indicate that the sample results were considered useable with appropriate qualification, with the following exceptions:

- Sediments: Several herbicide results were qualified “R” due to surrogate recoveries below the data rejection limit. Several herbicide non-detect results were qualified “R” due to LCS/LCSD recoveries below the data rejection limit.
- Sediments: One AVS result, several SEM analyses of silver and mercury, several pesticides, and several semi-volatiles were qualified “R” due to MS/MSD recoveries below the rejection limit.

Several THg results in surface water samples were B-qualified due to detectable THg concentrations in equipment blanks; MeHg was not detected in any equipment blank sample. THg was detected in filtered and unfiltered samples from two equipment blank samples. In the filtered equipment blank samples, THg was detected at 0.22 ng/L, a concentration between the method detection limit (MDL) of 0.15 to 0.16 ng/L and the practical quantitation limit (PQL) of 0.39 to 0.42 ng/L. Detected THg concentrations in the unfiltered equipment blanks were 2 and 4.19 ng/L. Unfiltered blank samples also included detected concentrations of TSS. Field samples associated with these equipment blanks containing less than five times the blank detection were assigned a “B” qualifier; B-qualified data are usable as estimated values for risk assessment purposes (EPA, 1992).

Detections of low-level THg concentrations in equipment blanks may potentially be attributed to trace residual particulate matter entrained in the diaphragm pump. As previously indicated, suspended particulate matter, particularly in the form of senescent phytoplankton and other vegetative material was observed in the water column during the 2013 sampling event (see Section 3.3). While decontamination procedures included flushing the diaphragm pump with several volumes of distilled water, it is possible that some particulates entrained in the pump may have been introduced into the blank sample. These trace concentrations were detectable by low-level THg analyses conducted using EPA 1631.

Qualified surface water results are not likely to influence ecological risk conclusions regarding surface water exposure due to the low-level concentrations measured by EPA 1631. For example, the concentrations measured in the filtered equipment blank samples (0.22 ng/L) were several orders of magnitude below the chronic National Recommended Water Quality Criterion (NRWQC) and New Jersey Surface Water Quality Standard (NJSWQS) of 770 ng/L (dissolved). Trace THg concentrations may be biased slightly high in surface water samples; however, this bias is not likely to influence overall conclusions regarding surface water exposure. Potential bias from trace blank contamination may slightly overestimate THg concentrations in reference areas. As previously stated, no potential bias due to residual MeHg concentrations was identified for any surface water samples.

The DDR reports for the 2013 Ecological Investigation datasets are provided in Appendix B.

5.0 Ecological Effects Analysis

The effects analysis uses site-specific data and peer-reviewed literature to identify concentrations of THg and MeHg in exposure media that may result in adverse effects to ecological receptor categories identified in the ECSM. This section reviews the site-specific and literature-derived ecological effects information for mercury.

5.1 Benthic Macroinvertebrates

Potential effects to benthic invertebrates exposed to mercury in the PLSA were evaluated based on the SQT (see Section 4.1.2; Appendix A) and tissue residue approaches. The following subsections evaluate potential effects associated with the four lines of evidence used to evaluate exposure to benthic macroinvertebrates:

- Benthic community evaluation
- Sediment toxicity testing
- Sediment/pore water chemistry evaluation
- Critical body residues (CBRs) for benthic macroinvertebrate tissues

5.1.1 Sediment Quality Triad Evaluation

As described in Section 4.1.2, an SQT investigation was conducted to evaluate potential mercury-associated toxicity to benthic macroinvertebrates in the PLSA across a gradient of sediment THg concentrations. A complete report summarizing the findings of the SQT investigation is provided as Appendix A. A summary of the key elements of the SQT investigation that are pertinent to evaluating potential site-specific effects to benthic macroinvertebrates associated with mercury exposure is presented below for each measurement endpoint.

Sediment Chemistry Evaluation

The results of sediment mercury analyses were compared to generic sediment quality benchmarks (SQBs) to evaluate the potential for mercury-associated effects based on bulk sediment chemistry. Generic SQBs are typically derived from large co-occurrence databases of sediment chemistry and toxicity data from a wide range of freshwater environments. The resulting SQBs have limited relevance to site-specific exposures and may not reflect a reliable cause and effect relation between exposure to an individual constituent, particularly mercury, and an ecological effect observed in test organisms exposed to a mixture of chemical and non-chemical stressors that may be acting together in a sediment toxicity test. Because contaminant concentrations tend to co-vary in sediments (Long et al., 1998, Smith and Jones 2006), concentrations of multiple constituents are likely to be correlated with observed toxicity, even when the concentration of the constituent in question is not sufficiently high enough to contribute significantly to toxicity (Fuchsman et al., 2006).

Recognizing the limitations of co-occurrence SQBs, THg concentrations were compared to the severe effects level (SEL) of 2.0 µg THg/g developed by Persaud et al. (1992) and adopted by the NJDEP as an upper bound ecological benchmark for mercury in freshwater sediment. The SEL has been used in previous investigations of potential mercury toxicity to benthic organisms in Pompton Lake (Exponent and ANSP, 2003). An SQB was not identified from the available literature sources of ecological screening values to evaluate potential exposure to MeHg in sediments.

Pore Water and Surface-Water Chemistry Evaluation

Invertebrate exposure to mercury in aqueous media within the benthic environment may be associated with pore water or surface water. Aqueous exposure of infaunal benthic invertebrates is primarily associated with exposure to pore water; epifaunal benthic invertebrates are exposed primarily to surface water at the sediment-surface water interface, but may also be exposed to pore water in shallow sediment.

Aqueous toxicity studies were evaluated to identify potential effects associated with exposure to mercury in pore water and surface water. Studies presenting concentration-response relationships for survival and growth endpoints based on benthic invertebrate test organisms were prioritized in the effects analysis (Chibunda, 2009; Azevedo-Pereira and Soares, 2010; Valenti et al., 2005). Studies using benthic invertebrate test organisms were also queried from the EPA ECOTOX (ECOTOXicology) database to provide additional aqueous endpoints for mercury. Selected studies focused on exposure to freshwater benthic invertebrate test organisms to provide a toxicity dataset relevant to conditions in Pompton Lake; test organisms from marine or estuarine environments were excluded.

An evaluation of aqueous toxicity endpoints for THg indicates that sublethal responses are generally more sensitive than lethal responses. In studies establishing concentration-response relationships for relevant benthic test organisms exposed to aqueous mercury, statistically significant reductions in growth were observed at lower aqueous mercury concentrations than reductions in survival (Chibunda, 2009; Azevedo-Pereira and Soares, 2010; Valenti et al., 2005). Chibunda (2009) reported no significant reduction in 14-day survival of *C. riparius* exposed to THg concentrations in filtered pore water up to 85,000 ng THg/L; Valenti et. al. (2005) reported no significant reduction in the survival of juvenile rainbow mussel exposed to a solution of $HgCl_2$ containing 114,000 ng THg/L over a 21-day exposure. Figure 5-1 presents a cumulative frequency distribution plot of average median lethal concentrations (LC_{50}) for benthic test organisms exposed to THg in filtered and unfiltered aqueous toxicity tests over various durations. The plot indicates that the vast majority of lethal responses to THg in are associated with aqueous exposure media concentrations of THg exceeding 10,000 ng THg/L (see Figure 5-1).

Potential sublethal effects associated with benthic invertebrate exposure to THg in aqueous media were evaluated using studies reporting concentration-response relationships for growth endpoints (Azevedo-Pereira and Soares, 2010; Chibunda, 2009; Valenti et al., 2005). Growth endpoints from these studies were expressed on a relative basis given the varied, but biologically sensitive metrics used to measure growth in each study (e.g., total body length, dry weight). Relative growth was calculated as the ratio of the growth endpoint in the study treatment to the growth endpoint in the study control. Figure 5-2 presents the relative growth of *C. riparius* (8-day and 14-day exposures) and juvenile rainbow mussel *Villosa iris* (21-day exposure) over a range of THg concentrations in aqueous exposure media; open symbols in Figure 5-2 indicate growth endpoints that were statistically different than control treatments ($p < 0.05$), as reported in each respective study.

As illustrated in Figure 5-2, the relative growth of benthic invertebrate test organisms decreased with exposure to increasing concentrations of THg in aqueous media. The minimum bounded NOEC of 4,000 ng THg/L was identified for the 21-day exposure of juvenile *Villosa iris* (Valenti et al., 2005); the LOEC of 8,000 ng THg/L was identified as the lowest concentration at which a statistically significant reduction in growth was reported. An ECOTOX query of growth endpoints for freshwater benthic invertebrate test organisms did not indicate a more sensitive growth endpoint for inorganic forms of mercury, indicating that these NOEC and LOEC values are adequately sensitive to evaluate adverse growth effects in the PLSA. Based on this analysis, 4,000 ng THg/L was selected as a NOEC and 8,000 ng THg/L was selected as a LOEC to evaluate potential sublethal growth effects to benthic macroinvertebrates exposed to pore water and surface water at the sediment-surface water interface.

Toxicological data on the effects of aqueous exposures of MeHg on benthic invertebrate test organisms are limited. However, water quality screening benchmarks have been derived for MeHg for the general protection of aquatic life.

Methylmercury Water Quality Screening Benchmark	NOEC (ng/L)	LOEC (ng/L)	Source
Canadian Water Quality Guideline (WQG)	4	40	CCME (2003)
Effect Concentration (EC20) Daphnids	--	870	Suter (1996)
EPA Tier II Secondary Chronic Value (SCV)	2.8	--	Suter and Tsao (1996)

The bounded NOEC and LOEC values presented in the Canadian Water Quality Guidelines (WQGs) were selected to evaluate potential benthic invertebrate exposure to MeHg in filtered pore water. These values represent conservative screening values derived for the broader protection of aquatic life. As such, these benchmark concentrations are not necessarily indicative of adverse effects to benthic invertebrate organisms, which may be substantially less sensitive to MeHg exposure than the aquatic test organisms (e.g., daphnids) used to derive the benchmarks.

Sediment Toxicity Testing

The evaluation of site-specific sediment toxicity was based on the following chronic test endpoints measured during the 2013 SQT investigation:

- 28-day *H. azteca* (EPA Method 100.4; EPA, 2000): 28-day survival (percent), growth (mg dry weight per surviving individual), and biomass (mg dry weight per exposed individual)
- 20-day *C. dilutus* (EPA Method 100.5; EPA, 2000): 20-day survival (percent), growth [ash free dry weight (AFDW) per surviving individual], and biomass (mg AFDW per exposed individual)

The results of the toxicity tests were integrated into an SQT evaluation to identify potential site-specific sediment effects benchmarks for benthic invertebrates in the PLSA. The results of the sediment toxicity tests are presented in detail in Appendix A and summarized below.

Sediment effects benchmarks derived from site-specific toxicity tests are likely conservative based on observed differences in mercury exposure conditions measured in field and laboratory pore water samples. THg concentrations measured in pore water samples collected from surrogate test chambers on Day 7 of the toxicity test were 20 to 75 fold greater than concentrations in field-collected samples for the same stations; MeHg concentrations in Day 7 pore water samples were two to 5.4 times greater compared pore water concentrations measured in field samples (see Figure 5-3). These findings indicate the toxicity tests overestimate mercury exposure to *in situ* benthic invertebrate; therefore, benchmarks derived from the toxicity tests are likely conservative when applied to *in situ* exposure point concentrations. Further discussion of the differences between *ex situ* and *in situ* exposure conditions is provided in Appendix A.

Potential differences in sediment toxicity endpoints in the PLSA were evaluated in the context of the variability associated with reference conditions using the reference envelope approach (Hunt et al., 2001). The reference envelope approach has been applied in sediment toxicity testing programs as a means to distinguish between non-contaminant-related sources of variability in reference area toxicity test results and contaminant-related toxicity associated with exposure to impacted sediments (Hunt et al., 2001; MacDonald et al., 2009; Ingersoll et al., 2009a; Ingersoll et al., 2009b). The reference envelope approach establishes a reference envelope value (REV), which represents a lower limit of endpoint values that may be attributed to non-contaminant-related sources of variability in sediment toxicity tests from reference areas. If the mean endpoint value calculated for a given PLSA station was statistically lower than the reference station used to establish the REV, the result was considered to be indicative of a potentially negative (i.e., toxic) response for that endpoint. A summary of the sediment toxicity results and comparisons to the reference envelope are provided for each test in the following sections.

28-Day Hyalella azteca Exposure

The results of the 28-day sediment toxicity tests for *H. azteca* indicate no significant lethal and limited sublethal responses resulting from exposure to PLSA sediments (see Figures 5-4 and 5-5) and pore water (see Figure 5-6). Mean survival at all PLSA stations exceeded the survival test acceptability criteria (TAC) of 80 percent and the reference envelope value (REV) of 82.5 percent, with mean survival ranging from 82.5 ±4.53 to 97.5 ±1.64 percent. Differences observed in growth and biomass endpoints at some PLSA stations were lower than the reference conditions established by the reference envelope approach. However, these results indicate a relatively minor sublethal response relative to reference conditions, particularly given that exposure concentrations for mercury, and potentially other redox-sensitive stressors, were greater in the toxicity tests than what was measured in field sediment samples. In addition, lower growth and biomass endpoint values measured at limited PLSA stations were not consistent with a negative response to increasing mercury exposure concentrations, i.e. no dose-response relationship was observed (see Appendix A).

20-Day Chironomus dilutus Exposure

The results of the 20-day sediment toxicity tests for *C. dilutus* indicated no significant lethal or sublethal responses resulting from exposure to PLSA sediments and were generally consistent with the results presented above for *H. azteca*. Mean survival at

PLSA stations exceeded the survival TAC of 70 percent, with the exception of PLSA-C1-39, which had a comparable mean survival 68.8 percent (PLSA-C1-39). Lower mean survival at PLSA-C1-39 was skewed by two of the eight replicates in the test; percent survival in the other six replicates from this station ranged from 70 to 100 percent and averaged 88 percent. Minimal differences observed in growth at some PLSA stations were not significantly lower than the reference conditions established by the reference envelope approach; mean biomass endpoints at each PLSA station were within the range of the reference response. Based on the reference envelope approach, no PLSA stations were identified as toxic to *C. dilutus* because lethal and sublethal endpoints were within the statistical significance of the reference station used to establish the REV. Overall, lethal and sublethal endpoints were not consistent with a dose response relationship to increasing mercury exposure in sediment or pore water (see Appendix A).

Benthic Community Evaluation

Multivariate and multi-metric analyses of benthic macroinvertebrate community data collected from SQT stations did not indicate impairment at PLSA stations that could be attributed to exposure to mercury or other constituents in sediment or pore water (see Appendix A). Differences observed between benthic macroinvertebrate community attributes were consistent with differences in macro-habitat attributes (e.g., water depth, macrophytes) that are typical in freshwater lake systems, particularly eutrophic systems like Pompton Lake.

Summary of Sediment Quality Triad Weight-of-Evidence Evaluation

The multiple LOEs evaluated in the SQT investigation were integrated into a WOE evaluation of potential sediment toxicity within the PLSA based on the framework established by Bay and Weisberg (2010). The findings of the WOE evaluation indicate that benthic macroinvertebrate receptors were classified as “unimpacted” or “likely unimpacted” throughout the PLSA. Based on the absence of adverse effects, maximum THg and MeHg concentrations evaluated in the SQT investigation were established as NOECs for benthic macroinvertebrate exposure to sediment; LOECs were not identified from the SQT investigation because the WOE evaluation did not classify any PLSA sites as impacted. These findings are consistent with previous SQT and benthic community analyses evaluating mercury exposure in the ABD (see Section 2.3).

Site-Specific SQT Sediment Benchmarks	NOEC	LOEC	Basis
Total mercury (µg/g dw)	23.5	NA	SQT investigation NOECs; no LOECs identified (see Appendix A).
Methylmercury (ng/g dw)	4.7	NA	

5.1.2 Critical Body Residues

Literature studies were evaluated to identify CBRs for mercury in invertebrate tissue residues. These CBRs were used to evaluate potential effects associate with larval insects and crayfish tissue samples collected in the PLSA.

Larval Insects

Nine studies were evaluated that reported mercury concentrations in tissue residues associated with survival, growth, or reproductive success endpoints for aquatic invertebrates (see Table 5-1). While most studies evaluated survival endpoints, growth and reproduction endpoints were the most sensitive endpoints.

Potential effects of mercury exposure on benthic invertebrate growth were not identified in a literature review (see Table 5-1). Naimo et al. (2000) did not observe diminished growth of hexagenid mayfly nymphs with increasing concentrations of mercury in tissue concentrations up to 183.7 ng MeHg/g dw (36.7 ng MeHg/g ww[9]) or 10, 819 ng THg/g dw (2,164 ng THg/g ww) during a series of four 21-day bioaccumulation tests (Naimo et al., 2000[10]). Growth was also not influenced in a 9-day experiment with hexagenid mayfly nymphs that accumulated up to 7,493 ng MeHg/g ww and 3,765 ng THg/g ww (Saouter et al., 1993).

Studies that associated adverse effects on invertebrates with mercury concentrations in tissue residues were limited (see Table 5-1). Biesinger et al. (1982) and Niimi and Cho (1983) identified reproductive THg LOECs for the water flea (*Daphnia magna*) of 2,330 and 4,660 ng THg/g ww, respectively. Other LOECs identified for survival ranged from 9,730 to 18,400 ng THg/g ww (see Table 5-1).

Benthic invertebrate CBRs were selected based on the review of available studies associating invertebrate tissue residues with potential effects on growth and reproduction (see Table 5-1). A CBR_{NOEC} of 36.7 ng MeHg/g ww was selected for MeHg based on Naimo et al. (2000). Bounded reproduction endpoints for daphnids reported by Biesinger et al., (1982) of 1,530 ng THg/g ww and 2,330 nanograms per gram (ng/g) ww were selected as the minimum CBR_{NOEC} and CBR_{LOEC} for THg, respectively.

The selected CBRs are comparable to (THg) or more conservative than (MeHg) the results of a field study of population-level benthic invertebrate impacts and measured invertebrate tissue residues. In a long-term study conducted near a mine site at Clear Lake, California, Suchanek et al. (2008) reported THg body burdens of 288 ng THg/g dw (1,440 ng THg/g ww) and MeHg body burden of 67 ng/g dw (335 ng MeHg/g ww) in larval chironomids. A 50-year monitoring effort showed that chironomids did not experience any significant population-level effects and that the littoral invertebrate community did not exhibit any significant response to the mercury exposures from surface water and sediment. The findings of Suchanek et al. (2008) indicate that the selected CBRs are adequately conservative to evaluate potential benthic invertebrate impacts in the PLSA.

Critical body residues were not identified for emergent adult invertebrates due to the lack of data available to evaluate adverse ecological effects based on tissue residue concentrations. However, it is assumed that CBRs protective of aquatic stages (i.e., larvae or nymphs) are protective of metamorphosis into adult stages.

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[9] Conversions of dry weight values reported in literature studies assume a moisture content of 80 percent.

[10] Note: Concentrations reported in literature studies reviewed for invertebrate critical body residues have been expressed as ng/g ww for consistency with the presentation of invertebrate tissue concentrations in this report.

Crayfish

Crayfish have been used as bioindicators for environmental mercury contamination (Simon and Boudou, 2001) and mercury bioaccumulation in crayfish has been documented in different systems (Parks and Hamilton, 1987; Pennuto et al., 2005; Gustin et al., 2005; Hothem et al., 2007). However, studies linking mercury concentrations in crayfish tissue at environmentally relevant exposures to adverse effects have not been identified in the literature. Studies evaluating mercury bioaccumulation based on whole body residue have considered tissue concentrations < 100 ng/g ww to be associated with background concentrations that are not indicative of adverse effects (Park and Hamilton, 1987).

Based on available information regarding the relative toxicity of crayfish to mercury exposure, CBRs in whole body crayfish are not likely to be lower than the CBRs derived for invertebrates in the previous section. Effects of mercury on the survival or reproduction of crayfish are generally observed at aqueous concentrations much higher than the NRWQC of 770 ng/L (filtered) for THg. For example, *Astacus astacus* individuals exposed to $HgCl_2$ at 100,000 to 800,000 ng/L experienced cardiac arrhythmia and high levels of mortality (Styrishave et al., 1995; Styrishave and Depledge, 1996). As a result, potential effects associated with crayfish tissue concentrations measured in the PLSA were evaluated relative to the THg and MeHg CBRs derived in the preceding section.

5.1.3 Summary of Benthic Invertebrate Effects Benchmarks

Based on the rationale presented in the preceding sections, the following ecological effects benchmarks have been identified to evaluate benthic macroinvertebrate exposure in the PLSA.

Exposure Media	NOEC	LOEC	Basis
Sediment			
Total mercury (µg/g dw)	23.5	NA	Sediment Quality Triad investigation NOECs; no LOECs identified (see Appendix A)
Methylmercury (ng/g dw)	4.7	NA	
Surface/Pore Water (ng/L)			
Total mercury	4,000	7,000	Bounded NOEC and LOEC derived based on the relative growth of benthic macroinvertebrates evaluated in Chibunda (2009); Azevedo-Pereira and Soares, (2010); Valenti et al. (2005).
Methylmercury	4	40	NOEC represents the CCME *Water Quality Guideline for the Protection of Aquatic Life* derived based on a LOEC of 40 ng/L for daphnid reproduction divided by a safety factor of 10 (CCME, 2003).
Critical Body Residue (ng/g ww)			
Total mercury	1,530	2,330	Based the lowest bounded endpoints in Table 5-1; based on Biesinger et al. (1982)
Methylmercury	36.7	NA	CBR_{NOEC} based on Naimo et al. (2000); CBR_{LOEC} not identified.

5.2 Fish

Potential effects to fish in the PLSA were evaluated based on direct contact exposure to surface water and CBRs based on whole body concentrations. The following subsections describe the selection of effects endpoints for fish.

5.2.1 Surface Water Benchmarks

A summary of aquatic toxicity of mercury on freshwater fish are provided in Table 5-2 Acute toxicities (LC_{50} or median effect concentrations [EC_{50}]) for IHg range from 30,000 to 1,000,000 ng THg/L in fish (EPA, 1985 and 1996). The Canadian Council of Ministers for the Environment (CCME) also reported similar ranges, 150,000 to 900,000 ng THg/L for fish (CCME, 2003). Chronic values for THg range from < 230 to > 64,000 ng THg/L (EPA, 1985; Niimi and Kissoon 1994; CCME, 2003). Adverse effects reported commonly among studies include growth, reproduction and development, and mortality. Snarski and Olson (1982) used a 60 day flow-through test to determine the effect of IHg on growth (weight change) and reproduction in juvenile fathead minnows (*Pimephales promelas*). The study found a LOEC for IHg of 260 ng THg/L, based on impairments to growth and reproductive endpoints.

Current EPA NRWQC for the protection of aquatic life for IHg is based on EPA (1996) derivations. Acute Criteria Maximum Concentration (CMC) and chronic Criteria Continuous Concentration (CCC) protective of general aquatic life are 1,400 and 770 ng

THg/L, respectively, based on the filtered (dissolved) water fraction. These criteria have been promulgated by NJDEP as NJSWQS.

Acute toxicities of MeHg range from 24,000 to 84,000 ng MeHg/L in fish (EPA, 1985; McKim et al., 1976), while chronic values range from 290 to 63,000 ng MeHg/L for fish (McKim et al., 1976; CCME, 2003). McKim et al. (1976) exposed three generations of brook trout (*Salvelinus fontinalis*) to 30 to 290 ng MeHg/L as MeHg over a 144-week period. No significant effects on survival, growth, or reproduction were observed in second generation trout at < 930 ng MeHg/L and no toxic symptoms were found in the third generation at < 290 ng MeHg/L. EPA currently does not provide an NRWQC for MeHg for the protection of aquatic life due to its recognized bioaccumulation potential.

Based on a review of the available literature for aqueous toxicity of mercury to fish, the following surface-water mercury benchmarks were selected to evaluate exposure to fish in the PLSA:

- THg: 770 ng THg/L (dissolved) for THg based on the current NRWQC (EPA, 2014b)/NJSWQS.
- MeHg: 290 ng MeHg/L (dissolved) for MeHg based on the lowest chronic toxicity value observed in a multi-generational exposure for brook trout (McKim et al., 1976).

5.2.2 Critical Body Residues

Several studies have attempted to establish mercury CBRs for the protection of fish (Niimi and Kissoon, 1994; Wiener and Spry, 1996; Beckvar et al., 2005; and Dillon et al., 2010). Based on available literature at the time, Niimi and Kissoon (1994) concluded that lethal body burdens of mercury ranged from 10,000 to 20,000 ng THg/g ww (whole body) and speculated that sublethal impacts would be associated with the 1,000 to 5,000 ng THg/g ww (whole body) concentration range. Wiener and Spry (1996) conducted an exhaustive review of mercury residue-effects literature and identified a CBR of 5,000 ng/g ww (whole body) as the probable toxic effects level and 3,000 ng/g ww (whole body) as the no-observed-effects-level for freshwater fish.

Beckvar et al. (2005) summarized no effect residue (NER) and low effect residue (LER) body burden (whole body) thresholds for mercury (see Table 5-3). Based on the geometric mean of paired NER and LER values for all species and life stages evaluated, Beckvar et al. (2005) recommended a whole body threshold effect concentration of 210 ng THg/g ww; this threshold effect concentration was considered protective of juvenile and adult fish due to the representation of multiple life stages in the supporting studies. This benchmark is considered a conservative, low end CBR_{NOEC} for evaluating YOY and adult tissue residues in the PLSA.

The endpoints summarized in Beckvar et al. (2005), were further evaluated to develop a more site-specific and relevant benchmark for fish tissue data collected as part of the Ecological Investigation (see Table 5-3). Species not applicable to or appropriate for Pompton Lake, including brackish (e.g., striped mullet, mummichog) and arctic species (grayling) were not considered in development of a site-specific CBR. In addition, comparisons of concentrations in early life stages (ELS), including eggs and larvae, were not appropriate for comparisons to YOY and adult tissue residues measured in Pompton

Lake. Based on applicable and appropriate species and life stages, the geometric mean of NER and LER endpoints was calculated as 436 ng THg/g ww (see Table 5-3). This benchmark was established as a CBR_{LOEC} for comparisons of YOY and adult whole body tissue residues from the PLSA. This benchmark is consistent with overall LER effects benchmarks for adult/juvenile and ELS endpoints; the geometric mean of LER concentrations for all life stages for species appropriate to Pompton Lake is 406 ng THg/g ww (see Table 5-3).

The CBR_{LOEC} of 436 ng THg/g ww is supported as a low effects benchmark by the evaluation of mercury fish tissue residues conducted by Dillon et al. (2010). Mercury dose-response relationships (D-Rs) were developed for ELS and juvenile or adult fish based on published tissue residue-toxicity data. The D-Rs relied primarily on lethality-equivalent test endpoints (i.e., endpoints that can be directly related to mortality, such as survival, reproductive success, and developmental abnormalities). The D-Rs for the juvenile and adult fish predicted 2.8 to 77.8 percent effects over a tissue residue range of 100 to 10,000 ng THg/g ww; for the same range of tissue residues, the D-R for ELS fish predicted 19.8 to 96.1percent effects. Consistent with the CBR_{LOEC}, Dillon et al. (2010) found an 11 percent probability of effects at ~400 ng THg/g ww.

Regional data indicate that mercury concentrations in largemouth bass exceeding the whole body CBR_{LOEC} of 436 ng THg/g ww may not be causing adverse effects. Friedmann (2002) indicated no substantial decrease in general and reproductive health for adult largemouth bass in three New Jersey lakes (field study assessing body weight, length, condition factor, gonadosomatic index) with average whole body mercury concentrations ranging from 210 to 3,800 ng THg/g, ww[11]. The findings of this study indicate that the identified CBR_{NOEC} and CBR_{LOEC} for fish tissue are adequately protective of adult largemouth bass in the PLSA.

In summary, more recent literature-based whole body CBRs indicate a conservative (i.e., no effect) screening benchmark of 210 ng THg/g ww for juvenile and adult fish. Multiple sources support the derivation of a low-effect level of 436 ng THg/g ww for juvenile and adult fish exposure in the PLSA (Beckvar et al., 2005; Dillon et al., 2010). As a result, CBR_{NOEC} and CBR_{LOEC} benchmarks for fish tissue were established as 210 ng THg/g ww and 436 ng THg/g ww, respectively. This range of CBRs was used to evaluate potential effects associated with mercury concentrations measured in juvenile and adult fish tissue sampled in the PLSA.

5.2.3 Summary of Fish Effects Benchmarks

Based on the rationale presented in the preceding sections, the following ecological effects benchmarks have been identified to evaluate fish exposure in the PLSA.

[11]Whole body concentration estimated from fillet data assuming a whole body:filet ratio of 0.7.

Exposure Media	NOEC	LOEC	Basis
Surface/Pore Water (ng/L)			
Total mercury	770	NA	NRWQC/NJSWQS of 770 ng/L (filtered) represents a conservative benchmark for fish exposure at various life stages.
Methylmercury	290	NA	Lowest chronic toxicity value observed in a multi-generational exposure for brook trout (McKim et al., 1976)
Critical Body Residue (ng/g ww)			
Total mercury	210	436	CBR_{NOEC} based on Beckvar et al. (2005); CBR_{LOEC} derived from data compiled in Beckvar et al. (2005).
Methylmercury	210	436	CBRs for MeHg are equivalent to THg based on assumption that nearly all mercury in fish is methylated.

5.3 Amphibians

Amphibians may be exposed to mercury through dietary ingestion pathways and direct contact with sediments and surface/pore water. The following subsections summarize effects data that may be used to evaluate potential ecological effects to amphibians exposed to mercury within the PLSA.

5.3.1 Sediment Benchmarks

Literature reviews did not identify toxicity data related to amphibian exposure to mercury in sediment. Therefore, amphibian exposure to mercury was evaluated based on exposure to surface/pore water and critical body residues, as described below.

5.3.2 Surface Water and Pore Water Benchmarks

A review of aqueous toxicity endpoints indicated that amphibian sensitivity to mercury exposure is highly variable, particularly at different life stages. A summary of aqueous endpoints for various amphibians and life stages developed from literature reviews have previously been discussed (Schuytema and Nebeker, 1996; WHO, 1989; Boening, 2000; Linder and Grillitsch, 2000). Comparisons of compiled aqueous toxicity endpoints for amphibians indicate that general surface water quality criteria are protective of the varied effects concentrations at the different life stages evaluated, including sensitive life stages. Adverse effects concentrations for lethality, malformations, and reproductive changes are generally greater than 1,000 ng /L for THg. Based on this comparison, ambient surface water quality criteria that are protective of a broad range of aquatic life are selected as a conservative NOECs for THg and MeHg exposure in surface water and pore water:

- THg: 770 ng THg/L (filtered) based on the chronic NRWQC/NJSWQS for the protection of aquatic life
- MeHg: 4 ng MeHg/L based on the CCME WQG for the protection of aquatic life.

It is important to note that these concentrations do not represent effect concentrations, but rather conservative benchmarks below which adverse effects to sensitive life stages of amphibians are not likely.

5.3.3 Critical Body Residues

Mercury CBRs for adverse effects on amphibians have not been clearly established, particularly for adult life stages. As previously discussed, the evaluation of potential exposure to amphibians based on tissue residues was a secondary objective of the amphibian sampling program (see Section 4.1.5). A review of available studies evaluating mercury body burdens is adult amphibians in presented below.

Recent investigations have evaluated the effects of maternal transfer of mercury on the survival and growth of amphibian offspring (Todd et al., 2011a, 2011b, 2012; Bergeron et al., 2011; Bergeron et al., 2010). Todd et al. (2011a) reported reduced growth of American toad (*Bufo americanus*) offspring with mothers containing the equivalent of adult whole body THg and MeHg concentrations of 655 ng THg/g ww and 347 ng MeHg ww, respectively. Although the long term population-level impacts of reduced offspring growth are uncertain (Todd et al. (2012), these concentrations represent potential effect concentrations for maternal transfer from adult female frogs to their offspring. These concentrations were used as critical body residues ($CBRs_{LOEC}$) to evaluate potential effects on maternal transfer in adult American bullfrogs sampled in the PLSA.

In the absence of amphibian critical body residue information for mercury, investigators have compared whole body concentrations to mercury effects benchmarks derived for fish (Todd et al., 2011a; Hothem et al., 2010; Burke et al., 2010; Bergeron et al., 2010). In the few studies where amphibian effects have been compared to fish benchmarks, effects-based body burdens in amphibians were greater than benchmarks for fish (Burke et al., 2010; Todd et al., 2011a). As a result, the fish CBR_{NOEC} derived in Section 5.2.2 was used as a no effect CBR to evaluate whole body adult amphibian tissue concentrations.

5.3.4 Summary of Amphibian Effects Benchmarks

Based on the rationale presented in the preceding sections, the following ecological effects benchmarks have been identified to evaluate amphibian exposure in the PLSA.

Exposure Media	NOEC	LOEC	Basis
Sediment			
Total mercury (µg/g dw)	NA	NA	Sediment benchmarks for amphibian exposure to mercury were not identified in the literature review.
Methylmercury (ng/g dw)	NA	NA	
Surface/Pore Water (ng/L)			
Total mercury	770	NA	NRWQC/NJSWQS of 770 ng/L represents a conservative benchmark for amphibian exposure at various life stages.
Methylmercury	4	40	CCME WQG for the protection of aquatic life represents a conservative benchmark for amphibian exposure at various life stages.
Critical Body Residue (ng/g ww)			
Total mercury	210	655	Based on whole body CBRs for mothers associated with effects in offspring due to maternal transport (Todd et al., 2011a)
Methylmercury	210	347	

5.4 Wildlife Toxicity Reference Values

Toxicity reference values (TRVs) were derived to evaluate the potential for adverse ecological effects to wildlife associated with dietary exposure using the approach described in Appendix C. Reference doses to evaluate potential effects associated with modeled doses were derived from the following sources:

- Literature-derived TRVs: As presented in Appendix C, an evaluation of mercury toxicity to avian and mammalian wildlife was conducted to identify TRVs for comparisons with the dietary doses calculated for IHg and MeHg. TRVs were derived from the review of toxicity studies from the literature as no observed adverse effects levels (NOAELs) or lowest observed adverse effects levels (LOAELs). Selection of the appropriate TRVs to evaluate potential risks due to mercury exposure was based on their direct relevance to the assessment endpoints for the maintenance and sustainability of wildlife populations (survival, growth, and reproduction). These assessment endpoints were selected for the protection of local populations and communities of representative ecological receptors, consistent with the objectives of EPA (1997) and EPA *Principles for Ecological Risk Assessment and Risk Management* (EPA, 1999). Observations of physiological (e.g., immunotoxicity, endocrine effects), behavioral, or other sublethal endpoints were not included in the derivation of TRVs because their dose-dependence and population-level implications are unclear.
- Reference area doses: Daily doses estimated based on site-specific measurements of mercury in dietary items from the upstream reference areas are also considered in the evaluation of potential site-related ecological effects. Mercury is a global

contaminant with regional impacts in the northeastern United States (Driscoll et al., 2007). In New Jersey and over a dozen other states, the bioaccumulation of mercury in aquatic ecosystems has resulted in state-wide fish consumption advisories [U.S. Geological Survey (USGS), 2000]. Due to the regional impact of mercury on aquatic systems, it is appropriate to quantify reference area doses to assess potential site-related exposures relative to exposure due to ambient conditions in northern New Jersey. In addition, for receptors with prey items having limited range, the reference area dose essentially represents a site-independent effect dose because exposure pathways are not complete between the site and reference area. The site-independent dose from the reference areas may be useful in evaluating the relevance of literature-derive TRVs with high uncertainty (due to limited toxicological data, inter-species extrapolation, etc.) in characterizing potential site-related risks to wildlife populations.

The following subsections summarize the derivation of literature-derived TRVs for comparisons to doses calculated for avian and mammalian wildlife receptors; further detail regarding the selection of TRVs is provided in Appendix C.

5.4.1 Avian Toxicity Reference Values

Avian sensitivity to mercury exposure, particularly MeHg exposure, differs between species (Heinz et al., 2009; Heinz et al., 2011). As presented in detail in Appendix C, existing literature studies for dietary exposures were evaluated to identify TRVs representative of the relative avian sensitivities to MeHg reported by Heinz et al. (2009). Dietary TRVs were developed for the following categories of avian receptors:

- High sensitivity piscivores/waterfowl: Defined as receptors or related taxa with egg survival LC_{50} values lower than 0.25 µg/g (Heinz et al., 2009). TRVs derived based on high sensitivity piscivores/waterfowl are compared to doses estimated for great blue heron and belted kingfisher.
- Low-moderate sensitivity[12] piscivores/waterfowl: Defined as receptors or related taxa with egg survival LC_{50} values greater than 0.25 µg/g (Heinz et al., 2009). TRVs derived based on low sensitivity piscivores/waterfowl are compared to estimated doses for mallard and double crested cormorant.
- Passerines: Defined as small-bodied receptors included in the avian order Passeriformes. TRVs derived based on studies evaluating mercury exposure to passerines are applied to tree swallow and Carolina wren.

[12] Heinz et al. (2009) separated species with moderate sensitivity (LC_{50} values between 0.25 and 1.0 µg/g) and low sensitivity (LC_{50} values greater than 1.0 µg/g); for the purposes of the ecological investigation, dietary toxicity studies including receptors or related taxa with moderate and low sensitivity were evaluated as one category.

Avian TRVs for mercury were generally selected based on the critical study approach (CSA) using data from various controlled studies, as summarized in Appendix C. As appropriate, uncertainty factors (UFs) were applied to the LOAEL or NOAEL from the critical study to derive generic or receptor-specific TRVs. The UFs may account for potential sources of uncertainty including:

- Differences in species sensitivity between the test species and the species to be protected
- Sub-chronic to chronic extrapolations
- LOAEL-to-NOAEL extrapolations

UFs range between 1 and 10, based on available information and professional judgment (EPA, 1995). In studies where only a LOAEL dose was reported, the LOAEL was divided by a LOAEL-to-NOAEL UF of 3.25 to estimate a NOAEL dose. The LOAEL-to-NOAEL UF was estimated based on the mean ratio of LOAEL to NOAEL doses reported for avian studies with survival, growth, and reproduction endpoints (French et al., 2010; Heinz and Lock, 1976; Heinz et al., 2010; Scheuhammer, 1988; see Appendix C). This UF is comparable to or more conservative than LOAEL-NOAEL UFs applied in the derivation of mercury water quality criteria for the protection of wildlife, which ranged between 2 and 3 (EPA, 1995; EPA, 1997; NJDEP, 2001). The following subsections summarize the derivation of TRVs for avian exposure to MeHg and IHg in the PLSA.

MeHg

As described above, TRVs for piscivores and waterfowl were selected based on the relative sensitivities of avian species to embryonic exposure to MeHg (Heinz et al., 2009). Potential effects associated with exposure to small-bodied passerine birds were evaluated independent of toxicity data for piscivores and waterfowl. A detailed review of studies used as the basis for avian TRVs for MeHg is presented in Appendix C. The following subsections summarize MeHg TRVs identified for high and low sensitivity avian piscivores/waterfowl and passerine birds.

Piscivores/Waterfowl: High Sensitivity

Dietary studies evaluating survival, growth, and reproduction endpoints for species or related taxa with high sensitivity to MeHg were available for American kestrel (*Falco sparverius*) and great egret (*Ardea alba*) (Albers et al., 2007; French et al., 2010; Spalding et al., 2000a).

Based on the review of these dietary studies presented in Appendix C, a LOAEL of 0.055 µg MeHg/g-day based on Albers et al. (2007) was selected to evaluate MeHg exposure to piscivores and waterfowl with high sensitivity to MeHg. Applying the LOAEL-to-NOAEL UF of 3.25, a NOAEL of 0.017 µg MeHg/g-day was estimated as the basis for a no observed adverse effect exposure to high sensitivity piscivores and waterfowl.

Piscivores/Waterfowl: Low-Moderate Sensitivity

Dietary studies evaluating survival, growth, and reproduction endpoints were reviewed for species or related taxa with low-moderate sensitivity to MeHg, as classified by Heinz et al. (2009). Low-moderate sensitivity TRVs are intended to be protective of avian receptor categories represented by mallard and double-crested cormorant, which are among the least sensitive to MeHg exposure based on Heinz et al. (2009).

Based on the review of dietary studies evaluating survival, growth, and reproduction endpoints for avian species with low-moderate sensitivity to MeHg (see Appendix C), a LOAEL of 0.078 µg MeHg/g BW-day was estimated from mallard exposure studies by Heinz (1974; 1976a, b; 1979). LOAELs estimated from other dietary studies with taxa with low-moderate sensitivity to MeHg were greater and therefore, less conservative than the selected LOAEL of 0.078 µg MeHg/g BW-day. Applying the LOAEL-to-NOAEL UF of 3.25, a NOAEL of 0.024 µg MeHg/g-day was estimated as the basis for a no observed adverse effect exposure to low-moderate sensitivity piscivores and waterfowl.

Passerine Birds

Available toxicity literature evaluating mercury exposure to passerine birds was reviewed independent of toxicity literature for piscivores and waterfowl. Taxa studied to evaluate mercury exposure to piscivores and waterfowl are relatively large bodied (e.g., mallard and loon) with lower mass-specific metabolic rates and lower mass-specific food ingestion rates in comparison with passerine birds (Bennett and Harvey, 1987). As a result, TRVs based on larger birds (and of different feeding guilds) may not be sufficiently conservative for the protection of passerine species. To address the uncertainty in identifying adequately protective dietary TRVs for comparison with modeled doses for tree swallow and Carolina wren, studies specifically evaluating the toxicity to passerines were evaluated.

A review of avian toxicological literature identified only one laboratory dosing study evaluating the effects of mercury exposure on passerine birds (Scheuhammer, 1988). In the absence of additional laboratory dosing studies to evaluate sublethal endpoints (e.g., growth and reproduction) for passerine birds exposed to dietary MeHg, available field studies were identified that concurrently measured dietary MeHg concentrations (e.g., bolus measurements) and sublethal endpoints (e.g., reproductive success metrics). Based on field-measured effects endpoints and associated dietary MeHg concentrations, dietary TRVs were estimated using assumptions of representative body weights and food ingestion rates (FIRs) estimated based on allometric relationships developed for passerine birds (Nagy, 2001). Using this approach, a NOAEL of 0.025 mg/kg BW-day was calculated as the geometric mean of NOAELs calculated from data reported in four tree swallow field studies (Gerrard and St. Louis, 2001; Longcore et al., 2007; Custer et al., 2008; Brasso and Cristol, 2008). Although corresponding LOAELs were not derived based on these field studies, the maximum NOAEL from these four field studies of 0.078 mg/kg BW-day calculated from data reported by Longcore et al. (2007) is conservatively identified to represent a potential upper bound of the no effect dataset (see Appendix C). The derived NOAELs for passerines are substantially lower than the NOAEL of 0.88 mg/kg BW-day reported for neurotoxicity and mortality endpoints for zebra finch (*Taeniopygia guttata*) in the single laboratory dosing study identified in the literature (Scheuhammer, 1988).

Inorganic Mercury

Relatively fewer studies are available to evaluate chronic avian toxicity to IHg (see Appendix C). Based on a review of the limited studies available for IHg, avian TRVs for

IHg are estimated based on the more conservative endpoints presented in Hill and Schaffner (1976). Based on the suppression of egg fertilization, a LOAEL is estimated as 0.9 µg IHg/g BW-day; a NOAEL for IHg is estimated based on the no effect treatment from Hill and Schaffner (1976), which was equivalent to 0.45 µg IHg/g BW-day. TRVs derived for IHg were used for comparisons to IHg doses calculated for each representative avian receptor.

Summary of Avian Toxicity Reference Values

A summary of the TRVs used to evaluate potential risks associated with modeled dietary doses of IHg and MeHg to avian receptors within the PLSA is provided in the table below.

Receptors	NOAEL (mg/kg BW/day)	LOAEL (mg/kg BW/day)	Basis
Methylmercury			
Piscivores/Waterfowl High Sensitivity	0.017	0.055	Reproductive effects on American kestrel (Albers et al., 2007)
Piscivores/Waterfowl Low-Moderate Sensitivity	0.024	0.078	Reproductive effects on mallard duck (Heinz, 1974; 1975; 1976a,b; 1979)
Passerines	0.025/0.078[a]	ND[b]	Based on geometric mean of NOAELs derived from field studies (Gerrard and St. Louis, 2001; Longcore et al., 2007; Brasso and Cristol, 2008; Custer et al., 2008)
Inorganic mercury	0.45	0.90	Reproductive effects on Japanese quail (Hill and Schaffner, 1976)

Notes:
a. Dose represents a potential upper bound of the NOAEL dataset;
b, ND, A dose was not derived due to the limited availability of dietary studies indicating adverse ecological effects.

5.4.2 Mammalian Toxicity Reference Values

Mammalian TRVs for MeHg and IHg were identified using a similar CSA process as described in the preceding section for avian wildlife. The following subsections describe the derivation of TRVs for MeHg and IHg; additional details regarding the derivation of mammalian TRVs are provided in Appendix C.

MeHg

EPA (1995) derived MeHg TRVs for mammals based on a compilation of mammalian toxicity studies. These data were reviewed and additional mammalian effects data from studies conducted since 1995 were also included in the review. Appendix C provides further details regarding mammalian studies that were reviewed, TRVs associated with the studies, and the underlying assumptions regarding their derivation. A summary of the selected mammalian TRVs for MeHg is provided below for piscivores and aerial insectivores.

Piscivores

As part of the Great Lakes Initiative (EPA, 1995), EPA based its derivation of water quality criteria for the protection of piscivorous mammals on two subchronic studies of mink conducted by Wobeser et al. (1976a, 1976b). Wobeser et al. (1976b) is used as the basis for evaluating exposure to piscivorous mammals because it was a controlled, 93-day study of exposure to a site-specific receptor that identified relevant, no effect and effect endpoints. Because the study was considered to be subchronic, UFs were applied to the estimated NOAEL and LOAEL doses to represent a chronic exposure. The subchronic NOAEL (0.16 µg/g-day) and LOAEL (0.27 µg/g-day) doses derived from Wobeser et al. (1976b) were divided by a UF of three to estimate chronic TRVs (EPA, 1997). The resulting chronic NOAEL for mammalian piscivores was estimated as 0.053 mg/kg BW/day and the chronic LOAEL was estimated as 0.09 mg/kg BW/day. The estimated TRVs correspond well with a NOAEL of 0.050 mg/kg BW/day[13] estimated from the 145-day exposure to ranch-raised mink reported by Wobeser et al. (1976a) and the LOAEL of 0.09 mg/kg BW/day estimated based on Dansereau et al. (1999) in a multi-generational exposure. Because mink and river otter are in the same family (Mustelidae), the chronic NOAEL and LOAEL derived based on Wobeser et al. (1976b) were used to evaluate potential exposure to both receptors.

Aerial Insectivores

Toxicological data are limited to evaluate the effects of mercury exposure to aerial insectivorous mammals (e.g., bats). A review of available literature did not identify dietary dosing studies or field studies that could be used to derive a receptor-specific NOAEL or LOAEL to evaluate potential risks associated with dietary exposure to bats.

In the absence of available dietary studies, the relative toxicity of mercury to mammals was evaluated to support the development of an uncertainty factor that may be applied to TRVs derived for mink to evaluate potential risks to bats. Bats feed on emergent insects and have relatively high metabolic rates associated with flight and small size. As a result, bats have greater relative FIRs than mammals that are less active or larger. Due to these factors and general differences in species sensitivities to MeHg exposure, bats may have different sensitivities to MeHg exposure relative to other mammals, such as rats. Studies of rat exposures to MeHg indicate that mink are generally more sensitive to dietary exposure than other mammals (see Table C-4 of Appendix C).

In the absence of mercury toxicity information for bats, an interspecies UF of 2 was applied to the MeHg TRVs derived from mink studies reported by Wobeser et al., (1976b), as described in the preceding section. The application of a UF may be conservative given that rat studies indicate less sensitive endpoints relative to mink studies; however, given the lack of toxicity data for taxa directly related to bats, the application of a UF is warranted. Applying a UF of 2 to the TRVs derived for mammalian piscivores, the chronic NOAEL and LOAEL for aerial insectivores were estimated as 0.027 mg/kg BW/day and 0.045 mg/kg BW/day, respectively.

[13] Assuming a dietary concentration of 0.33 mg MeHg/kg ww, a mink body weight of 1.0 kg, and an FIR of 0.015 kg/day ww

As previously stated, the evaluation of mercury exposure to mammalian aerial insectivores within the PLSA was evaluated based on comparisons of modeled doses to literature-derived TRVs and doses calculated based on exposure in reference areas. Dietary doses estimated for bats foraging in reference areas represent a site-independent dose that may be used to assess the relative exposure to bats in the PLSA, as well as to evaluate the uncertainty associated with the literature-derived TRVs described above.

Inorganic Mercury

TRVs for mammalian exposure to IHg were selected based on a compilation of dietary exposure studies (see Appendix E). A NOAEL TRV for IHg was selected based on a chronic no effect dietary concentration for reproductive effects of mercuric chloride on mink (Aulerich et al., 1974). Sample et al. (1996) derived a NOAEL of 1.01 mg/kg BW/day for IHg based on no observed effects on growth, mortality, and reproductive success relative to controls, as reported in Aulerich et al. (1974). This NOAEL is selected to evaluate IHg dietary exposure to mammals in the PLSA. No LOAELs were identified for mammalian exposure to IHg.

Summary of Mammalian Toxicity Reference Values

A summary of the TRVs used to evaluate potential risks associated with modeled doses of IHg and MeHg to mammalian receptors within the PLSA is provided in the table below.

Receptors	NOAEL (mg/kg BW/day)	LOAEL (mg/kg BW/day)	Basis
Methylmercury			
Piscivores	0.053	0.090	Based on intoxication and mortality in mink (Wobeser et al., 1976b) and subchronic-to-chronic extrapolation factor of 2.
Aerial Insectivores	0.027	0.045	Based on an interspecies uncertainty factor of 2 applied to the TRVs for piscivores (above)
Inorganic mercury	1.01	NA	NOAEL derived by Sample et al. 1996 using mink reproductive endpoints reported by Aulerich et al. (1974)

6.0 Exposure Analysis

In the exposure analysis, mercury concentrations in exposure media within the PLSA are characterized for each receptor group identified in the ECSM (see Section 3.4). Mercury concentration data from site-specific sampling and analysis conducted for the 2013 Ecological Investigation provide the basis for evaluating ecological exposure in the PLSA (see Section 4.0). Information used to estimate exposure is described in this section, including an overview of the various sources, the spatial and temporal distribution of mercury in exposure media, and the methods through which different types of exposure are estimated for each receptor group.

In general, the upper confidence limit of the mean concentration (UCL_{mean}) was calculated as the exposure point concentration (EPC) for each exposure medium and study area to represent a conservative estimate of the average or typical exposure that a receptor may experience while foraging randomly throughout the study area. UCL_{mean} concentrations were calculated using EPA ProUCL Version 5.0 (EPA, 2013b). This application calculates UCL_{mean} concentrations based on various data distributions and provides recommendations for selecting an appropriate UCL_{mean} value based on the distribution of the test dataset. In general, ProUCL recommendations were used to select the most appropriate UCL_{mean} concentration to represent the EPC for a given exposure medium.

In addition to identifying EPCs, the exposure analysis evaluated the spatial and temporal context of exposure concentrations measured in the PLSA. Concentrations of THg and MeHg measured in exposure media from the PLSA were compared statistically to concentrations measured in reference areas to evaluate potential contributions of the site to overall mercury exposure. To maximize the power of these comparisons, statistical analyses used one-tailed statistical tests evaluating whether exposure concentrations are significantly greater in the PLSA when compared to reference areas. Paired one-tailed tests between PLSA and reference area datasets were conducted using parametric t-tests or non-parametric Mann-Whitney U tests, depending on the underlying distribution of the test datasets. Concentrations in the PLSA were considered to be significantly greater than reference concentrations at an alpha (α) of 0.05. Table 6-1 presents a summary of the statistical results for the analyzed matrices; further discussion of the power associated with statistical comparisons is provided in Section 8.1.1.

In select matrices where exposure data were also collected from the ABD (e.g., YOY fish, spiders, crayfish, American bullfrog), one-factor analysis of variance (ANOVA) testing was conducted to evaluate differences in concentrations measured in multiple study areas. Data satisfying parametric assumptions were evaluated using a parametric ANOVA; significant differences in the ANOVA results were evaluated *post hoc* using Tukey Honestly Significant Difference (HSD) pairwise comparisons. Non-parametric datasets were evaluated using the Kruskal-Wallis test; non-parametric pairwise comparisons were conducted using Mann-Whitney U tests. In cases where ANOVA testing was conducted, one-tailed paired comparisons were also conducted to maximize the statistical power in evaluating whether concentrations in the PLSA were significantly greater than concentrations in reference areas. Statistically significant differences were evaluated at $\alpha = 0.05$ (see Table 6-1).

6.1 Mercury Concentrations in Abiotic Media

Mercury concentrations in abiotic media (surface water, sediment, and pore water) collected during the Ecological Investigation provide a relevant measure of the magnitude and spatial distribution of potential mercury exposure in the PLSA. Collection of samples during the late summer coincides with the period of time that selected receptors are likely to be exposed and the rates of mercury methylation are greatest (Exponent and ANSP, 2003; CRG, 2006; Section 2.2). The following subsections describe the detection frequencies, range of concentrations, central tendency and EPCs for THg and MeHg in surface water (see Section 6.1.1.), sediment (see Section 6.1.2) and pore water (see Section 6.1.3).

6.1.1 Surface Water

Concentrations of THg and MeHg were measured in filtered and unfiltered surface water sampled at 20 total stations within the ABD, PLSA, and reference area (see Figures 6-1a and 6-1b, respectively). Summary statistics for surface water samples are presented in Table 6-1; a complete summary of surface water analytical data for individual samples is provided in Table D-1 of Appendix D.

THg was detected in unfiltered and filtered samples from surface and near bottom samples in each study area (see Table 6-2). The mean concentration of THg in unfiltered samples from the ABD (359 ±199 ng/L) was greater than mean concentrations of THg in unfiltered samples from the PLSA (5.4 ±1.48 ng/L) and reference area (2.31 ± 0.26). The greatest concentrations in unfiltered samples were measured at stations (ABD-SW-31 and ABD-SW-11) located in nearshore areas adjacent to the mouth of Acid Brook (see Figure 6-1a). THg concentrations in filtered surface water samples were substantially lower than unfiltered results in all areas (see Figure 6-2). Mean THg concentrations in filtered samples from the ABD (4.36 ±0.89 ng/L) were greater than mean concentrations in the PLSA (0.88 + 0.15 ng/L) and reference areas (0.58 ±0.03 ng/L). These findings indicate that THg in surface water is primarily associated with suspended particles within the ABD (see Figure 6-2). Exposure point concentrations for THg in the PLSA based on UCL_{mean} concentrations for unfiltered and filtered surface water fractions were 8.79 and 1.21 ng THg/L, respectively.

Statistical evaluations of surface water data indicate that unfiltered THg concentrations were statistically different in each of the three study areas ($p < 0.01$; see Figure 6-2). However, filtered THg and particle THg concentrations were only statistically greater in the ABD; filtered THg and particle THg were not statistically greater ($p > 0.05$) in PLSA samples when compared to reference area samples (see Figure 6-2).

MeHg concentrations in surface water were more similar between study areas than THg concentrations (see Figure 6-2). However, MeHg concentrations in surface water samples, particularly MeHg associated with particles, were significantly greater ($p < 0.01$) in samples from the ABD relative to the PLSA and reference areas. MeHg concentrations in surface water samples from the PLSA were not significantly greater than MeHg concentrations in reference area samples for either fraction (see Figure 6-2). These findings are consistent with previous investigations that have indicated that the greatest MeHg concentrations in surface water are associated with nearshore areas of the ABD and that MeHg concentrations in surface water samples from the remainder of the lake are similar to reference area samples (Exponent and ANSP, 2003; CRG, 2006). Exposure point concentrations for MeHg in the PLSA based on UCL_{mean} concentrations for unfiltered and filtered surface water fractions were 0.05 and 0.035 ng MeHg/L, respectively.

In summary, the evaluation of surface water analytical data indicates that THg and MeHg concentrations are greatest in the ABD. In the PLSA, surface water concentrations, particularly for filtered fractions of THg and MeHg and mercury associated with particles are similar to concentrations in measured in reference area samples.

Based on the surface water data obtained from the PLSA and reference areas, exposure to receptors with complete direct contact or ingestion pathways to surface water were evaluated using UCL_{mean} concentrations as summarized below.

Exposure Area Sample Fraction	Surface Water UCL_{mean} EPC	
	THg (ng/L)	MeHg (ng/L)
PLSA		
Filtered	1.21	0.035
Unfiltered	8.79	0.05
Reference Area		
Filtered	0.65	0.027
Unfiltered	2.83	0.034

6.1.2 Sediment

Sediment exposure was evaluated in the PLSA and reference areas based on samples from SQT stations (Category 1) plus additional stations sampled to characterize THg and MeHg concentrations in surface sediments (Categories 2 and 3; Section 4.1.2). Thirty-nine stations were sampled in the PLSA (see Figure 6-3a and 6-3b), and eight stations were sampled in the reference area (see Figure 6-3c). Station PLSA-C1-40, which was included in the SQT investigation to capture the upper bound of the THg gradient in surface sediment, was not included in the exposure evaluation because this station is within the 2011 CMI WP removal area. Table 6-3 presents summary statistics for sediment samples collected within the PLSA and reference area; a summary of sediment analytical data is provided in Table D-2 of Appendix D.

Overall, THg concentrations were greater in sediment samples from the PLSA relative to the reference area; however, MeHg concentrations in sediment were similar between areas. As illustrated in Figure 6-4, THg[14] concentrations in samples from the PLSA were

[14] Sediment concentrations for THg are expressed in µg/g or parts per million on a dry weight basis; THg concentrations were reported by Brooks Rand in µg/kg (parts per billion), but were converted to parts per million for presentation in the report.

significantly greater compared to the reference area ($p < 0.001$). Concentrations of THg in sediment samples within the PLSA ranged from 0.0191 to 13.1 µg THg/g and from 0.0188 to 0.25 µg THg/g in the reference area (see Table 6-3). The greatest variability in THg concentrations in sediment was associated with stations sampled along the 2011 CMI WP removal limit (see Figure 6-3a). Mean concentrations of THg were 2.95 ±0.49 µg/g in the PLSA and 0.116 ±0.031 µg/g in the reference area (see Table 6-3). UCL_{mean} concentrations for THg in sediment samples were 4.19 µg THg/g and 0.175 µg THg/g in the PLSA and reference areas, respectively (see Table 6-3).

Overall, MeHg[15] concentrations in sediment were not significantly greater in the PLSA relative to concentrations from the reference area (see Figure 6-4). Concentrations of MeHg in sediment samples ranged from 0.053 to 4.7 ng MeHg/g in the PLSA and 0.124 to 1.17 ng MeHg/g in the reference area. The maximum MeHg concentration in sediment was measured at station PLSA-C1-10, a nearshore station in the LRC portion of the PLSA (see Figure 6-3b). Average concentrations of MeHg were 0.904 ±0.145 ng/g in the PLSA and 0.449 ±0.123 ng MeHg/g in the reference area (see Table 6-3). UCL_{mean} concentrations for MeHg in sediment samples were 1.17 ng MeHg/g and 0.682 ng MeHg/g in the PLSA and reference areas, respectively (see Table 6-3).

MeHg exposure in sediments increased in nearshore stations with fine-grained sediments and reducing conditions. As shown in Figure 6-5, sediment MeHg concentrations were positively correlated with TOC ($R^2 = 0.5$; $p = 0.003$) and AVS ($R^2 = 0.65$; $p = 0.03$) in the PLSA-LRC stations; MeHg concentrations in sediment were weakly correlated with AVS ($R^2 = 0.34$; $p = 0.015$) in the PLSA-URC, but not with TOC. There was no relation observed between MeHg concentrations and TOC or AVS in the reference areas. Consistent with previous studies in the ABD (see Section 3.4.2), the association with TOC and AVS suggests that mercury methylation is greater in sediments with high organic carbon content and highly reducing conditions.

Based on the sediment results summarized above, exposure to receptors in the PLSA with complete direct contact or ingestion pathways to sediment were evaluated using the UCL_{mean} concentrations as follows.

Exposure Area	Sediment UCL_{mean} EPC	
	THg (µg/g dw)	MeHg (ng/g dw)
PLSA	4.19	1.17
Reference Area	0.175	0.682

6.1.3 Pore Water

Pore water samples were collected simultaneously with sediment samples in the PLSA and reference areas at SQT stations and additional characterization stations (see Section 4.1.2). Thirty-nine stations in the PLSA (see Figure 6-3a and 6-3b) and eight stations in the reference area were sampled for pore water (see Figure 6-3c). Table 6-4 presents

[15] Sediment concentrations for MeHg are expressed in ng/g or parts per billion on a dry weight basis

summary statistics for sediment samples collected within the PLSA and reference area; a summary of pore water analytical data is provided in Table D-3 of Appendix D.

Similar to sediment, overall THg concentrations in pore water samples from the PLSA were significantly greater than concentrations in reference area samples; however, concentrations of MeHg in pore water were similar between areas (see Figure 6-4). THg was detected in 95 percent of pore water samples from the PLSA (37 of 39 samples) and in 100 percent of the samples from the reference area (8 of 8 samples) (see Table 6-4). Detected concentrations of THg in pore water samples ranged from 0.2 ng/L to 12.7 ng/L in the PLSA and 0.2 to 0.61 ng THg/L in the reference area. Mean concentrations of THg in pore water samples were 2.61 ±0.58 ng THg/L in the PLSA and 0.39 ±0.05 ng THg/L in the reference area (see Table 6-4). UCL_{mean} concentrations for THg in pore water samples were 6.22 ng THg/L and 0.48 ng THg/L in the PLSA and reference areas, respectively (see Table 6-4).

Overall, MeHg concentrations in pore water were not significantly greater in samples from the PLSA when compared to reference area samples (see Figure 6-4). MeHg was detected in 97 percent of pore water samples from the PLSA (38 of 39 samples) and in 100 percent of the samples (8 of 8 samples) from the reference area (see Table 6-4). Detected concentrations of MeHg in pore water samples ranged from 0.023 to 1.31 ng MeHg/L in the PLSA and 0.029 to 0.164 ng MeHg/L in the reference area. Mean concentrations of MeHg were 0.138 ±0.034 ng/L in the PLSA and 0.088 ±0.018 ng/L in the reference area (see Table 6-4). UCL_{mean} concentrations for MeHg in pore water samples were 0.287 ng MeHg/L and 0.122 ng MeHg/L in the PLSA and reference areas, respectively (see Table 6-4).

Based on the pore water data summarized above, direct contact exposure to pore water in the PLSA was evaluated relative to the following EPCs.

Exposure Area	Pore Water UCL_{mean} EPC	
	THg (ng/L)	MeHg (ng/L)
PLSA	6.22	0.287
Reference Area	0.48	0.122

6.2 Exposure Estimation for Invertebrates

In addition to the EPCs summarized in the preceding section for surface water, sediment, and pore water, invertebrate exposure was estimated based on measured concentrations of THg and MeHg in tissue residues (see Sections 4.1.3 and 4.1.7). The following subsections summarize the results of invertebrate tissue analyses for larval and adult chironomids, crayfish, and spiders.

6.2.1 Larval Insect Tissue Residues

Concentrations of THg and MeHg in depurated larval chironomid tissues were measured at 17 stations within the PLSA (see Figures 6-6a) and four reference stations (see Figures 6-6b). A complete summary of analytical data for larval chironomid samples is provided in Table D-5 of Appendix D.

Summary statistics of larval chironomid exposure concentrations are presented in Table 6-5. THg concentrations measured in samples from PLSA stations ranged from 3.27 to 300 ng THg/g ww at station PLSA-C1-12 (see Figure 6-6a). However, this maximum concentration was identified as a statistical outlier within the PLSA dataset based on Dixon's Outlier Test performed in ProUCL 5.0 ($p < 0.001$); the second greatest THg concentration in the PLSA was 82.3 ng THg/g ww (PLSA-C1-39; Figure 6-6a). The maximum concentration measured in reference area samples was 32.6 ng THg/g ww. Although the THg concentration measured at PLSA-C1-12 was not representative of the other 16 samples analyzed in the PLSA, this result was retained in the dataset to enable a conservative evaluation of exposure within the PLSA. As result of including this sample in the exposure calculations, mean and UCL_{mean} EPCs of 46.2 ± 16.5 ng THg/g ww and 118 ng THg/g ww, respectively, were likely biased high (see Table 6-5). Excluding the outlier, mean and UCL_{mean} concentrations would be 30.3 ±4.77 ng THg/g ww and 38.7 and ng THg/g ww, respectively.

MeHg concentrations detected in larval chironomid tissues sampled at PLSA stations ranged from 1.84 to 6.12 ng MeHg/g ww. Mean and UCL_{mean} MeHg concentrations measured in larval chironomids the PLSA were 3.95 ± 0.33 ng MeHg/g ww and 4.47 ng MeHg/g ww, respectively. Mean and UCL_{mean} MeHg concentrations in larval chironomid samples were below the maximum detected concentration measured in larval chironomid samples from reference areas (4.5 ng MeHg/g ww).

Comparisons of larval chironomid tissue concentrations from PLSA and reference area samples indicate that THg concentrations in larval tissue concentrations were greater in the PLSA; however, MeHg concentrations in larval tissues were not greater in the PLSA (see Figure 6-7). One-tailed tests indicated that THg concentrations in larval chironomid tissue samples collected from the PLSA were significantly greater than reference area concentrations ($p < 0.01$; Figure 6-7). This result was likely influenced by the inclusion of the outlier in the dataset; however, re-analysis removing the statistical outlier indicated that THg concentrations in PLSA samples were marginally greater than THg concentrations in reference area samples. An evaluation of the size distributions of the individual larval chironomids included in composite samples from each area indicates no statistical differences in weight per individual; therefore, it is unlikely that there was a size effect on the comparisons of mercury concentrations in tissues between sampling areas (see Figure E-1 of Appendix E).

6.2.2 Emergent Adult Insect Tissue Residues

Concentrations of THg and MeHg in adult chironomid tissues were measured at 20 stations within the PLSA and five reference stations (see Figures 6-6a and 6-6b, respectively). A complete summary of analytical data for adult chironomid samples is provided in Table D-6 of Appendix D.

Summary statistics of adult chironomid exposure concentrations are presented in Table 6-6. THg concentrations measured in samples from PLSA stations ranged from 7.7 to 52.6 ng THg/g ww. MeHg concentrations in adult chironomid tissues sampled at PLSA stations ranged from 5.26 to 29.7 ng MeHg/g ww. Calculated UCL_{mean} EPCs for THg and MeHg measured at PLSA stations were 28.8 ng THg/g ww and 15.9 ng MeHg/g ww, respectively (see Table 6-6). Maximum concentrations of THg and MeHg in reference area samples were 19.9 ng THg/g ww and 12.3 ng MeHg/g ww, respectively.

The evaluation of adult chironomid tissue concentrations indicates that exposure to THg and MeHg in representative emergent insects is not greater in the PLSA relative to reference areas. Parametric one-tailed comparison of means indicated that concentrations of THg and MeHg in PLSA samples were not significantly greater than concentrations measured in reference area samples ($p > 0.05$; Figure 6-7). An evaluation of the size distributions of adult chironomids included in composite samples from each area indicated no statistical differences in weight per individual; therefore, there is no size effect on the comparisons of mercury concentrations in tissues between sampling areas (see Figure E-1 of Appendix E).

6.2.3 Crayfish Tissue Residues

Concentrations of THg and MeHg in crayfish tissue samples were measured in five samples collected within the ABD, 10 samples collected from the PLSA, and 10 reference area samples (see Figures 6-6a to 6-6b, respectively). A complete summary of analytical data for crayfish tissue samples is provided in Table D-7 of Appendix D.

As summarized in Table 6-7, THg concentrations in crayfish samples from the ABD ranged from 61.3 to 70.1 ng THg/g ww; MeHg concentrations ranged from 42.6 to 66.9 ng MeHg/g ww. Concentrations of THg in crayfish sampled within the PLSA ranged from 10.9 to 36.8 ng THg/g ww; MeHg concentrations ranged from 7.01 to 35.7 ng MeHg/g ww. Maximum THg and MeHg concentrations measured in reference area samples were 21.8 ng THg/g ww and 13.3 ng MeHg/g ww, respectively. Exposure point concentrations calculated for the PLSA based on UCL_{mean} concentrations of THg and MeHg were 28.3 ng THg/g ww and 25.1 ng MeHg/g ww, respectively. Reference area EPCs based on UCL_{mean} concentrations of THg and MeHg were 15.1 ng THg/g ww and 9.55 ng MeHg/g ww, respectively (see Table 6-7).

Comparisons of tissue concentrations between the PLSA and reference areas indicated greater crayfish concentrations in PLSA samples; however, concentrations in both areas were substantially lower (i.e., less than half of the mean concentrations) than concentrations in the ABD (see Figure 6-8). Statistical analyses of THg and MeHg concentrations in crayfish based on an ANOVA indicated significant differences in crayfish concentrations between study areas; post hoc Tukey HSD pairwise comparisons indicated significant differences ($p < 0.01$) between all three study areas. Carapace length of individual crayfish did not differ significantly between the study areas, indicating that differences in size did not affect the comparisons of mercury concentrations between study areas (see Figure E-1 of Appendix E).

6.2.4 Spider Tissue Residues

Composite samples of Tetragnathid and Lycosid spiders were analyzed for THg and MeHg in each of the three study areas: ABD and PLSA (see Figure 6-9a) and reference area (see Figure 6-9b). Summary statistics for spider samples are presented in Table 6-8; a complete summary of analytical data for spider tissue samples is provided in in Table D-8 of Appendix D.

Measured concentrations of THg and MeHg in both types of predatory spider tissues were greatest in samples from the ABD (see Figure 6-10; Table 6-8). Concentrations of THg in Lycosid samples collected within the ABD ranged from 104 to 557 ng THg/g ww; concentrations of MeHg were similar, ranging from 101 to 420 ng MeHg/g ww. Lycosid spiders samples collected within the PLSA contained THg concentrations ranging from 28.5 to 385 ng THg/g ww; MeHg concentrations ranged from 28 to 256 ng MeHg/g ww. Maximum concentrations of THg and MeHg measured in Lycosid samples from the reference areas were 109 ng THg/g ww and 103 ng MeHg, respectively. Overall, EPCs calculated for the PLSA based on UCL_{mean} concentrations of THg and MeHg were 209 ng THg/g ww and 165 ng MeHg/g ww, respectively. Reference area EPCs based on UCL_{mean} concentrations of THg and MeHg were 86.7 ng THg/g ww and 77.4 ng MeHg/g ww, respectively (see Table 6-8).

The greatest concentrations of THg and MeHg in Lycosid spiders within the PLSA were measured in samples collected from three sampling stations (PLSA-LYCO-01, PLSA-LYCO-02, and PLSA-LYCO-03) located around the island on the western shoreline of the LRC (see Figure 6-9a). Concentrations of THg in these composite samples ranged from 184 to 385 ng THg/g ww; concentrations in the remaining Lycosid samples analyzed from PLSA were less than 165 ng THg/g ww.

Samples of Tetragnathid spiders collected along the ABD shoreline also contained greater concentrations of THg and MeHg relative to the PLSA and reference area (see Figure 6-10; Table 6-8). Tetragnathid samples from the ABD contained THg concentrations ranging from 175 to 519 ng THg/g ww and MeHg concentrations ranging from 112 to 204 ng MeHg/g ww. Exposure point concentrations in the PLSA based on UCL_{mean} concentrations for THg and MeHg were 118 and 79.6, respectively. In reference areas, UCL_{mean} concentrations of THg and MeHg were similar at 105 ng THg/g ww and 69.4 ng MeHg/g ww, respectively (see Table 6-8).

Comparisons of mean THg and MeHg concentrations in spider tissue samples indicate that exposure for both families was significantly greater in the ABD compared to PLSA and reference area (see Figure 6-10). Statistical comparisons using an ANOVA and Tukey HSD pairwise comparisons indicated that THg and MeHg concentrations in samples from both types of spider tissues were significantly greater in the ABD when compared to the PLSA or reference area ($p < 0.01$). One-tailed comparisons indicated that THg concentrations in Tetragnathid samples were significantly greater in the PLSA relative to reference; however, MeHg concentrations in Tetragnathid spiders were not significantly greater in PLSA samples relative to reference samples (see Table 6-1). Concentrations of THg and MeHg in Lycosid spider samples were significantly greater in the PLSA samples when compared to reference samples. These findings indicate that exposure to spiders in the ABD was greater than the remainder of the PLSA and the reference area. Within the PLSA, exposures to mercury in spiders were slightly greater than reference areas, particularly for ground-dwelling Lycosid spiders.

6.2.5 Summary of Invertebrate Tissue Exposure

Based on the analyses of THg and MeHg concentrations in invertebrate tissue samples discussed in the previous sections, the following EPCs were calculated to evaluate

1) potential exposure to benthic invertebrates based on CBRs and 2) invertivorous wildlife exposure through dietary exposure modeling.

Exposure Area Tissue Type	Invertebrate Tissue UCL_{mean} EPC	
	THg (ng/g ww)	MeHg (ng/g ww)
PLSA		
Larval insect	118	4.47
Emergent adult insect	28.8	15.9
Crayfish	28.3	25.1
Lycosid spiders	209	165
Tetragnathid spiders	118	79.6
Reference Area		
Larval insect	32.6[a]	4.5[a]
Emergent adult insect	19.9[a]	12.3[a]
Crayfish	15.1	9.55
Lycosid spiders	86.7	77.4
Tetragnathid spiders	105	69.4

Notes:

a, EPC based on the maximum measured concentration due to insufficient sample size to calculate a reliable UCL_{mean} concentration in ProUCL 5.0.

6.3 Exposure Estimation for Fish

In addition to the EPCs summarized in Section 6.1.2 for surface water, fish exposure was estimated based on measured concentrations of THg and MeHg in whole body tissue residues measured in the Pompton Lake study areas (see Figure 4-3). The following subsections summarize the results of tissue analyses of YOY and adult fish.

6.3.1 YOY Tissue Residues

Concentrations of THg and MeHg were analyzed for whole body composite samples of YOY bluegill, largemouth bass, and yellow perch collected from the ABD, PLSA, and reference area (see Section 4.1.4 and Figure 4-3). A complete summary of analytical data for YOY fish tissue samples is provided in Table D-9 of Appendix D.

The results of YOY fish tissue analyses indicate greater mercury exposure in the ABD relative to the PLSA or reference area. Summary statistics presented in Table 6-9 indicate that the ranges of THg and MeHg concentrations detected in YOY samples of all three test species collected from the ABD were greater than maximum concentrations measured in the PLSA or reference areas (see Table 6-9). An insufficient number of samples was available to calculate UCL_{mean} EPCs; therefore, EPCs for YOY fish were conservatively based on the maximum measured tissue concentration within each study area.

Comparisons of mean THg and MeHg concentrations in YOY fish tissue indicate that concentrations were greatest in the ABD (see Figure 6-11). Based on a non-parametric

ANOVA (Kruskal-Wallis test), concentrations of THg and MeHg YOY largemouth bass and bluegill were significantly greater in samples collected from the ABD when compared to samples from the PLSA and reference areas ($p < 0.001$); statistical comparisons of yellow perch tissue residues were not conducted for the ABD due to low sample size ($n = 2$). Comparisons of YOY tissue concentrations between the PLSA and reference area indicate that THg concentrations in YOY samples of largemouth bass and yellow perch from the PLSA were significantly greater than samples from reference areas; however, for these species, only MeHg concentrations in YOY largemouth bass were significantly greater in PLSA samples. Concentrations of THg and MeHg in YOY bluegill samples from the PLSA were not significantly greater than concentrations in YOY bluegill samples from reference areas. (see Figure 6-11). These findings indicate that localized exposure to mercury, as reflected in YOY fish tissue, was greatest in the ABD and decreases in the PLSA to levels equivalent to or slightly elevated above reference conditions.

A comparison of 2005 and 2013 YOY fish tissue data collected from the ABD and reference area indicate that exposure conditions were consistent between sampling events. As illustrated in Figure 6-12, THg and MeHg concentrations in YOY largemouth bass were not statistically different between sampling events. Similarly, comparisons of bluegill tissue concentrations did not differ statistically between sampling events, with the exception of 2013 THg measurements in the ABD. In both events, concentrations of THg and MeHg were significantly greater in the ABD when compared to the reference area ($p < 0.01$). These findings indicate consistency in mercury exposure conditions for YOY fish in 2005 and 2013 prior to late summer tissue sampling.

6.3.2 Adult Tissue Residues

Adult fish tissue samples were analyzed to evaluate potential mercury bioaccumulation in feeding groups identified in the ECSM (see Section 4.1.4). A complete summary of analytical data for adult fish tissue samples is provided in Table D-10 of Appendix D.

The results of adult fish tissue analyses are summarized in Table 6-10. UCL_{mean} concentrations of adult fish in the PLSA ranged from 232 ng THg/g ww (largemouth bass) to 328 ng THg/g ww (yellow perch); the maximum THg concentration measured in golden shiner samples was 131 ng THg/g ww. The overall maximum whole body THg concentration measured in fish tissue was 497 ng THg/g ww, measured in an adult bullhead within the PLSA (see Table 6-10). In reference areas, UCL_{mean} concentrations ranged from 55.1 ng THg/g ww (bullhead spp.) to 149 ng THg/g ww.

THg and MeHg concentrations in adult largemouth bass were not significantly greater in samples collected from the PLSA when compared to reference areas (see Figure 6-13). Mean THg concentrations in adult largemouth bass collected in the PLSA were 144 ±20 ng THg/g ww compared to 102 ±9.93 ng THg/g ww in the reference area; mean MeHg concentrations in largemouth bass were similar, with MeHg representing 88 percent of the THg concentration, on average. An evaluation of the size distributions of adult largemouth bass indicates no statistical differences in TL between study areas; therefore, the potential for length-associated differences in mercury body burdens was effectively controlled by sampling similar-sized fish in both study areas[16] (see Figure E-3 of Appendix E).

The statistical significance of other adult fish tissue concentrations measured in the PLSA and reference area varied by taxa (see Figure 6-14). THg and MeHg concentrations in adult yellow perch samples collected from the PLSA were not statistically greater than concentrations in samples collected from reference areas. An evaluation of size distributions of adult yellow perch indicated that fish sampled from the PLSA were slightly larger than fish sampled from the REF. This indicates that concentrations in adult yellow perch sampled from reference areas were not biased high due to sampling larger fish (see Figure E-3 of Appendix E). This indicates that the mean concentrations measured in reference area yellow perch may have been biased slightly low for comparisons with similarly-sized fish in the PLSA.

Concentrations of THg in bullhead catfish and golden shiner sampled in the PLSA were significantly greater than concentrations measured in reference samples; however, only bullhead catfish had significantly greater MeHg concentrations in tissue when compared to reference (see Figure 6-14). Size distributions for both taxa indicated that fish included in the reference area dataset were smaller fish than fish sampled from the PLSA, indicating that concentrations in reference area samples were not biased high due to sampling larger fish (see Figure E-3 of Appendix E).

6.3.3 Summary of Fish Tissue Exposure

Based on the analyses of THg and MeHg concentrations in fish tissue samples discussed in the previous sections, the following EPCs were calculated to evaluate potential exposure to fish.

Exposure Area Tissue Type	Fish Tissue UCL_{mean} EPC	
	THg (ng/g ww)	MeHg (ng/g ww)
PLSA		
YOY Bluegill	45.8[a]	41.8[a]
YOY Largemouth bass	81.8[a]	86.1[a]
YOY Yellow perch	62.3[a]	55.9[a]
Adult Largemouth bass	232	212
Adult Yellow perch	328	294
Adult Golden shiner	131[a]	116[a]
Adult Bullhead	255	204
Reference Area		
YOY Bluegill	43.3[a]	40[a]
YOY Largemouth bass	63.6[a]	54.1[a]
YOY Yellow perch	39[a]	34.8[a]
Adult Largemouth bass	121	109
Adult Yellow perch	149	145
Adult Golden shiner	107[a]	117[a]
Adult Bullhead	55.1	53.5

[16] Analysis of co-variance (ANCOVA) procedures were evaluated to control for length-effects in statistical comparisons of concentrations measured between study areas; however, fish tissue data did not satisfy the parametric assumptions of the ANCOVA and an appropriate non-parametric equivalent to the ANCOVA could not be identified.

Notes:
a. EPC based on the maximum measured concentration due to insufficient sample size to calculate a reliable UCL_{mean} concentration in ProUCL 5.0.

Potential exposure to piscivorous wildlife through the consumption of fish within the PLSA is discussed in Section 6.5.

6.4 Exposure for Amphibians

In addition to the EPCs summarized in Section 6.1.2 for sediment and surface/pore water, exposure for amphibians was estimated based on measured concentrations of THg and MeHg in whole body tissue residues. As previously stated, amphibian tissues were collected primarily to support wildlife dietary exposure modeling; the evaluation of amphibian exposure based on CBRs was a secondary objective for collecting amphibian tissue. The following section presents the results of amphibian tissue sampling and analyses in the ABD, PLSA, and reference area.

6.4.1 Adult Tissue Residues

Concentrations of THg and MeHg in American bullfrog tissue samples were measured in seven samples collected within the ABD, 14 samples collected from the PLSA, and five reference area samples (see Figure 6-15). A complete summary of analytical data for American bullfrog tissue samples is provided in Table D-11 of Appendix D.

As summarized in Table 6-11, concentrations of THg and MeHg in American bullfrog were generally greater in samples from the ABD. THg concentrations measured in samples from the ABD ranged from 29 to 166 ng THg/g ww; MeHg concentrations ranged from 14.7 to 160 ng MeHg/g ww. Concentrations of THg in bullfrogs sampled within the PLSA ranged from 9.23 to 157 ng THg/g ww; MeHg concentrations ranged from 7.34 to 134 ng MeHg/g ww. Exposure point concentrations calculated for the PLSA based on UCL_{mean} concentrations of THg and MeHg were 76.1 ng THg/g ww and 59.2 ng MeHg/g ww, respectively. Maximum THg and MeHg concentrations measured in bullfrogs from reference areas were 65.4 ng THg/g ww and 66 ng MeHg/g ww, respectively.

Comparisons between study areas indicate that tissue concentrations are, in general, similar between areas. ANOVA comparisons of THg concentrations in bullfrogs between study areas indicate a marginally significant difference between THg concentrations in samples collected in the ABD and the PLSA (see Figure 6-16). The ANOVA results did not indicate that THg concentrations in the ABD or PLSA were significantly different than reference concentrations. MeHg concentrations in bullfrog samples were not significantly different between any sampling areas (see Figure 6-16). No differences in were observed in SVL between sampling areas, indicating that size of organism did not confound comparisons of mercury concentrations in bullfrog samples between areas (see Figure E-4 of Appendix E).

Based on the American bullfrog tissue data summarized above, amphibian exposure in the PLSA was evaluated relative to the following tissue EPCs.

Exposure Area	Amphibian Tissue UCL_{mean} EPC	
	THg (ng/g ww)	MeHg (ng/g ww)
PLSA	76.1	59.2
Reference Area	65.4[a]	66[a]

Notes:
a, EPC based on the maximum measured concentration due to insufficient sample size to calculate a reliable UCL_{mean} concentration in ProUCL 5.0.

Potential exposure to piscivorous wildlife through the consumption of amphibians within the PLSA is discussed in Section 6.5.

6.5 Exposure Estimation for Wildlife

Appendix C provides a detailed description of the wildlife dietary modeling approach used for estimating exposures for the representative wildlife receptors at PLSA (see Section 3.4.5). Exposure estimates for the representative wildlife receptors represent the daily dose of IHg or MeHg (in mg/kg BW/day) that may be ingested via diet, drinking water, and incidental ingestion of sediments. Following the EPA guidance on ecological exposure modeling, a tiered approach was used in which exposure estimates were initially based on deterministic models and were subsequently refined using probabilistic models.

Initial deterministic models estimated discrete values of IHg and MeHg exposures (point estimates) for each receptor. These point exposure estimates were compared to the corresponding TRVs to determine potential risks. Where potential risks (i.e., exposures potentially exceeding the TRVs) were indicated, exposure estimates were refined using probabilistic models. The following subsections provide brief overviews of the exposure modeling approach; further details are provided in Appendix C.

6.5.1 Deterministic Modeling Approach

Deterministic models for point estimates of exposures use exposure factors that are typical of a representative receptor, but with reasonable maximum exposures (RME) such that the resulting exposure estimates are conservative. If the conservative estimates of exposures are below TRVs that are not known to cause adverse effects (such as the NOAEL), then no unacceptable risks are indicated. Otherwise, the potential for risks cannot be ruled out. Typically, point estimates of exposures are then refined progressively to reflect more realistic scenarios. The section following provides a brief overview of the deterministic dietary exposure models used for the evaluations at PLSA.

Overview of Deterministic Dietary Exposure Models

The follow equation forms the basis for the point exposure estimate for a given receptor:

$$DMIR_i = CF \times \frac{1}{BW} \times \left(FIR \times \sum_{j=1}^{N}\left(f_i \times C_{i,j}\right) + SIR \times C_{SED,i} + WIR \times C_{SW,i}\right) \times AUF_i \quad \text{(Eq. 1)}$$

where:

$DMIR_i$ = Estimated Daily Mercury Intake Rate for exposure area *i* (mg IHg or MeHg/kg BW/day)

CF	= Unit conversion factor for DMIR (= 0.001 for ng/g BW/day to mg/kg BW/day)
BW	= Body weight (g)
FIR	= Food ingestion rate (g ww/day)
f_j	= Dietary preference for diet item *j* (fraction)
$C_{i,j}$	= Concentration of IHg or MeHg in the diet item *j* in exposure area *i* (ng/g ww)
SIR	= Sediment ingestion rate (g dw/day)
$C_{SED,\ i}$	= Concentration of IHg or MeHg in sediment in exposure area *i* (ng/g dw)
WIR	= Water ingestion rate (L/day)
$C_{SW,\ i}$	= Concentration of IHg or MeHg in surface water in exposure area *i* (ng/L)
AUF_i	= Area use factor for exposure area *i* (= 1.0, assumed)

General discussion of parameter estimation is provided below; additional details are provided in Appendix C.

Deterministic Exposure Parameter Estimation

The initial purpose of the deterministic model was to estimate a RME for a typical representative receptor. Therefore, average and/or typical values of exposure factors were used (e.g., mean BW and typical dietary preference). Various literature sources were reviewed to select the receptor-specific exposure factors, including the Wildlife Exposure Factors Handbook (EPA, 1993). These receptor-specific values of the exposure factors used in the deterministic models are presented in Table C-2a of Appendix C.

Deterministic Estimation of Dietary Concentrations

Exposure point concentrations were calculated as concentrations representing the UCL_{mean} concentration of IHg and MeHg measured in the biotic (dietary items, $C_{i,j}$ in Equation 1) and abiotic components ($C_{SED,\ i}$ and $C_{SW,\ i}$ in Equation 1) of the receptors diet and ingestion, as described in Appendix C. The EPCs used for the deterministic wildlife dietary exposure models are summarized in Table 6-12.

6.5.2 Probabilistic Modeling Approach

Unlike in the deterministic model which used single, discrete values for model inputs (i.e., representative of a typical or a reasonable worst case), the probabilistic model used a distribution of values for exposure factors and exposure concentrations to account for their inherent variability and/or uncertainty. Consequently, rather than a discrete estimate of exposure (DMIR), the probabilistic modeling results in a distribution of exposure estimates that a receptor or a population of receptors are likely to experience. The following provides an overview of the probabilistic dietary exposure models for the PLSA evaluations.

Overview of Probabilistic Dietary Exposure Models

The underlying algorithm (Equation 1) is the same for the deterministic and the probabilistic exposure models. In the probabilistic model, Monte Carlo simulations were run in Crystal Ball v.11.1.2 (Crystal Ball) to simulate the possible exposures that individuals in a receptor population would experience given the variability in the exposure factors and the exposure concentrations. The details of the modeling approach and its implementation using Crystal Ball are described in detail in Appendix C.

Initially, the distribution of Daily Mercury Intake Rates (DMIRs) was estimated based on 10,000 iterations of DMIR calculations. This estimated DMIR distribution represents the daily exposure variability for the receptors within a population. Using this DMIR distribution and the number of days per year a receptor is potentially exposed in the PLSA, a distribution of average daily mercury intake rate (ADMIR) is estimated using bootstrapping methods in Crystal Ball. In this method, DMIRs for the number of days a receptor is potentially exposed in the PLSA are randomly selected from the estimated DMIR distribution and their arithmetic mean (average) is calculated. This process is repeated 10,000 times to result in 10,000 ADMIRs that form the basis for the ADMIR distribution. The ADMIR distribution represents the variability in the average daily exposure for receptor over the duration that the receptor may reside at the PLSA. It is likely that the average exposure is lower when a receptor is not resident at the PLSA (e.g., during winter) than when it is resident at the PLSA. The annual daily average will then be lower than the ADMIR, i.e., the ADMIR is a conservative daily average dose to be compared with the TRVs.

Probabilistic modeling was performed to estimate MeHg exposure distributions only for receptors for which deterministic exposure estimates indicated potential risks (i.e., point estimates exceeding the NOAEL dose). Initially, MeHg exposure distributions (both DMIR and ADMIR) were estimated separately for the PLSA and the reference areas assuming an area use factor (AUF) of 1.0 (i.e., assuming the local bird population forages exclusively within the PLSA or the reference areas). Subsequent distributions were also estimated for AUF-adjusted DMIRs based on AUF-weighted average of the DMIRs in the PLSA and the reference area for each of the 10,000 iterations in a Monte Carlo simulation. The distributions of AUF-adjusted ADMIRs were estimated from the underlying distribution of AUF-adjusted DMIRs, as described above. Appendix F provides further details of the receptor-specific probabilistic model calculations.

Probabilistic Exposure Parameter Estimation

Probabilistic exposure modeling evaluated a range of potential exposure factors to capture the individual- and population-level variation in exposure factors for the representative receptors. The ranges of values used for the exposure factors in the probabilistic models are presented in Table C-2b of Appendix C. Appendix C provides the detailed basis for the ranges of values considered for each representative receptor.

Probabilistic Estimation of Dietary Concentrations

Table 6-13 presents a summary of the MeHg exposure concentrations that the probabilistic models simulated. As indicated, the following were considered in estimating the distributions of the MeHg concentrations:

- In estimating the EPCs for deterministic models, ProUCL calculations indicated that MeHg concentrations for each matrix, except in sediments, were normal, lognormal, and gamma-distributed at a five percent significance level. Sediment

MeHg concentrations were lognormal or gamma-distributed at five percent significance level.

- Crystal Ball was used to fit distributions to the site-specific concentrations data for datasets with number of samples (N) ≥ 15. The best-fit distribution was selected based on Anderson-Darling statistics from among the three distributions that ProUCL identified as being statistically significant.
- For the rest of the datasets with 8 < N < 15, normal distributions were assumed to be consistent with ProUCL results.
- The lower ranges of all distributions were truncated at 0 to prevent the simulations from selecting negative concentrations.

Except for datasets with N < 8 samples, the distributions of the MeHg concentrations within the reference area were also estimated as discussed above. In cases where N < 8 samples, point estimates based on the maximum concentration was used because there was an insufficient number of observations to develop a distribution to estimate exposure concentrations. It is important to note that point estimates bases on the maximum detected concentration were only used in a limited number of datasets within the reference area [adult chironomid (N=5), larval chironomid (N = 4), bullfrog (N = 5), and surface water (N = 6)]; exposure concentrations for the PLSA were based on modeled distributions (see Table 6-13).

7.0 Risk Characterization

The risk characterization quantifies potential risks associated with each combination of exposure and effects data. This approach develops risk estimates for receptors inhabiting or foraging in the PLSA by comparing the estimated EPCs or dietary doses (e.g., ADMIR for birds and mammals) of mercury (see Section 6.0) to a corresponding ecological or benchmark or TRV (see Section 5.0). Potential risks associated with direct contact or dietary exposure pathways were expressed as hazard quotient (HQs), which represent the ratio of 1) the EPC to the ecological benchmark concentration or CBR, or 2) the calculated estimated daily dose (EDD) to the TRV for wildlife ingestion pathways:

$$HQ = \frac{EPC}{Benchmark\ or\ CBR} \quad or \quad \frac{DMIR\ or\ ADMIR}{TRV}$$

Potential risk may be characterized based on HQs, as follows:

- HQs less than 1.0 based on a NOEC or NOAEL indicate that adverse effects are extremely unlikely because exposure results in an EPC or dose that has been demonstrated not to cause adverse ecological effects.
- HQs greater than 1.0 based on comparisons to no adverse effects benchmarks (e.g., NOEC or NOAEL) indicate that exposure exceeds a known benchmark associated with no adverse effects; further evaluation of exposure is warranted.
- HQs less than 1.0 based on a LOEC or LOAEL indicate that mercury exposure does not result in an EPC or dose associated with adverse ecological effects to test organisms; HQs less than 1.0 based on a LOEC or LOAEL are not likely to result in adverse population-level effects to receptors.
- HQs greater than 1.0 based on a LOEC or LOAEL indicate that exposure exceeds a known benchmark associated with low adverse effects (e.g., LOAELs); further evaluation of adverse effects may be warranted.

This section presents risk estimates for ecological receptor categories identified in the ECSM (see Section 3.4). Potential risks to ecological receptors are estimated based on the selected measurement endpoints identified to evaluate the assessment endpoints of survival, growth, and reproduction identified for each receptor category (see Table 3-1 and Section 3.5). Overall risks to ecological receptor categories are characterized in a WOE assessment of the individual measurement endpoints.

7.1 Benthic Invertebrates

The potential for adverse effects to benthic invertebrates exposed to mercury in the PLSA was evaluated based on the SQT and tissue residue approaches. The following subsections integrate the effects benchmarks established in Section 5.1 with the exposure estimates in Sections 6.1 and 6.2 to estimate and characterize potential risk to benthic macroinvertebrate communities exposed to mercury in the PLSA.

7.1.1 Sediment Quality Triad Investigation

As presented in detail in Appendix A, the SQT investigation provided a site-specific WOE assessment of the potential for adverse effects to benthic macroinvertebrates exposed to mercury in sediment and pore water in the PLSA. The results of the SQT investigation supported an assessment of potential impacts to benthic macroinvertebrates based on the following measurement endpoints (see Section 3.5 and Table 3-1):

- Measurement Endpoint (ME) #1: Comparisons of THg and MeHg concentrations measured in sediment, pore water, and surface water to NOEC benchmarks for adverse effects to benthic macroinvertebrates.
- ME #2: Statistical evaluation of differences in survival, growth, and biomass endpoints from chronic, long-term sediment toxicity testing of bulk sediments from the PLSA and comparable endpoints from reference areas.
- ME #3: Statistical evaluations of potential mercury-associated differences in the structure of benthic macroinvertebrate communities in PLSA and reference area stations based on multi-metric comparisons of community attributes (e.g., taxa richness, abundance, diversity, biotic index) and multivariate statistical comparisons (e.g., ordination) of benthic macroinvertebrate taxa-abundance data.

The WOE assessment of potential mercury-associated effects on benthic macroinvertebrate receptors indicated that sediments within the PLSA were not impacted relative to reference areas based on the above measurement endpoints. Benthic macroinvertebrate community attributes at PLSA stations were generally consistent with the attributes of reference area benthic macroinvertebrate communities. The results of sediment toxicity testing conducted under conservative laboratory exposure conditions indicated only marginal effects in the biomass endpoint at a limited number of stations. Any potential effects on benthic community structure or toxicity test endpoints were inconsistent with exposure gradients for mercury in sediment or pore water, indicating that endpoint values were not explained by THg or MeHg concentrations in exposure media, i.e., there was no concentration-response relationship. The integration of these lines of evidence into the SQT framework resulted in the classification of 14 of 17 PLSA stations as “unimpacted” and the remaining three stations as “likely unimpacted” based on a modified SQT framework (Bay and Weisberg, 2010; Appendix A).

The results of the 2013 SQT investigation were similar to the findings of previous evaluations of sediment-associated impacts to benthic invertebrate communities within the ABD. The results of 10-day sediment toxicity tests conducted during the Phase 2 Ecological Investigation did not indicate toxicity to *C. dilutus* and *H. azteca* exposed to a maximum THg concentration of 186 µg/g ABD sediments (Exponent and ANSP, 2003). Benthic community analyses at co-located sediment toxicity testing stations in the ABD did not indicate alterations to the structure of benthic communities that were explained by sediment THg concentrations. These findings support the results of the 2013 SQT investigation, which indicate that benthic communities in the PLSA are unimpacted at substantially lower sediment THg concentrations than concentrations evaluated in the Phase 2 Ecological Investigation.

The findings of the SQT investigation were used to evaluate potential risks to benthic macroinvertebrates resulting from mercury exposure in a broader spatial extent within the PLSA. Maximum concentrations of THg and MeHg in sediment from "unimpacted" or "likely unimpacted" SQT stations were established as NOECs to estimate potential risks associated with sediment exposure (see Section 5.1.3). In addition, aqueous benchmarks developed for benthic macroinvertebrates were used to evaluate exposure to pore water and surface water (see Section 5.1.1). Sediment and pore water data collected from additional characterization stations (Categories 2 and 3) were used in combination with SQT stations to estimate potential risks to benthic macroinvertebrates in other areas of the PLSA (see Section 6.1.2).

As summarized in Table 7-1, risk estimates for benthic macroinvertebrates exposed to sediment, pore water, and surface water in the PLSA indicate that adverse effects associated with mercury are unlikely. Maximum exposure concentrations were lower than NOEC benchmarks for sediment and pore water at all 39 stations evaluated in the PLSA; surface water concentrations were below aqueous NOEC benchmarks for benthic macroinvertebrates in all 14 surface water samples analyzed within the PLSA. Given that measured concentrations in abiotic exposure media for benthic macroinvertebrates were below NOEC benchmarks, the risks of mercury-associated effects on benthic macroinvertebrates are considered to be negligible in the PLSA.

7.1.2 Tissue Residue Approach

In addition to the measurement endpoints evaluated in the SQT investigation, an additional measurement endpoint was included to evaluate the potential for adverse effects associated with accumulated concentrations of THg and/or MeHg in benthic macroinvertebrate tissue:

- ME #4: Comparisons of THg and MeHg concentrations measured in site-specific larval insect and crayfish tissue residues:
  - Statistical comparisons to evaluate whether concentrations in the PLSA were significantly greater than reference area concentrations.
  - Comparisons of THg and MeHg UCL_{mean} concentrations measured in larval insect and crayfish tissue residues to CBR_{NOEC} and CBR_{LOEC} benchmarks for ecological effects.

Risk estimates based on tissue residues for larval insects and crayfish are presented in the following subsections.

Larval Insects

Mercury residues in tissues of larval chironomids sampled from the PLSA were consistent with residues measured in reference area samples and were not indicative of CBRs associated with adverse effects. As presented in Section 6.2.1, concentrations of MeHg measured in larval chironomid samples from the PLSA were not significantly greater than concentrations in samples from reference areas. Furthermore, maximum concentrations of THg and MeHg measured in larval chironomid samples from the PLSA were below $CBRs_{NOEC}$, indicating negligible potential for mercury-associated effects on the basis of tissue residues (see Table 7-1).

Crayfish

Analyses of tissue residues in crayfish samples from the PLSA were not indicative of adverse effects to invertebrates. Concentrations of THg and MeHg in whole body crayfish tissue were significantly greater in the PLSA when compared to reference areas; however, maximum concentrations of THg and MeHg were below $CBRs_{NOEC}$ (see Table 7-1). Mercury concentrations in crayfish tissues measured in the PLSA and reference areas were significantly lower than concentration measured in the ABD. These findings indicate that mercury exposures to crayfish in the PLSA are significantly lower than exposures in the ABD and are not likely to result in adverse effects based on CBRs.

Further review of literature pertaining to mercury residues in crayfish tissues indicate that concentrations of THg and MeHg in both PLSA and reference area crayfish are toward the low end of the range reported for other areas without known point sources of mercury. Allard and Stokes (1989) determined THg concentrations ranging from 22 to 614 ng THg/g ww in 13 lakes in South-Central Ontario (Canada) that receive mercury loading to their watersheds via atmospheric deposition. Pennuto et al. (2005) determined mean THg concentrations in tail muscles ranging from 23 to 550 ng/g ww[17] in crayfish sampled from four major drainage basins in New England. The study reported that 14 of the 28 sites had THg levels at or above an expected background concentration of less than 100 ng THg/g ww proposed by Parks and Hamilton (1987). In comparison to these studies, THg concentrations measured in crayfish samples from the PLSA were relatively low (see Table 7-1). This finding supports the conclusion that mercury-associated adverse effects to crayfish are unlikely based on tissue residues.

7.1.3 Benthic Invertebrate Risk Description

The findings of the integrated assessment of benthic macroinvertebrate measurement endpoints indicates that adverse effects associated with exposure to mercury is unlikely to occur in the PLSA. The findings of the site-specific SQT investigation did not indicate impacts to benthic communities in the PLSA when compared to reference areas. The assessment based on the SQT findings was conservative, considering that mercury exposure conditions were greater in the sediment toxicity test in comparison with the exposure conditions measured in the field (see Section 5.1.1; Appendix A). The SQT findings are supported by previous investigations that did not identify mercury-associated impacts to benthic macroinvertebrate communities exposed to greater mercury concentrations within the ABD (Exponent and ANSP, 2003). Furthermore, mercury residues in invertebrates sampled within the PLSA were below no effect benchmarks based on the tissue residue approach. Based on these findings, none of the measurement endpoints evaluated were indicative of adverse effects to benthic macroinvertebrates as a result of mercury exposure.

[17] THg concentration in tail muscle was not significantly different from the remaining body THg concentration (Pennuto et al., 2005).

7.2 Fish

The assessments of potential risks to YOY and adult fish exposed to mercury in the PLSA were based on measurement endpoints evaluating direct contact exposure to surface water and mercury bioaccumulation in tissues relative to tissue concentrations associated with adverse effects:

- ME #1: Comparisons of THg and MeHg concentrations in surface water to effects benchmarks protective of adult and juvenile fish.
- ME #2: Comparisons of THg concentrations measured in site-specific YOY fish tissue residues:
  - Statistical comparisons to evaluate whether concentrations in the PLSA are significantly greater than reference area concentrations.
  - Comparisons of THg and MeHg UCL_{mean} concentrations measured in YOY fish tissue residues to CBR_{NOEC} and CBR_{LOEC} benchmarks for adverse effects.

For the purposes of risk estimation, comparisons of mercury residues in fish tissue were based on THg measured in whole body samples, consistent with the derivation of CBRs for fish tissue in Section 5.2.2. The following subsections present risk estimates for YOY and adult fish exposed to mercury in the PLSA.

7.2.1 YOY Fish

The evaluation of direct contact surface water pathways (ME #1) indicates negligible risks to YOY fish in the PLSA associated with mercury exposure. As summarized in Table 7-2, maximum concentrations of THg and MeHg in filtered surface water samples from the PLSA were orders of magnitude below NOEC criteria protective of general aquatic life (THg) and specific to fish (MeHg).

Concentrations of THg in some YOY taxa were elevated in PLSA samples relative to reference area samples; however, whole body tissue residues for mercury were below concentrations associated with adverse effects in fish (see Section 6.3.1). THg concentrations in YOY bluegill sampled from the PLSA were not significantly greater than concentrations in reference samples; however, THg concentrations in YOY largemouth bass and yellow perch were significantly greater in PLSA samples. Concentrations of THg in each YOY taxon were significantly greater in the ABD compared to other study areas. A temporal comparison of YOY fish tissue data indicated consistency in YOY fish tissue samples from the ABD and reference areas in 2005 and 2013 sampling events.

Based on comparisons to critical body residues, THg concentrations in YOY fish of each taxon are not indicative of tissue residues associated with adverse effects to juvenile fish. Maximum THg concentrations measured in each taxon of YOY fish sampled from the PLSA were below CBR_{NOEC} concentrations protective of adult and juvenile fish (see Table 7-2). As stated in Section 5.2.2, the CBR_{NOEC} is based on a conservative tissue residue benchmark that was developed for the protection of juvenile and adult fish. This comparison indicates that mercury exposure within the PLSA is not likely to result in adverse effects to YOY fish.

7.2.2 Adult Fish

Consistent with the evaluation of exposure to YOY fish, the evaluation of direct contact surface water pathways (ME #1) indicates negligible risks to adult fish in the PLSA (see Table 7-2).

Concentrations of THg in adult fish tissue samples had greater variability between the PLSA and reference area than YOY fish tissue concentrations. THg concentrations in similarly-sized largemouth bass samples were not statistically greater in the PLSA when compared to samples from reference areas (see Figure 6-13). However, the significance of differences in THg concentrations between the PLSA and reference area varied by taxa for other adult fish (see Figure 6-14). Significantly greater concentrations of mercury in bullhead catfish (THg and MeHg) and yellow perch (THg) were primarily driven by concentrations in larger (i.e., longer-lived) individual fish. In addition to longer exposure durations, these larger fish likely forage over greater areas within Pompton Lake. It is possible that these larger fish, although captured in the PLSA, spent at least part of their time foraging in the higher mercury exposure areas within the ABD where shallow water depths and dense aquatic vegetation provide ideal habitat for forage fish.

Comparisons of THg EPCs for adult fish tissue sampled in the PLSA with tissue residue benchmarks indicate limited potential for adverse mercury-associated effects to adult fish (see Table 7-2). Exposure point concentrations based on UCL_{mean} concentrations of THg measured in largemouth bass, yellow perch, and bullheads slightly exceeded the conservative CBR_{NOEC}, with HQs ranging from 1.1 (largemouth bass) to 1.6 (yellow perch). Measured THg concentrations in golden shiner were below the CBR_{NOEC}. None of the EPCs for adult fish exceeded the CBR_{LOEC}, which is more indicative of a potential threshold for effects associated with THg body burdens. The maximum exposure concentration of 20 adult largemouth bass samples collected from throughout the PLSA was lower than the CBR_{LOEC}. THg concentrations exceeded the CBR_{LOEC} in only one of 18 bullhead samples and one of six yellow perch samples analyzed in the PLSA. These findings indicate that mercury exposure to adult fish is not likely to result in adverse individual or population-level effects.

7.2.3 Fish Risk Description

The evaluation of measurement endpoints for fish indicates that the potential for mercury-associated adverse effects to YOY and adult fish are not likely in the PLSA. Concentrations of THg measured in YOY fish were relatively low in the PLSA when compared to the ABD, likely reflecting the localized exposure of YOY fish to substantially lower mercury concentrations in abiotic media (e.g., surface water and sediment) within the PLSA compared to reference areas. Based on YOY fish tissue concentrations, mercury exposure in the PLSA was generally consistent with reference area exposure. Comparisons of measured THg concentrations in fish to CBRs indicate negligible risks to YOY and adult fish in the PLSA. These findings indicate that exposure to mercury in the PLSA is not likely to result in adverse effects to fish at individual or population levels.

7.3 Amphibians

The assessments of potential risks to amphibians exposed to mercury in the PLSA were based on measurement endpoints evaluating direct contact exposure to surface water and pore water and mercury bioaccumulation in tissues at concentrations associated with adverse effects:

- ME #1: Comparisons of THg and MeHg concentrations in surface water and pore water to effects benchmarks protective of amphibians.
- ME #2: Comparisons of THg and MeHg concentrations measured in site-specific amphibian tissue residues:
  - Statistical comparisons to evaluate whether concentrations in the PLSA are significantly greater than reference area concentrations.
  - Comparisons of THg and MeHg UCL_{mean} concentrations measured in amphibian tissue residues to CBR_{NOEC} and CBR_{LOEC} benchmarks for ecological effects.

The following subsections present risk estimates for direct contact and tissue residue evaluations of mercury exposure to amphibians in the PLSA.

7.3.1 Direct Contact Exposure

Direct contact risk estimates for amphibian exposures were based on comparisons of THg and MeHg concentrations in surface water and pore water. Risk estimates were not developed based on sediment concentrations because a sediment benchmark for amphibians could not be identified in the literature (see Section 5.3.1).

The evaluation of direct contact exposure to amphibians indicates that potential risks due to exposure to THg and MeHg in surface water and pore water are negligible. Concentrations of THg and MeHg in filtered surface water and pore water were orders of magnitude below NOEC concentrations that are protective of various life stages of amphibians (see Table 7-3).

7.3.2 Tissue Residue Approach

Comparisons of adult American bullfrog tissue concentrations indicate similar exposure to mercury in the PLSA and reference areas. Mean concentrations of THg and MeHg measured in whole body adult samples were not significantly different in PLSA and reference areas. Based on tissue residues, the potential for adverse effect to amphibians associated with exposure to mercury were no greater in the PLSA than the reference area.

Mercury concentrations measured in adult American bullfrog were lower than concentrations associated with adverse effects to amphibians. Maximum concentrations of THg and MeHg were well below CBR_{LOEC}, which is based on maternal concentrations associated with reduced growth in offspring (see Table 7-3). Maximum concentrations were also below the CBR_{NOEC}, which was based on the conservative benchmark for fish tissue that has been applied in some studies as a basis for comparison for mercury concentrations in amphibians (see Table 7-3; Todd et al., 2011a; Hothem et al., 2010; Burke et al., 2010; Bergeron et al., 2010). These findings indicate that adverse mercury-associated effects to adult amphibians are not likely in the PLSA based on measured tissue residues.

7.3.3 Amphibian Risk Description

The evaluation of amphibian exposure in the PLSA indicated that concentrations of THg and MeHg in abiotic exposure media (surface water and pore water) were below benchmarks concentrations protective of various life stages of amphibians. Evaluations of mercury concentrations in whole body tissue residues in adult American bullfrog were below concentrations associated with maternal transfer effects on offspring. These findings indicate that exposure to mercury in the PLSA is not likely to result in adverse effects to individuals or populations of amphibians.

7.4 Avian Wildlife

As discussed in Section 6.5, exposure and risk estimates for avian wildlife were based on dietary exposure modeling using site-specific measurements of MeHg and IHg in forage items of receptors. A phased modeling approach was used, consistent with EPA guidance. Deterministic modeling provided an initial conservative, reasonable maximum exposure scenario. If the results of deterministic modeling indicated a potential for adverse effects (i.e., estimated dose greater than the NOAEL), subsequent probabilistic modeling was conducted to evaluate likely dietary exposure over the range of exposure factors and exposure concentrations that may be experienced in the PLSA. The following subsections discuss the evaluation of mercury exposure and associated risks for avian receptors in the PLSA.

7.4.1 Deterministic Modeling

The results of deterministic dietary exposure modeling based on conservative exposure assumptions indicate negligible potential for avian risk resulting from exposure to IHg and minimal risk associated with exposure to MeHg (see Table 7-4). Deterministic models assumed that each avian receptor forages exclusively within the boundaries of the PLSA (i.e., AUF = 1). Based on this exposure scenario, NOAEL-based and LOAEL-based HQs (HQ_{NOAEL} and HQ_{LOAEL}, respectively) for dietary IHg exposure were less than one for each avian receptor.

Estimated DMIRs for MeHg exceeded NOAEL doses for great blue heron, belted kingfisher, double-crested cormorant, and Carolina wren, with HQ_{NOAEL} values ranging from 1.4 to 2.2 (see Table 7-4). Estimated doses to mallard duck and tree swallow were less than the respective NOAELs for each receptor. For tree swallow, the estimated DMIR for the PLSA only slightly exceeded the estimated DMIR for the reference area, resulting in an $DMIR_{PLSA}$:$DMIR_{REF}$ of 1.3 (Table 7-4). This indicates only a slight incremental increase in mercury exposure to tree swallow within the PLSA when compared to the reference area. Estimated dietary doses of MeHg were lower than LOAEL doses for each receptor evaluated (Table 7-4).

Based on the outcome of the conservative deterministic dietary exposure modeling, probabilistic modeling was conducted to further evaluate MeHg exposure in the PLSA to the following receptors:

- Great blue heron
- Belted kingfisher
- Double-crested cormorant
- Carolina wren

No further evaluations of dietary exposure pathways were conducted for mallard duck or tree swallow; potential risks to these receptors were considered to be negligible based on the results of deterministic modeling. No further evaluation of dietary exposure of IHg was conducted for any avian receptor.

7.4.2 Probabilistic Modeling

The following subsections present the results of probabilistic dietary exposure modeling for the four avian receptors identified above. Avian TRVs developed in Section 5.4.1, represent the average daily doses for the duration of the chronic exposures in the toxicity studies. Therefore, risk estimates are based on comparisons of the TRVs to the ADMIR distributions, which represent estimates of average receptor exposure in the study areas. Detailed modeling results, with full exposure distributions of the ADMIR and DMIR based on the Monte Carlo simulations, are presented in Appendix F. A summary of the probabilistic modeling results are provided in Table 7-5.

Great Blue Heron

The results of probabilistic dietary exposure modeling for great blue heron indicate negligible potential for adverse effects populations foraging in the PLSA and vicinity. Estimated ADMIRs indicate a near 0 percent probability that the ADMIR for great blue heron foraging exclusively within the PLSA will exceed the LOAEL dose (see Table 7-5). Based on the conservative assumption that great blue heron forage exclusively within the PLSA, the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is equivalent to 1.7; the probability of exceeding the NOAEL in this scenario is near 100 percent. However, assuming that great blue heron will forage only a portion of its total foraging range within the PLSA (approximately 9.5 percent of total foraging range; see Appendix F), the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is equal to one, with the probability of the ADMIR exceeding the NOAEL dose being less than one percent (see Table 7-5).

Belted Kingfisher

Probabilistic dietary exposure scenarios for belted kingfisher indicate negligible potential for adverse effects. Given the limited home range of belted kingfisher, it is possible that individuals could forage exclusively within the PLSA. Estimated ADMIRs indicate a near 0 percent probability that the ADMIR for belted kingfisher foraging exclusively within the PLSA will exceed the LOAEL dose (see Table 7-5). Based on exclusive foraging in the PLSA, the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is equivalent to 1.9; the probability of exceeding the NOAEL in this scenario is near 100 percent. However, it is important to note that the probability of exceeding the NOAEL for belted kingfisher foraging exclusively in reference areas is also near 100 percent with a 95th percentile HQ_{NOAEL} value for the ADMIR distribution equivalent to 1.4. This indicates minimal differences in exposure to individual belted kingfisher that forage in the PLSA relative to individuals that forage in reference areas.

Double-Crested Cormorant

Similar to other piscivores, probabilistic evaluations of exposure for double-crested cormorant indicate negligible risks of adverse effects. Estimated ADMIRs indicate a near 0 percent probability that the ADMIR for double-crested cormorant foraging exclusively within the PLSA will exceed the LOAEL dose (see Table 7-5). Based on the highly conservative assumption that cormorant forage exclusively within the PLSA, the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is equivalent to 1.2; the probability of exceeding the NOAEL in this scenario is near 100 percent. However, assuming that double-crested cormorant will forage only a portion of its total foraging range within the PLSA (approximately 2.4 percent of total foraging range; see Appendix F), the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is less than one, with the probability of the ADMIR exceeding the dose near 0 percent (see Table 7-5).

Carolina Wren

Probabilistic modeling of exposure for Carolina wren foraging on predatory terrestrial invertebrates in riparian areas of the PLSA indicates negligible potential for adverse population-level effects. Exposure scenarios assumed that individuals would forage exclusively within the PLSA, considering that the exposure area is greater than the foraging range of the Carolina wren. Estimated ADMIRs assuming exclusive foraging within the PLSA indicate a near 0 percent probability that the ADMIR for Carolina wren will exceed the LOAEL dose (see Table 7-5). Based on exclusive foraging within the PLSA, the 95th percentile HQ_{NOAEL} value for the ADMIR distribution is less than one; the probability of exceeding the NOAEL in this scenario is near 0 percent. The 95th percentile HQ_{NOAEL} value for the ADMIR distribution for the reference area (0.6) was comparable to the 95th percentile HQ_{NOAEL} calculated for the PLSA (0.8), indicating minimal incremental exposure in the PLSA relative to the reference area. These findings indicate that dietary mercury exposure to Carolina wren in the PLSA is unlikely to result in adverse population-level effects.

An evaluation of exposure pathways for invertivorous songbirds indicates that the estimated risks to Carolina wren likely represent the upper bound of exposure for spider-eating songbirds in the PLSA. The percentages of spiders in the diets of birds observed in Pompton Lake and the reference area during the June 2013 avian use survey (see Section 4.1.6) were compiled from literature sources of avian dietary composition. As shown in Table 7-6, Carolina wren was representative of the upper bound of consumption of spiders as a percentage of total diet. Based on the results of probabilistic modeling of exposure to Carolina wren, which indicated that average dietary MeHg exposure was not likely to result in adverse effects, it is not likely that dietary exposure to other songbirds consuming a lower percentage of spiders will result in adverse effects.

7.4.3 Avian Risk Description

The results of deterministic and probabilistic dietary exposure modeling indicate negligible potential for adverse effects to avian receptors foraging in the PLSA. Conservative deterministic modeling indicated that estimated dietary doses to tree swallow and mallard duck were below NOAEL TRVs. Probabilistic modeling assuming realistic exposure conditions based on typical foraging behavior indicates that average exposure to MeHg from dietary sources for great blue heron, belted kingfisher, double-crested cormorant, and Carolina wren did not result in doses exceeding the LOAEL TRVs. In many cases, the average doses calculated for the PLSA were only slightly greater than the doses calculated for the upstream reference area, indicating minimal incremental risks of dietary exposure to MeHg in the PLSA when compared to reference conditions. Based on the outcome of the deterministic and probabilistic exposure modeling, potential risks to avian receptors foraging in the PLSA are negligible.

7.5 Mammalian Wildlife

The results of dietary exposure modeling for mammalian receptors are presented in the following subsections.

7.5.1 Deterministic Modeling

The results of deterministic dietary exposure modeling based on conservative exposure assumptions indicate negligible potential for risk to mammalian receptors resulting from exposure to MeHg and IHg in the PLSA (see Table 7-4). HQ_{NOAEL} values for deterministic dietary estimates of IHg were less than one for the three mammalian receptors evaluated. Estimates of dietary exposures to MeHg also resulted in HQ_{NOAEL} values less than one for the three mammalian receptors. Estimated doses of MeHg from the PLSA slightly exceeded estimated reference doses, with the ratio of PLSA and reference area doses ($DMIR_{PLSA}$:$DMIR_{REF}$) ranging from 1.3 (little brown bat) to 2.1 (river otter). This indicates minimal incremental risks of dietary MeHg exposure in the PLSA when compared to reference exposure.

The similarity of the PLSA dose to the reference dose is particularly important for the little brown bat, which had high uncertainty associated with the derivation of TRVs due to insufficient toxicity data for bats (see Section 5.4.2). Given that the dietary dose of MeHg estimated for little brown bat in the PLSA only slightly exceeded the dose for the reference area ($DMIR_{PLSA}$:$DMIR_{REF}$ = 1.3), adverse effects associated with incremental exposure to mercury in the PLSA are not likely.

The results of conservative dietary exposure modeling indicate negligible risk to piscivorous mammals potentially foraging within the PLSA. In addition to risk estimation, it is important to emphasize that exposure pathways are not likely complete for piscivorous mammal populations given a lack of suitable habitat in the PLSA. The largely developed shoreline of Pompton Lake (residential and public land use) does not provide adequate cover or suitable den sites to support populations of piscivorous mammals. Consistent with the lack of habitat, no piscivorous mammals were observed in Pompton Lake during reconnaissance or field sampling activities occurring over more than eight weeks between April and September 2013. Although the possibility of individual piscivorous mammals being present in Pompton Lake cannot be definitively excluded, it is likely that exposure pathways for populations of these receptors are incomplete for the PLSA. However, in the event that individual piscivorous mammals would forage in the PLSA, exposure modeling indicates that the potential for adverse effects associated with MeHg exposure is negligible.

7.5.2 Mammalian Risk Description

Consistent with the findings of dietary modeling for avian receptors, potential risks are negligible for mammalian receptors exposed to mercury through dietary pathways in the PLSA. Conservative deterministic modeling indicated that estimated dietary doses to all three mammalian receptors were below NOAEL TRVs. Based on the outcome of deterministic modeling, further probabilistic modeling was not warranted. As with avian models, dietary doses of MeHg calculated for the PLSA only slightly exceed the doses calculated for the upstream reference area, indicating minimal incremental risks of dietary exposure to MeHg in the PLSA when compared to reference conditions. This finding was particularly important for evaluating exposure to little brown bat due to limited toxicity information to derive TRVs. Based on the outcome of the deterministic and probabilistic exposure modeling, potential risks to mammalian receptors foraging in the PLSA are negligible.

8.0 Uncertainty Analysis

An uncertainty analysis was performed to identify assumptions and procedures that may result in either positive or negative bias in the estimation of exposure or the characterization of potential risks associated with mercury. The uncertainty analysis focuses on the major assumptions and other factors that may influence the overall risk findings of the assessment. Discussions of uncertainty are organized by three relevant phases of the assessment with inherent uncertainty: sampling design/data quality, exposure evaluation, and risk characterization.

8.1 Sampling Design/Data Quality

The following uncertainties were identified relating to sample design/data quality issues.

8.1.1 Sampling Design

A critical aspect of the sampling design is collecting an adequate number of samples to determine significant differences between potentially impacted areas and reference areas. The determination of statistical significance is based, in part, on the statistical power of the test employed. Statistical power is the probability of not committing a Type II error, or that a given test will reject the null hypothesis (H_o) when alternative hypothesis (H_a) is true. In order to determine if the statistical tests used in this study were adequately powered, a *post hoc* power analysis (PHP) was conducted to determine the statistical power achieved based on the observed data.

The observed data were used to compute the effect size (Cohen's d; Cohen, 1988), which is the difference between the average PLSA and reference area values divided by the combined standard deviation. Small values indicate small differences between the means. Effect size is used to calculate necessary sample sizes assuming the desired statistical power and significance level (α). In cases where the p-value of the test was not significant, an *a priori* power analysis was performed to determine the total sample size (n) that would be necessary to detect a difference between the means, given the effect size observed during the 2013 study. Estimates were made assuming standard statistical power and significance level, and assuming a 1:1 ratio between PLSA and reference area sample sizes. Statistical power and the total sample size was determined using G*Power statistical software (Faul et al., 2007). Results of the analysis are incorporated into Table 6-1.

The results of the power analysis indicate that in general, tests of significance were adequately powered to detect differences between the PLSA and reference area datasets. Where moderate to large effect sizes were observed, significant differences were detected. However, it is a known feature of PHP that the power of a test is inversely proportional to the p-value and to a lesser extent, the degrees of freedom (Lenth, 2007). In the cases of non-significance, where the effect sizes are small, the results of the *a priori* approach indicate that much larger total sample sizes would be necessary to detect differences between the means. This would not be warranted, because the small effect sizes are not likely biologically relevant.

8.1.2 Analytical Data Quality

As discussed in Section 4.2, the DDR review of analytical data quality indicated that data were usable for the purposes of the study objectives, with limited exceptions. These exceptions were primarily associated with low recoveries of organic constituents (pesticides, herbicides, and SVOCs) and SEM metals.

An evaluation of detection frequencies for THg and MeHg analyses in the 2013 Ecological Investigation indicate that the data quality objectives regarding detection limits were satisfied, as indicated by the detection frequencies for each sampling matrix.

Analytical Matrix	Number of Samples	Number of Detections	Detection Frequency
Sediment (ng/g dw)			
Total mercury	48	48	100
Methylmercury	48	48	100
Pore Water (ng/L)			
Total mercury	52	53	98
Methylmercury	51	53	96
Surface Water (ng/L)			
Total mercury	50	50	100
Methylmercury	37	50	74
Biota (ng/g ww)			
Total mercury	289	289	100
Methylmercury	283	289	97

Detection frequencies for THg and MeHg were at or near 100 percent for each matrix, with the exception of surface water. Reported detection limits for surface water were <0.42 ng THg/L and < 0.052 ng MeHg/L, which were below surface water benchmarks used to evaluate potential ecological effects associated with mercury exposure.

Overall, analytical data quality was adequate to satisfy the objectives of the investigation. Uncertainty is low regarding the potential influence of analytical data quality on the findings of the investigation.

8.2 Effects Evaluation

Toxicity reference values for wildlife receptors were derived based on available data. Uncertainties involved in these derivations primarily involved the assumptions of the relative sensitivities of receptors to MeHg exposure and the appropriateness of underlying data (and thus the extrapolations used).

The procedures for deriving wildlife TRVs were generally conservative and to the extent possible attempts were made to account for species differences. For example, TRVs were derived for three categories of birds: high sensitivity piscivores/waterfowl, low-moderate sensitivity piscivores/waterfowl, and passerines (see Section 4.1 in Appendix C) and two categories of mammals: piscivores and aerial insectivores (see Section 4.2 in

Appendix C). Potential uncertainties were specifically identified in derivation of avian TRVs for the belted kingfisher and passerines:

- Belted kingfisher was conservatively included in the high sensitivity category although it is likely moderately sensitive to mercury exposure (see Appendix C).
- For passerine birds (Carolina wren and tree swallow), two NOAELs were identified based on field studies. The lower NOAEL (0.25 mg MeHg/kg BW/day), based on the geometric mean of the estimated NOAELs, likely represents a conservative estimate of exposure (see Section 4.1.1 in Appendix C).

For mammals, the greatest uncertainty in deriving TRVs was associated with the little brown bat. Dietary studies evaluating mercury exposure to bats were not identified in the literature. Therefore, conservative UFs were applied to TRVs derived for mink, a sensitive mammalian species. The protectiveness of these TRVs is uncertain given the lack of toxicological data for bats exposed to dietary mercury.

It is unlikely that the uncertainties associated with the TRVs identified above underestimated potential risk. The NOAEL TRV for belted kingfisher was likely conservative because the 95th percentile of the average dose for reference area exposures exceeded the NOAEL (HQ_{NOAEL}=1.4; see Table 7-4). Reference area doses for the other receptors with uncertain TRVs did not exceed the NOAEL; however, estimated doses for these receptors in the PLSA were similar to reference area doses. It is assumed that adverse ecological effects are not associated with exposure to ambient mercury concentrations in the reference area; therefore, the reference area doses essentially represent an additional NOAEL dose. Similar doses between the PLSA and reference area indicate that adverse effects are not likely in the PLSA. These findings indicate that the derived TRVs did not underestimate risk to the receptors identified above.

8.3 Exposure Analysis

The following subsections review the major uncertainties associated with the exposure analysis.

8.3.1 Selection of Receptors

By design, ecological risk assessments must evaluate a focused list of representative ecological receptors. As a result, representative receptors were selected based on trophic category, particular feeding behaviors, and availability of life history information to represent several similarly exposed species. If the receptors evaluated in the assessment differ in terms of exposure to site-related constituents than some receptor populations, the results may overestimate or underestimate overall ecological risk in the PLSA.

Potential exposure to reptiles was not explicitly evaluated in the ecological investigation and therefore represents an uncertainty in the exposure analysis. As discussed in Section 3.4.5, most reptilian species likely to occur in substantial populations in the PLSA, with the possible exception of snapping turtles, will likely occupy lower trophic levels within the lake food web (e.g., herbivores, omnivores) and therefore have less exposure relative to higher order piscivores selected as receptors. As previously stated, the limited data available to evaluate reptilian exposure to mercury indicate that turtle reproduction endpoints may not be as sensitive as avian endpoints (Hopkins et al., 2013). Based on the assumption that potential mercury-associated risks to snapping turtles will not be greater than the most sensitive avian receptor and the findings of limited potential risk to piscivorous birds, adverse mercury-associated effects to snapping turtles are not expected to occur in the PLSA. However, potential risks to snapping turtles or other reptiles potentially exposed within the PLSA cannot be explicitly quantified based on limited available toxicological information. As a result, exposure to this receptor category represents an uncertainty in the analysis.

Overall, receptors evaluated in the in the Ecological Investigation provide an adequate representation of potential risks to wildlife that may forage in the PLSA. The selection of receptors was reviewed with EPA, USFWS, and NJDEP during scope development meetings between April and July 2013[18]. Additional receptors, including mink, river otter, and Carolina wren, were added at the request of the agencies to the investigation as a result of these discussions to provide a broader assessment of potential wildlife exposure pathways. The uncertainty associated with receptor selection is low due to the collaborative receptor selection and inclusion of additional receptors.

8.3.2 Estimation of Wildlife Food Ingestion Rate

The major source of uncertainties in the wildlife dietary exposure evaluations is associated with the estimates for FIRs for birds and mammals. Uncertainty in the FIR and its implications on the risk estimates are discussed below. Additional, less influential, sources of uncertainties associated with the wildlife dietary exposure analysis are discussed in Appendix F.

FIRs were estimated for a typical (or average) receptor using applicable allometric relationships from Nagy (2001). While the basis for the allometric relationships is the field metabolic rate (FMR), several assumptions are needed to translate the FMR into FIR, such as dietary preference, moisture content and caloric values of the dietary items, and life stages. These assumptions contribute to the uncertainty of the predicted FIRs, which are reported as the average absolute difference (species deviation) between the actual FIRs and those predicted for each species using the group equations. Nagy (2001) reported that species deviations ranged from 28 to 33 percent for birds and 26 to 33 percent for the mammals represented in the current evaluations. These deviations mean that, on average, the actual FIRs were within a factor of 0.67 to 1.33 of the predicted FIRs.

To evaluate the influence of potentially under predicting the FIR on the conclusions regarding dietary exposure, it can be assumed that the actual FIRs are 1.33 times the predicted FIRs (i.e., 33 percent higher than those estimated in the current analyses). A proportionate increase in the estimated exposures would result in estimated exposures that are 1.33 times higher than current estimates. In the deterministic model results, NOAELs for IHg for receptors are at least 18 times lower than the current exposure estimates. Similarly, MeHg NOAELs for mammals and two birds (mallard and tree swallow) are at least two times lower than the current estimates of MeHg exposures. Therefore, uncertainties in the FIR estimates are unlikely to impact the risk conclusions

[18] Meeting dates: April 11, 2013; June 10, 2013, and July 16, 2013.

reached in the deterministic dietary exposure models for the mammals and the two birds (mallard and tree swallow).

For the probabilistic models, uncertainty associated with FIR estimates (species deviation, as defined previously) was 28 percent[19] for carnivorous birds and 32 percent for the passerine Carolina wren[20]. Based on these species deviations, the actual exposures may be, on average, as high as 1.28 and 1.32 times the estimated exposures for the three piscivorous birds and the passerine, respectively. For simplicity, this level of uncertainty may be accounted for by shifting the current ADMIR distributions for these receptors to the right by a factor of 1.28 or 1.32. The range of MeHg ADMIRs resulting in the simulations and corresponding uncertainty-adjusted ranges are compared with the corresponding TRVs in Table 8-1. These comparisons indicate that the potential uncertainty in the estimated FIRs is not expected to alter the current conclusions based on the following:

- Maximum uncertainty-adjusted ADMIRs are lower than the corresponding LOAELs (i.e., $HQ_{LOAEL} < 1$) indicating absence of potential population-level risks.
- The range of AUF-adjusted AMDIRs for double-crested cormorant additionally upward adjusted for potential uncertainty in FIRs, remains below its NOAEL, indicating absence of potential risks at individual level.
- The range of AUF-adjusted ADMIRs for great blue heron and ADMIRs for Carolina wren, both upward adjusted for potential uncertainty in FIRs, are slightly above, but comparable to the corresponding NOAELs.
- The range of ADMIRs for belted kingfisher in the PLSA, upward adjusted for potential uncertainty in FIRs, is two to three times higher than the NOAEL. However, similar levels of exposures are also estimated for the reference areas, indicating minimal incremental risks of dietary exposure to MeHg in the PLSA when compared to reference conditions based on the adjusted FIRs.

This uncertainty evaluation indicates that the potential variability in estimating FIRs would not result in a change in the overall risk conclusions regarding wildlife dietary exposure in the PLSA.

8.4 Risk Characterization

Potential uncertainties in either the effects evaluations or the exposure evaluations result in uncertainties in risk estimation and risk characterizations. However, as discussed above, those uncertainties either resulted in over-estimates of risks or did not impact risk-estimates to the extent to significantly alter the overall risk characterizations.

But there are limitations to the current evaluations that may be considered in characterizing the wildlife risks at the PLSA. These include, but are not limited to, the following:

[19] Equation 64 in Nagy (2001) for great blue heron, belted kingfisher, and double-crested cormorant.
[20] Equation 38 in Nagy (2001) for Carolina wren.

- Avian and mammalian exposure evaluations considered the adult life-stage of receptors. Risks to other life-stages (e.g., juveniles) were not explicitly evaluated. However, these other life-stages were indirectly considered in estimating TRVs that evaluated potential effects based on several generations of surrogate species.
- Wildlife exposure evaluations did not consider habitat suitability within the PLSA. For example, mink and river otter are unlikely to forage in the PLSA given that developed shorelines limit the availability of adequate cover or den sites (see Section 7.5.2). In addition, foraging habits of the birds are likely dictated by accessibility, availability, and abundance of dietary items within subareas of the PLSA. The exposure models considered the dietary items to be equally accessible, available, and abundant.

Uncertainties in characterizing risks are also associated with the assumption that an HQ greater than 1.0 is an adequate indicator of the potential for ecological risks resulting from exposure to mercury. Given the use of conservative exposure and effects assumptions, there is minimal uncertainty that the potential for ecological risks from exposure to mercury were not identified in the evaluation. Conversely, there is a possibility of false positive identification of ecological risks associated with mercury exposure. The influence of HQs on risk characterization may underestimate but more likely overestimates risk.

8.5 Summary of Uncertainty Analysis

The 2013 Ecological Investigation used conservative assumptions and estimates to evaluate potential ecological impacts associated with mercury exposure in the PLSA. Because conservative estimates or assumptions were made for most factors considered in the assessment, there is confidence that the conclusions of the ecological investigation are adequately conservative to identify potential adverse effects to ecological receptor populations.

9.0 Conclusions

The objective of the 2013 Ecological Investigation was to confirm or refine the ECSM for potential ecological exposures to mercury in the PLSA outside of the ABD remedial action area and to provide data to support risk-based remedial decision-making for sediment in Pompton Lake. The findings of the investigations reported in the preceding sections support the following conclusions regarding potential ecological risks associated with mercury exposure in the PLSA:

- Mercury exposure in surface water is not likely to result in adverse effects to aquatic receptors given that surface water concentrations in the PLSA were similar to reference areas and below surface water quality benchmarks.
- Benthic macroinvertebrate communities in the PLSA are not adversely impacted by mercury concentrations in sediments and pore water when compared to reference communities.
- Mercury residues in YOY and adult fish tissue sampled within the PLSA are not likely to result in adverse effects at the individual or population levels; whole body EPCs were below the CBR_{LOEC} associated with potential adverse effects.
- Based on available toxicity data in the literature, amphibian exposure to mercury in the PLSA is not likely to result in adverse effects based on comparison of mercury concentrations in abiotic exposure media and whole body tissue samples.
- Dietary exposure to mercury in the PLSA is not likely to result in adverse effects to avian wildlife receptors representing multiple feeding categories; dietary exposures for multiple avian receptors (e.g., tree swallow, Carolina wren, and avian piscivores) resulted in only minimal incremental risks relative to reference exposures.
- Dietary exposure to mercury in the PLSA is not likely to result in adverse effects to mammalian wildlife receptors; dietary exposures for mammals in the PLSA resulted in only minimal incremental risks relative to reference exposures.
- Exposure to mercury in abiotic and biotic exposure media is greatest in the ABD when compared to the PLSA and reference area.

The overall findings of the 2013 Ecological Investigation indicate that mercury concentrations measured in abiotic and biotic exposure media within the PLSA are not likely to result in adverse effects to ecological receptors through direct contact or dietary exposure pathways. These findings are consistent with the existing ECSM, which indicates that the greatest exposures to mercury, particularly MeHg, in abiotic and biotic media within Pompton Lake are associated with nearshore areas of the ABD. Mercury concentrations in some abiotic and biotic media are elevated in the PLSA relative to the reference areas; however, this minimal incremental increase in exposure does not result in an unacceptable risk. Based on the finding of this investigation, no further investigations or actions are warranted in the PLSA on the basis of ecological risk associated with mercury exposure.

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Tables

Table 2-1
Summary of Major Biological Assemblages in Pompton Lake and the Reference Area
2013 Pompton Lake Ecolgoical Investigation Report
DuPont Pompton Lakes Works
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Major Biological Assemblage	Description	Representative Taxa Observed
Macrophytes	Submerged, floating, and emergent wetland plants composed primarily of a few species were identified in the ABD and reference areas (PTI Environmental Services et al., 1997).	Submerged plants: Coontail (*Ceratophyllum demersum*) Common water-milfoil (*Myriophyllum spicatum*) Floating plants: White water lily (*Nymphaea odorata*) Spatterdock (Nuphar luteum) Emergent wetland plants: Swamp loosestrife (Decondon verticillatus) Purple loosestrife (Lythrum salicaria)
Phytoplankton	Phytoplankton in the ABD and reference areas consisted of a dense, but moderately diverse, community dominated by a few species. Phytoplankton communities in Pompton Lake were typical of small, shallow eutrophic lakes and consistent with communities observed in other northeastern New Jersey lakes (PTI Environmental Services et al., 1997).	Pennate diatom *Navicula viridula* *Centric diatom* Cyclotella striata Undetermined species of *Chrysopyta* and *Chlorophyta*
Zooplankton	Zooplankton in the ABD and reference area consisted of a community of cladocerans (“water fleas”) and copepods typical of small lakes with fish (PTI Environmental Services et al., 1997). Smaller species of zooplankton were generally found in greater relative abundance than larger species, suggesting that fish predation on larger zooplankton species is regulating zooplankton community structure.	Cladocera (Order) Daphnidae (Subfamily) Bosminidae (Subfamily) Chydoridae (Subfamily) Sididae (Subfamily) Copepoda (Order) Calanoida (Subfamily) Cyclopoida (Subfamily) Harpacticoida (Subfamily)
Benthic Invertebrates	Benthic invertebrate communities observed in the ABD and reference area were typical of communities observed in eutrophic lakes with fine-grained sediments (PTI Environmental Services et al., 1997). Benthic invertebrate communities were dominated by chironomid and oligochaete taxa, opportunistic species which are common in highly organic, fine-grained sediments where low oxygen conditions prevail.	Chironomidae Oligochaeta (See Appendix A for additional taxa)
Fish	The fish community observed in Pompton Lake included a range of trophic groups that are typical for similar regional water bodies (PTI Environmental Services et al., 1997). In addition to species typical of lake systems, species common in rivers and streams were also noted, which is consistent with the relatively large riverine input of the Ramapo River.	Piscivores: largemouth bass (*Micropterus salmoides*) Mixed piscivores-invertivores: White perch (Morone americana) Yellow perch (Perca flavescens) Channel catfish (Ictalurus punctatus), Benthic and epibenthic invertivores: Pumpkinseed (Lepomis gibbosus) Brown bullhead (Ameiurus nebulosus) White sucker (Catostomus commersoni) Mixed invertivores-planktivores Black crappie (Pomoxis nicromaculatus) Bluegill (Lepomis macrochirus) Planktivores Golden shiner (Notemigonus crysoleucas) Omnivores: Carp (Cyprinus carpio)

Table 2-2
Avian Species Observed at Pompton Lake and Reference Areas - June 2013
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DuPont Pompton Lakes Works
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Common Name	Scientific Name	Species Observations by Date and Study Area					
		6/11/2013		6/19/2013		6/21/2013	
		Pompton Lake	Reference	Pompton Lake	Reference	Pompton Lake	Reference
Piscivores							
Bald Eagle	*Haliaeetus leucocephalus*	●*	●*				
Black-crowned Night-Heron	*Nycticorax nycticorax*	●				●	
Belted Kingfisher	*Megaceryle alcyon*	●			●	●	●
Double-crested Cormorant	*Phalacrocorax auritus*	●*	●	●	●	●	●
Great Blue Heron	*Ardea herodias*	●	●	●	●	●	●*
Great Egret	*Ardea alba*					●	
Green Heron	*Butorides virescens*	●	●	●	●	●	●
Invertivores							
American Robin	*Turdus migratorius*	●		●	●	●	●
Barn Swallow	*Hirundo rustica*	●		●		●	
Carolina Wren	*Thryothorus ludovicianus*	●					●
Chimney Swift	*Chaetura pelagica*			●*			
Cliff Swallow	*Petrochelidon pyrrhonota*		●		●		●
Common Yellowthroat	*Geothlypis trichas*	●	●			●	●
Downy Woodpecker	*Picoides pubescens*					●	●
Eastern Kingbird	*Tyrannus tyrannus*			●	●	●	●
Eastern Phoebe	*Sayornis phoebe*		●	●		●	
Eastern Wood-Pewee	*Contopus virens*	●					
Great Crested Flycatcher	*Myiarchus crinitus*			●		●	
Hairy Woodpecker	*Picoides villosus*	●			●		
Northern Flicker	*Colaptes auratus*	●	●	●	●	●	●
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*			●			
Red-bellied Woodpecker	*Melanerpes carolinus*		●	●		●	
Spotted Sandpiper	*Actitis macularius*		●				
Tree Swallow	*Tachycineta bicolor*	●	●	●	●	●	●
Warbling Vireo	*Vireo gilvus*				●	●	●
White-breasted Nuthatch	*Sitta carolinensis*	●				●	
Woodpecker sp.	*Picoides* sp.	●			●	●	
Yellow Warbler	*Setophaga petechia*	●	●	●	●		●
Omnivores							
American Crow	*Corvus brachyrhynchos*	●*		●		●	
Baltimore Oriole	*Icterus galbula*	●	●	●	●	●	●
Black-capped Chickadee	*Poecile atricapillus*	●				●	
Blue Jay	*Cyanocitta cristata*	●	●	●	●	●	●
Brown-headed Cowbird	*Molothrus ater*				●		
Chipping Sparrow	*Spizella passerina*	●					
Common Grackle	*Quiscalus quiscula*	●	●	●	●	●	●
Eastern Towhee	*Pipilo erythrophthalmus*			●			
European Starling	*Sturnus vulgaris*					●	
Gray Catbird	*Dumetella carolinensis*	●	●	●	●	●	●
Indigo Bunting	*Passerina cyanea*			●	●		
Mallard	*Anas platyrhynchos*	●	●	●	●	●	●
Northern Cardinal	*Cardinalis cardinalis*	●	●	●	●	●	●
Northern Mockingbird	*Mimus polyglottos*			●	●		
Orchard Oriole	*Icterus spurius*			●			
Red-winged Blackbird	*Agelaius phoeniceus*	●	●	●	●	●	●
Song Sparrow	*Melospiza melodia*	●	●	●	●	●	●
Tufted Titmouse	*Baeolophus bicolor*	●	●	●		●	●
Wood Duck	*Aix sponsa*	●				●	
Carnivores							
Red-tailed Hawk	*Buteo jamaicensis*			●*	●*		
Turkey Vulture	*Cathartes aura*	●*		●*			●*
Frugivore							
Cedar Waxwing	*Bombycilla cedrorum*				●		
Granivore							
American Goldfinch	*Spinus tristis*		●	●*	●	●	●
House Sparrow	*Passer domesticus*	●		●	●	●	●
Mourning Dove	*Zenaida macroura*	●		●*	●	●	
Rock Pigeon	*Columba livia*			●			
Herbivores							
Canada Goose	*Branta canadensis*	●	●	●	●	●	●
Mute Swan	*Cygnus olor*	●	●	●	●	●	●
	Total Number of Species Observed:	35	24	36	31	37	28

Notes:
* - The species was observed flying over the lake; individuals were not observed using the lake.
Species names are in accordance with American Ornithologists' Union 7th Checklist and Supplements

Table 3-1
Summary of Ecological Receptors, Assessment Endpoint, Measurement Endpoints, and Risk Questions
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Ecological Receptor Category	Focal Species/Level of Organization	Assessment Endpoints	Risk Questions	Measurement Endpoints
Benthic invertebrates	Population	Survival Growth Reproduction	Are concentrations of methylmercury (MeHg) and total mercury (THg) in sediment, porewater, or surface water greater than effects thresholds for the survival, growth, or reproduction of benthic invertebrates?	Sediment Quality Triad (SQT) Line of Evidence: Comparison of THg and MeHg concentrations measured in sediment, pore water, surface water to effects benchmarks protective of benthic invertebrate test organisms
	Population	Survival Growth	Is the survival or growth of freshwater test organisms exposed to whole sediments from Pompton Lake study areas significantly lower than comparable endpoints for test organisms exposed to whole sediments from reference areas?	SQT Line of Evidence: Statistical comparisons of survival, growth, and biomass endpoints from chronic, long-term sediment toxicity testing of bulk sediments from Pompton Lake study areas to comparable endpoints from reference areas
	Community	Structure Function	Is the benthic community structure in Pompton Lake study areas different from the benthic community structure in reference areas with similar habitat? If differences in structure are observed, are those differences explained by mercury concentrations in abiotic or biotic exposure media and/or other habitat parameters?	SQT Line of Evidence: Statistical comparisons of multiple metrics (e.g., richness, composition, tolerance measures) that measure the structure and function of benthic invertebrate communities between study and reference stations; statistical evaluation of the results of the multi-metric community analyses with THg or MeHg concentrations in exposure media and other habitat parameters.
				SQT: Multivariate statistical comparisons (e.g., ordination) of benthic invertebrate taxa-abundance data to evaluate the structure and function of benthic communities between study area and reference area stations; statistical evaluation of the results of the multivariate analyses of community data with THg or MeHg concentrations in exposure media and other habitat parameters.
	Population	Survival Growth Reproduction	Are concentrations of MeHg or THg measured in benthic invertebrate tissues from Pompton Lake study areas greater than: 1) critical body residues (CBRs) for the survival, growth, or reproduction of benthic invertebrates; or 2) tissue concentrations measured in reference areas?	1) Statistical comparisons of site-specific THg and MeHg concentrations measured in benthic invertebrate tissues sampled from Pompton Lake study areas and reference areas; and 2) Comparisons of 95 percent upper confidence limit of the mean concentrations (UCL95) of THg and MeHg measured in benthic invertebrate tissues from Pompton Lake study areas to CBRs representative of benthic invertebrates present in Pompton Lake.

Table 3-1
Summary of Ecological Receptors, Assessment Endpoint, Measurement Endpoints, and Risk Questions
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Ecological Receptor Category	Focal Species/Level of Organization	Assessment Endpoints	Risk Questions	Measurement Endpoints
Fish				
Young-of-Year (YOY)	Bluegill (*Lepomis macrochirus*) Yellow perch (*Perca flavescens*) Largemouth bass (*Micropterus salmoides*)	Survival Growth Reproduction	Are concentrations of MeHg or THg in surface water greater than effects thresholds for the survival, growth, or reproduction of juvenile fish?	Comparison of THg and MeHg concentrations in surface water to effects benchmarks protective of juvenile fish
			Are concentrations of MeHg or THg measured in YOY fish tissue from Pompton Lake study areas greater than: 1) CBRs for the survival, growth, or reproduction of juvenile fish; or 2) YOY fish tissue concentrations measured in reference areas?	1) Comparisons of maximum concentrations of THg and MeHg measured in YOY fish tissues from Pompton Lake study areas to CBRs representative of juvenile fish present in Pompton Lake; and 2) Statistical comparisons of site-specific THg and MeHg concentrations measured in YOY fish tissue sampled from Pompton Lake study areas and reference areas
Adult invertivore	Yellow perch (*Perca flavescens*)	Survival Growth Reproduction	Are concentrations of MeHg or THg in surface water greater than effects thresholds for the survival, growth, or reproduction of representative adult fish?	Comparison of THg and MeHg concentrations in surface water to effects benchmarks protective of adult fish
Adult benthic invertivore	Brown bullhead (*Ameiurus nebulosus*) White sucker (*Catostomus commersonii*)			
Adult omnivore	Golden shiner (*Notemigonus crysoleucas*)		Are concentrations of MeHg or THg measured in adult fish tissue from Pompton Lake study areas greater than: 1) CBRs for the survival, growth, or reproduction of adult fish; or 2) adult fish tissue concentrations measured in reference areas?	1) Comparisons of UCL_{95} concentrations of THg and MeHg measured in adult fish tissues from Pompton Lake study areas to CBRs representative of adult fish present in Pompton Lake; and 2) Statistical comparisons of THg and MeHg measured in adult fish tissue (length-controlled) sampled from Pompton Lake study areas and reference areas
Adult piscivore	Largemouth bass (*Micropterus salmoides*)			

Table 3-1
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Ecological Receptor Category	Focal Species/Level of Organization	Assessment Endpoints	Risk Questions	Measurement Endpoints
Amphibians	American bullfrog (*Rana catesbeiana*)	Survival Growth Reproduction	Are concentrations of MeHg and THg in sediment, porewater, or surface water greater than effects thresholds for the survival, growth, or reproduction of amphibians?	Comparison of THg and MeHg concentrations in sediment, pore water, and surface water to effects benchmarks for amphibians
			Are concentrations of MeHg or THg measured in amphibian tissue from Pompton Lake study areas greater than: 1) amphibian tissue concentrations measured in reference areas; or 2) CBRs for the survival, growth, or reproduction of amphibians?	1) Comparisons of UCL_{95} concentrations of THg and MeHg measured in amphibian tissues from Pompton Lake study areas to CBRs representative of amphibians present in Pompton Lake; and 2) Statistical comparisons of THg and MeHg concentrations measured in amphibian tissues sampled from Pompton Lake study areas and reference areas
Birds				
Piscivores	Belted kingfisher (*Megaceryle alcyon*) Double-crested cormorant (*Phalacrocorax auritus*) Great blue heron (*Ardea herodias*)	Survival Growth Reproduction	Does the daily dose of MeHg or inorganic mercury (IHg) received by birds through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from Pompton Lake study areas exceed toxicity reference values (TRVs) for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in fish and/or amphibian tissues, sediment, and surface water.
Omnivore	Mallard (*Anas platyrhynchos*)		Does the daily dose of MeHg or IHg received by birds through the direct ingestion of dietary items, inicidental ingestion of sediment, and direct ingestion of surface water from Pompton Lake study areas exceed TRVs for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in benthic invertebrates, sediment, and surface water.
Invertivorous songbird	Carolina wren (*Thryothorus ludovicianus*)		Does the daily dose of MeHg or IHg received by birds through the direct ingestion of dietary items and surface water from Pompton Lake study areas exceed TRVs for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in predatory terrestrial invertebrates (e.g., spiders) and surface water.
Aerial insectivore	Tree swallow (*Tachycineta bicolor*)		Does the daily dose of MeHg or IHg received by birds through the direct ingestion of dietary items and drinking water from Pompton Lake study areas exceed TRVs for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in emergent insect tissues and surface water.
Mammals				
Piscivores	Mink (*Mustela vison*) River otter (*Lontra canadensis*)	Survival Growth Reproduction	Does the daily dose of MeHg or IHg received by piscivorous mammals through the direct ingestion of dietary items, incidental ingestion of sediment, and direct ingestion of surface water from Pompton Lake study areas exceed TRVs for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in fish and/or amphibian tissues, sediment, and surface water.
Aerial insectivore	Little brown bat (*Myotis lucifugus*)	Survival Growth Reproduction	Does the daily dose of MeHg or IHg received by aerial insectivorous mammals through the direct ingestion of dietary items and surface water from Pompton Lake study areas exceed TRVs for the survival, growth, or reproduction of birds?	Comparison of TRVs to dietary doses modeled using site-specific concentrations of MeHg and THg measured in emergent insect tissues and surface water.

Table 4-1
Summary of 2013 Pompton Lake Ecological Investigation Data Collection Activities
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2013 Investigation Scope of Work	Endpoint Receptor								
	Benthic Invertebrates	Fish	Amphibians	Piscivorous birds	Invertivorous/omnivorous birds	Aerial insectivorous birds	Invertivorous songbirds	Aerial insectivorous mammals	Piscivorous mammals
Surface Water Characterization (SOW #4)	●	●	●	■	■	■	■	■	■
Sediment/Pore Water Characterization & SQT Investigation (SOW #7)	●			■	■				■
Fish Tissue Evaluation (SOW #6)		❍		■					■
Amphibian Tissue Evaluation (SOW #5)			❍	■					■
Invertebrate Tissue Evaluation (SOW #8)	❍				■	■	■	■	
Invertivorous Songbird Pathway Evaluation (SOW #3)						■	■		

Exposure Pathway:
- ● Direct Contact
- ❍ Tissue Resuidue Approach
- ■ Dietary Ingestion

Table 4-2
Summary of Home Range and Foraging Behavior for Target Fish Species
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Trophic Group	Target Species	Home Range	Foraging Behavior
Omnivore	Golden shiner (*Notemigonus crysoleucas*)	Golden shiner are forage fish that are typically found in schools ranging from 45 to 100 individuals located near well-established submerged aquatic vegetation (Ross 2001). Since golden shiner lay adhesive eggs upon filamentous algae or other aquatic plants, young golden shiner are assumed to have a restricted home range during their first year due to predator avoidance strategies (schooling during the day near structure, feeding at dawn and dusk in deeper water and returning to schooling behavior at other times). The restricted home range of golden shiner enables an evaluation of localized mercury exposure related to nearby sediments.	Golden shiner feed within the aquatic food web throughout its life cycle, primarily on zooplankton. Plant material may also comprise a significant portion of its diet, particularly during the late summer (Stauffer 1995, Ross 2001)
Invertivore	Yellow perch (*Perca flavescens*)	Yellow perch are typically found in and around submerged structure that provides cover such as aquatic vegetation and docks/piers. YOY fish are assumed to have a restricted home range during their first year due to predator avoidance strategies, which enables an evaluation of localized mercury exposure related to nearby sediments. Adult perch may move freely throughout a waterbody and may inhabit various regions of the lake throughout the year due to spawning and other seasonal movements. Analysis of mercury concentrations in adult specimens represents a less localized exposure related to the point of capture.	Perch feed within the aquatic food web throughout their life cycle, though a minor connection to the terrestrial food web may exist from the consumption of terrestrial insects taken from the surface of the water. Perch usually feed from the mid- to upper-water column, but may also forage on benthic invertebrate prey or those associated with submerged aquatic vegetation (Ross, 2001). Prey generally includes aquatic insects or small crustaceans. Both the yellow and white perches will also feed on small fish as they become larger in size.
Benthic invertivore (demersal)	Brown bullhead (*Ameiurus nebulosus*) **or** Yellow bullhead (*Ameiurus natalis*)	Bullheads are not known to migrate seasonally and have a small home range (0.5-2.1 km [Sakaris et al. 2005 in Pinkey and Harshbarger 2005]).	Bullheads are predominantly benthic invertivorous feeders; however, they also feed upon microcrustaceans, plant material, detritus and occasionally small fish. Bullheads are bottom-feeders that are exposed to sediments and sediment porewater through direct contact pathways in addition to dietary pathways.
Piscivore	Largemouth bass (*Micropterus salmoides*)	YOY largemouth bass are assumed to have a restricted home range during their first year, which enables an evaluation of localized mercury exposure related to nearby sediments. Adult largemouth bass move freely throughout a waterbody and may inhabit various regions of the lake throughout the year due to spawning and other seasonal movements. Analysis of mercury concentrations in adult specimens represents a less localized exposure related to the point of capture.	Largemouth bass feed within the aquatic food web throughout its life cycle, with limited foraging on terrestrial resources (e.g., frogs and mice). Young largemouth bass feed on invertebrates and shift to a primarily piscivorous diet between them lengths of 50 mm and 100 mm (Goldstein 1993, Ross 2001, DeVries et al. 2009). As a result, most prey items consumed by largemouth bass are linked to sediments and potential mercury exposure through varying trophic levels.

Table 4-3
Fish Tissue Sample Matrix
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Trophic Group	Target Species	Target Size Range	Sample Type	Number of Individuals Per Composite Sample	Whole Body Sample Size by Study Area		
					Pompton Lake Within the ABD	Pompton Lake Study Area (PLSA)	Ramapo River/ Potash Lake Reference Area
Young-of-Year (YOY)	Bluegill (*Lepomis macrochirus*)	YOY	Composite	5	5	5	5
	Yellow perch (*Perca flavescens*)	YOY	Composite	1-5	2	4	5
	Largemouth bass (*Micropterus salmoides*)	YOY	Composite	5	5	5	5
Omnivore	Golden shiner (*Notemigonus crysoleucas*)	Various	Composite	1-5	NS	7	5
Invertivore	Yellow perch (*Perca flavescens*)	< 130 mm	Composite	0	NS	0	0
		> 130 mm	Composite	3	NS	6	6
Benthic invertivore (demersal)	Brown bullhead (*Ameiurus nebulosus*) **and** Yellow bullhead (*Ameiurus natalis*)	< 130 mm	Individual	NA	NS	10	4
		> 130 mm	Individual	NA	NS	8	5
Piscivore	Largemouth bass (*Micropterus salmoides*)	< 130 mm	Individual	NA	NS	9	6
		> 130 - 350 mm	Individual	NA	NS	11	14

Notes:
NS, No sample proposed
NA, Not applicable. Submitted as individual whole body samples.

Table 4-4
Summary of Fish Sample Identifications by Area
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Species	Acid Brook Delta	Pompton lake Study Area			Reference
		URC	LRC-01	LRC-02	
YOY- Bluegill	ABD-Y-LEMAC-01	PLSA-Y-LEMAC-03	PLSA-Y-LEMAC-01	PLSA-Y-LEMAC-04	REF-Y-LEMAC-01
	ABD-Y-LEMAC-02	PLSA-Y-LEMAC-05	PLSA-Y-LEMAC-02	--	REF-Y-LEMAC-02
	ABD-Y-LEMAC-03	--	--	--	REF-Y-LEMAC-03
	ABD-Y-LEMAC-04	--	--	--	REF-Y-LEMAC-04
	ABD-Y-LEMAC-05	--	--	--	REF-Y-LEMAC-05
YOY- Largemouth Bass	ABD-Y-MISAL-01	PLSA-Y-MISAL-01	PLSA-Y-MISAL-03	PLSA-Y-MISAL-02	REF-Y-MISAL-01
	ABD-Y-MISAL-02	PLSA-Y-MISAL-05	--	PLSA-Y-MISAL-04	REF-Y-MISAL-02
	ABD-Y-MISAL-03	--	--	--	REF-Y-MISAL-03
	ABD-Y-MISAL-04	--	--	--	REF-Y-MISAL-04
	ABD-Y-MISAL-05	--	--	--	REF-Y-MISAL-05
YOY- Yellow Perch	ABD-Y-PEFLA-01	--	--	PLSA-Y-PEFLA-01	REF-Y-PEFLA-01
	ABD-Y-PEFLA-02	--	--	PLSA-Y-PEFLA-02	REF-Y-PEFLA-02
	--	--	--	PLSA-Y-PEFLA-03	REF-Y-PEFLA-03
	--	--	--	PLSA-Y-PEFLA-04	REF-Y-PEFLA-04
	--	--	--	--	REF-Y-PEFLA-05
Bullhead Catfish	--	PLSA-AMNAT-01	PLSA-AMNAT-06	PLSA-AMNAT-07	REF-AMNAT-02
	--	PLSA-AMNAT-08	PLSA-AMNAT-09	PLSA-AMNAT-11	REF-AMNAT-03
	--	PLSA-AMNEB-02	PLSA-AMNAT-10	PLSA-AMNAT-12	REF-AMNAT-04
	--	PLSA-AMNEB-03	PLSA-AMNAT-13	--	REF-AMNAT-05
	--	PLSA-AMNEB-04	--	--	REF-AMNAT-06
	--	PLSA-AMNEB-05	--	--	REF-AMNEB-01
	--	PLSA-AMNEB-14	--	--	REF-AMNEB-07
	--	PLSA-AMNEB-15	--	--	REF-AMNEB-08
	--	PLSA-AMNEB-16	--	--	REF-AMNEB-09
	--	PLSA-AMNEB-17	--	--	--
	--	PLSA-AMNEB-18	--	--	--
Largemouth Bass	--	PLSA-MISAL-01	PLSA-MISAL-04	PLSA-MISAL-05	REF-MISAL-01
	--	PLSA-MISAL-02	PLSA-MISAL-06	PLSA-MISAL-15	REF-MISAL-02
	--	PLSA-MISAL-03	PLSA-MISAL-07	PLSA-MISAL-16	REF-MISAL-03
	--	PLSA-MISAL-08	PLSA-MISAL-10	PLSA-MISAL-17	REF-MISAL-04
	--	PLSA-MISAL-09	PLSA-MISAL-11	PLSA-MISAL-19	REF-MISAL-05
	--	PLSA-MISAL-18	PLSA-MISAL-12	PLSA-MISAL-20	REF-MISAL-06
	--	--	PLSA-MISAL-13	--	REF-MISAL-07
	--	--	PLSA-MISAL-14	--	REF-MISAL-08
	--	--	--	--	REF-MISAL-09
	--	--	--	--	REF-MISAL-10
	--	--	--	--	REF-MISAL-11
	--	--	--	--	REF-MISAL-12
	--	--	--	--	REF-MISAL-13
	--	--	--	--	REF-MISAL-14
	--	--	--	--	REF-MISAL-15
	--	--	--	--	REF-MISAL-16
	--	--	--	--	REF-MISAL-17
	--	--	--	--	REF-MISAL-18
	--	--	--	--	REF-MISAL-19
	--	--	--	--	REF-MISAL-20
Golden Shiner	--	PLSA-NOCRY-04	PLSA-NOCRY-02	PLSA-NOCRY-01	REF-NOCRY-01
	--	PLSA-NOCRY-05	PLSA-NOCRY-03	PLSA-NOCRY-07	REF-NOCRY-02
	--	PLSA-NOCRY-06	--	--	REF-NOCRY-03
	--	--	--	--	REF-NOCRY-04
	--	--	--	--	REF-NOCRY-05
Yellow Perch	--	PLSA-URC	PLSA-LRC-01	PLSA-LRC-02	REF-PEFLA-06
	--	PLSA-URC	PLSA-LRC-01	--	REF-PEFLA-07
	--	--	PLSA-LRC-01	--	REF-PEFLA-08
	--	--	--	--	REF-PEFLA-09
	--	--	--	--	REF-PEFLA-10
	--	--	--	--	REF-PEFLA-11

Notes:
YOY, young of year
URC, upper Ramapo channel
LRC-01, lower Ramapo channel upper extent
LRC-02, lower Ramapo channel lower extent

Table 5-1
Summary of Invertebrate Critical Body Residues
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Test Species	Life Stage	Exposure Route	Effect Type	Tissue Type	Mercury Form	NOEC (ng Hg/g ww)	LOEC[a] (ng Hg/g ww)	References[b]
Mayfly (*Hexagenia*)	Nymph	Absorption	Growth	Whole Body	MeHg	36.7	NA	Naimo et al. (2000)[d]
Mayfly (*Hexagenia*)	Nymph	Absorption	Growth	Whole Body	THg	2,164	NA	Naimo et al. (2000)[e]
Mayfly-Burrowing (*Hexagenia rigida*)	Nymph	Combined	Growth	Whole Body	THg	2,700	NA	Odin et al. (1994)
Mayfly-Burrowing (*Hexagenia rigida*)	Nymph	Combined	Growth	Whole Body	MeHg	7,493	NA	Saouter et al. (1993)
Mayfly-Burrowing (*Hexagenia rigida*)	Nymph	Combined	Growth	Whole Body	THg	3,765	NA	Saouter et al. (1993)
Water flea (*Daphnia magna*)	Immature	Absorption	Reproduction	Whole Body	THg	1,530	2,330	Biesinger et al. (1982)
Water flea (*Daphnia magna*)	Juvenile	Water	Reproduction	Whole Body	THg	3,050	4,660	Niimi and Cho (1983)
Grass shrimp (*Palaemonetes pugio*)	Adult	Absorption	Survival	Whole Body	THg	1,640	NA	Barthalmus (1977)
Water flea (*Daphnia magna*)	Immature	Absorption	Survival	Whole Body	THg	2,600	NA	Biesinger et al. (1982)[c]
Mayfly-Burrowing (*Hexagenia rigida*)	Nymph	Combined	Survival	Whole Body	THg	2,700	NA	Odin et al. (1994)
Eastern elliptio (*Elliptio complanata*)	NS	Water	Survival	Soft Tissue	THg	3,400	NA	Tessier et al. (1996)
Water flea (*Daphnia magna*)	Juvenile	Water	Survival	Whole Body	THg	4,660	NA	Niimi and Cho (1983)
Banded mystery snail (*Viviparus georgianus*)	NS	Water	Survival	Soft Tissue	THg	6,000	NA	Tessier et al. (1996)
Water flea (*Daphnia magna*)	Juvenile	Water	Survival	Whole Body	THg	NA	9,730	Tsui and Wang (2006)
Water flea (*Daphnia magna*)	Immature	Absorption	Survival	Whole Body	THg	7,570	18,400	Biesinger et al. (1982)
Amphipod (*Hyalella azteca*)	Juvenile	Water	Survival	Whole Body	THg	11,200	18,000	Borgmann et al. (1993)
Non-biting Midge (*Chironomus riparius*)	Larval	Absorption	Survival	Whole Body	THg	107,600	NA	Rossaro et al. (1986)

Notes:
NA, Endpoint not available from study
NS, Lifestage not stated.
Concentrations reported in literature studies reviewed for invertebrate critical body residues have been expressed as ng/g ww for consistency with the presentation of invertebrate tissue concentrations in the 2013 Ecological Investigation Report.
a, All studies from ERED, unless noted otherwise. (http://el.erdc.usace.army.mil/ered/) accessed February 2014
b, From TOXRES Database (Jarvinen and Ankley, 1999)
c, From EVS (1999); Involved MeHg exposure and no effects on survival
d, Based on mean concentration (0.1837 mg MeHg/kg dw) from the highest no effect treatment and an assumed moisture content of 80 percent for benthic invertebrates.
e, Based on mean concentration (10.819 mg THg/kg dw) from the highest no effect treatment and an assumed moisture content of 80 percent for benthic invertebrates.

Table 5-2
Summary of Aqueous Toxicity Endpoints for Fish
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Toxicity	Species			Toxicity Endpoint	References	Total Mercury Concentration (ng/L)
ACUTE	IHg	Fathead minnow	*Pimephales promelas*	96-h LC_{50}	EPA (1985, 1996)	150,000 - 172,000
		Rainbow trout	*Oncorhynchus mykiss*	96-h LC_{50}	EPA (1985)	155,000 - 420,000
		Coho salmon	*Oncorhynchus kisutch*	96-h LC_{50}	Lortz et al. (1978)	240,000
		White Sucker	*Catostomus commersor*	96-h LC_{50}	Duncan and Klaverkamp (1983)	900,000
		Tilapia	*Talapia mossambica*	96-h LC_{50}	Qureshi and Saksena (1980)	1,000,000
	MeHg	Rainbow trout	*Oncorhynchus mykiss*	96-h LC_{50}	EPA (1985)	24,000 - 42,000
		Lamprey	*Petromyzon sp.*	96-h LC_{50} @12C	Mallat et al. (1986)	48,000
		Brook trout	*Salvelinus fontinalis*	96-h LC_{50}	McKim et al. (1976)	65,000 - 84,000
CHRONIC	IHg	Fathead minnow	*Pimephales promelas*	60-d Reproduction, Growth	Snarski and Olson (1982)	260
		Channel catfish	*Ictalurus punctatus*	10-d Survival	Birge et al. (1979)	300
		Largemouth bass	*Microptes salmoides*	8-d Survival	Birge et al. (1979)	4,300
	MeHg	Brook trout	*Salvelinus fontinalis*	3rd Generation	McKim et al. (1976)	290
		Brook trout	*Salvelinus fontinalis*	2nd Generation	McKim et al. (1976)	930
		Coho salmon	*Oncorhynchus kisutch*	48-d Survival	CCME (2003)	63,000

Notes:
LC_{50}, Median lethal concentration

Table 5-3
Summary of No Effect Residue (NER) and Low Effect Residue (LER) Body Burdern Thresholds for Mercury
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Species	Life Stage	THg NER (ng/g, ww)	THg LER (ng/g, ww)	THg Control (ng/g, ww)	Tissue Type	Effect Endpoint	Form and Route of Exposure	Reference	Include	Justification for Removal
Juvenile/Adult Endpoints										
Walleye	Juvenile (6 month old)	60	250	60	Whole body	Reproduction	MeHg, food	Friedman et al. 1996	Yes	
Fathead Minnow	Juvenile to Adult	100	390	100	Whole body	Reproduction	MeHg, food	Hammerschmidt 2002	Yes	
Golden Shiner	Adult	230	520	40	Whole body	Behavior	MeHg, food	Webber and Haines 2003	Yes	
Fathead Minnow	Larvae to Adult	620	1200	220	Whole body	Growth	HgCl, aqueous	Snarski and Olsen 1982	Yes	
Fathead Minnow	Juvenile to Adult	79	860	79	Whole body	Reproduction	MeHg, food	Drevnick and Sandheinrich 2003	Yes	
Brook Trout	Three Generations	2700	5000	100	Whole body	Lethality	MeHg, aqueous	McKim et al. 1976	Yes	
Geometric mean of juvenile/adult NER and LERs:		**436**								
Early Life Stage (ELS) Endpoints										
Rainbow Trout	Eggs	20	70	20	Eggs	Lethality	HgCl, aqueous	Birge 1979	Yes	
Rainbow Trout	Larvae	20	40	20	Whole body	Lethality	HgCl, aqueous + sediment	Birge 1979	Yes	
Geometric mean of applicable juvenile/adult and ELS LERs:			**406**							
Excluded Endpoints - Brackish/Arctic Species										
Striped Mullet		100	300	<100		Development	MeHg, aqueous	Weis and Weis 1978	No	Estuarine/Marine
Mummichog		210	440	80		Lethality	MeHg, food	Matta et al. 2001	No	Estuarine/Marine
Grayling	Fry	60	270	60	Whole body	Behavior	MeHg, aqueous	Fjeld 1998	No	Arctic

Notes:
Studies include compilation of whole body residue endpoints for mercury compiled by Beckvar et al. (2005)

Table 6-1
Summary of Statistical Analyses
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Sample Matrix		Data Attributes						Statistical Analyses[e]															
		Sample Size			Data Distribution			One-Factor Analysis of Variance (ANOVA)							Paired One-Tailed Comparisons (PLSA > REF)								
									Post Hoc Comparison Probability Value (p-value)							THg				MeHg			
		REF	ABD	PLSA	Normal	Normal-Transformed	Non-Normal	Statistical Test[a]	ABD/REF		ABD/PLSA		PLSA/REF		Statistical Test								
									THg	MeHg	THg	MeHg	THg	MeHg		p-value	Power[b]	Effect Size[c]	Required n[d]	p-value	Power[b]	Effect Size[c]	Required n[d]
Adult Fish	Bullhead Catfish	9	0	18		log(THg, MeHg)		NA	NA						Student's t-test	**<0.001**	0.87	1.16	--	**<0.001**	0.87	1.16	--
	Largemouth Bass	20	0	20			THg, MeHg	NA	NA						Mann-Whitney	0.144	0.13	0.56	2188	0.083	0.51	0.55	152
	Golden Shiner	5	0	5	THg, MeHg			NA	NA						Student's t-test	**0.024**	0.69	1.49	--	0.078	0.42	0.99	--
	Yellow Perch	6	0	6	THg, MeHg			NA	NA						Student's t-test	0.060	0.52	1.05	42	0.074	0.46	0.97	48
YOY Fish	Bluegill	5	5	5	THg, MeHg			ANOVA, Tukey HSD	**<0.001**	**<0.001**	**<0.001**	**<0.001**	1.000	0.859	Student's t-test	0.517	NA	0	NA	0.781	0.20	0.54	150
	Largemouth Bass	5	5	5	THg (w/o ABD), MeHg		THg (w/ ABD)	KW, Mann-Whitney (THg); ANOVA, Tukey HSD (MeHg)	**0.006**	**<0.001**	**0.006**	**<0.001**	**0.011**	0.125	Student's t-test	**0.010**	0.86	1.89	--	**0.004**	0.93	2.18	--
	Yellow Perch	5	2	4	THg, MeHg			NC	NC						Student's t-test	**0.022**	0.66	1.52	--	0.050	0.62	1.45	--
Crayfish	Crayfish	10	5	10	THg	log(MeHg)		ANOVA, Tukey HSD	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**0.004**	**<0.001**	Student's t-test	**0.002**	0.93	1.44	--	**<0.001**	0.99	1.84	--
American Bullfrog	American Bullfrog	5	7	14		log(THg, MeHg)		ANOVA, Tukey HSD	0.112	0.333	**0.043**	0.1	0.997	0.955	Student's t-test	0.472	0.19	0.42	246	0.611	0.08	0.14	2242
Chironomidae (Midge)	Adult Chironomid	5	0	20	MeHg	log(THg)		NA	NA						Student's t-test	0.058	0.62	1.01	46	0.076	0.50	0.84	64
	Larval Chironomid	4	0	18	MeHg	log(THg)		NA	NA						Student's t-test	**0.006**	0.34	0.71	--	0.277	0.11	0.25	706
Spider	Tetragnathidae	10	10	10	THg, MeHg			ANOVA, Tukey HSD	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.841	0.605	Student's t-test	**0.042**	0.93	0.82	--	0.085	0.40	0.64	114
	Lycosidae	10	9	10	THg, MeHg			ANOVA, Tukey HSD	**<0.001**	**<0.001**	**0.003**	**0.004**	0.308	0.289	Student's t-test	**0.019**	0.79	1.00	--	**0.023**	0.66	0.96	--
Sediment	Sediment	8	0	40		Sqrt (THg)	MeHg	NA	NA						Student's t-test (THg); Mann-Whitney (MeHg)	**<0.001**	0.95	1.30	--	0.095	0.49	0.65	108
Pore Water	Particles	8	0	40			THg, MeHg	NA	NA						Mann-Whitney	**0.005**	0.70	0.87	--	0.766	0.20	0.32	442
Surface Water	Unfiltered Surface Water	6	5	14		log(THg)	MeHg	ANOVA, Tukey HSD (THg); KW, Mann-Whitney (MeHg)	**<0.001**	**0.004**	**<0.001**	**<0.001**	0.448	0.148	Student's t-test (THg); Mann-Whitney (MeHg)	**0.019**	0.46	0.79	--	0.148	0.42	0.75	84
	Filtered Surface Water	6	5	14			THg, MeHg	KW, Mann-Whitney	**0.004**	**0.004**	**<0.001**	**0.001**	0.265	0.863	Mann-Whitney	0.265	0.40	0.73	164	0.863	0.22	0.46	222
	Particles in Surface Water	6	5	14		log x+1 (MeHg)	THg	ANOVA, Tukey HSD (THg); KW, Mann-Whitney (MeHg)	**0.004**	0.069	**0.002**	**0.018**	1.000	0.957	Mann-Whitney (THg); Student's t-test (MeHg)	1.000	0.27	0.53	48	0.635	0.06	0.06	806

Notes:
ABD, Acid Brook Delta; REF, Reference Area; PLSA, Pompton Lake Study Area
YOY, Young-of-year
NA, Statistical test not applicable
NC, Statistical test not conducted due to small sample size
a, Parametric analyses were conducted using ANOVA with Tukey Honestly Significant Difference (HSD) post hoc pairwise comparisons. Non-parametric analyses were conducted using non-parametric Kruskal-Wallis (KW) with pairwise comparisons conducted using Mann-Whitney U tests.
b, Statistical power is the probability that a given test will reject H_o (null hypothesis) when H_a (alternative hypothesis) is true, or the probability of not committing a Type II error.
c, Effect size (Cohen's d) is the difference between the average PLSA and REF values divided by the combined standard deviation. Small values indicate small differences between the means. It is used to calculate necessary sample sizes assuming the desired statistical power and significance level (a).
d, The required n is the total sample size (n) that would be necessary to detect a difference between the means, given the effect size observed during the study. Estimates were made assuming standard statistical power and significance level, and assuming a 1:1 ratio between Pompton Lakes Study Area (PLSA) and reference (REF) sample sizes.
e, Bold values indicate statistical significance at $\alpha = 0.05$.

Table 6-2
Summary of Surface Water Analytical Results
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Analyte	Units	Filtered / Unfiltered	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Acid Brook Delta									
Total Mercury	ng/L	Filtered	5	5	2.48	6.7	4.36 (± 0.89)	--	NC, small sample size
	ng/L	Unfiltered	5	5	31.5	1140	359 (± 199)	--	NC, small sample size
Methylmercury	ng/L	Filtered	5	5	0.056	0.559	0.204 (± 0.097)	--	NC, small sample size
	ng/L	Unfiltered	5	5	0.135	1.8	0.556 (± 0.317)	--	NC, small sample size
Pompton Lake Study Area									
Total Mercury	ng/L	Filtered	14	14	0.4	2.5	0.88 (± 0.15)	1.21	95% Adjusted Gamma
	ng/L	Unfiltered	14	14	1.32	21.6	5.4 (± 1.48)	8.79	95% Adjusted Gamma
Methylmercury	ng/L	Filtered	14	7	0.021	0.071	0.028 (± 0.004)	0.035	95% KM (%) Bootstrap
	ng/L	Unfiltered	14	12	0.022	0.096	0.042 (± 0.005)	0.05	95% KM (%) Bootstrap
Reference Area									
Total Mercury	ng/L	Filtered	6	6	0.48	0.68	0.58 (± 0.03)	0.65	95% Student's t
	ng/L	Unfiltered	6	6	1.33	3.23	2.31 (± 0.26)	2.83	95% Student's t
Methylmercury	ng/L	Filtered	6	3	0.021	0.03	0.023 (± 0.002)	0.027	95% KM (t)
	ng/L	Unfiltered	6	5	0.028	0.038	0.031 (± 0.003)	0.034	95% KM (%) Bootstrap

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
KM, Kaplan Meier
Filtered, 0.45 µm filter
NC, UCL_{mean} was not calculated due to low sample size.

Table 6-3
Summary of Sediment Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Pompton Lake Study Area								
Total Mercury	µg/g dw	39	39	0.0191	13.1	2.95 (± 0.495)	4.19	95% Adjusted Gamma
Methylmercury	ng/g dw	39	39	0.053	4.7	0.904 (± 0.145)	1.17	95% Adjusted Gamma
Reference Area								
Total Mercury	µg/g dw	8	8	0.0188	0.25	0.116 (± 0.031)	0.175	95% Student's t
Methylmercury	ng/g dw	8	8	0.124	1.17	0.449 (± 0.123)	0.682	95% Student's t

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
dw, dry weight

Table 6-4
Summary of Pore Water Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Pompton Lake Study Area								
Total Mercury	ng/L	39	37	0.2	12.7	2.61 (± 0.58)	6.22	97.5% KM (Chebyshev)
Methylmercury	ng/L	39	38	0.023	1.31	0.138 (± 0.034)	0.287	95% KM (Chebyshev)
Reference Area								
Total Mercury	ng/L	8	8	0.2	0.61	0.39 (± 0.05)	0.48	95% Student's t
Methylmercury	ng/L	8	8	0.029	0.164	0.088 (± 0.018)	0.122	95% Student's t

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
KM, Kaplan Meier

Table 6-5
Summary of Larval Chironomid Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Pompton Lake Study Area								
Total Mercury	ng/g ww	17	17	3.27	300	46.2 (± 16.5)	118	95% Chebyshev (Mean, Sd)
Methylmercury	ng/g ww	17	15	1.84	6.12	3.95 (± 0.33)	4.47	95% KM (t)
Reference Area								
Total Mercury	ng/g ww	4	4	1.43	32.6	10.7 (± 7.34)	--	NC, small sample size
Methylmercury	ng/g ww	4	2	2.18	4.5	3.47 (± 0.912)	--	NC, small sample size

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
KM, Kaplan Meier
ww, wet weight

Table 6-6
Summary of Adult Chironomid Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Pompton Lake Study Area								
Total Mercury	ng/g ww	20	20	7.7	52.6	24 (± 2.79)	28.8	95% Student's t
Methylmercury	ng/g ww	20	20	5.26	29.7	13.5 (± 1.4)	15.9	95% Student's t
Reference Area								
Total Mercury	ng/g ww	5	5	10.1	19.9	14.7 (± 1.86)	--	NC, small sample size
Methylmercury	ng/g ww	5	5	6.11	12.3	9.16 (± 1.28)	--	NC, small sample size

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
ww, wet weight

Table 6-7
Summary of Crayfish Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Acid Brook Delta								
Total Mercury	ng/g ww	5	5	61.3	70.1	64.6 (± 1.57)	--	NC, small sample size
Methylmercury	ng/g ww	5	5	42.6	66.9	53.3 (± 4.94)	--	NC, small sample size
Pompton Lake Study Area								
Total Mercury	ng/g ww	10	10	10.9	36.8	23.2 (± 2.78)	28.3	95% Student's t
Methylmercury	ng/g ww	10	10	7.01	35.7	19.9 (± 2.83)	25.1	95% Student's t
Reference Area								
Total Mercury	ng/g ww	10	10	8.73	21.8	12.8 (± 1.25)	15.1	95% Student's t
Methylmercury	ng/g ww	10	10	6.61	13.3	8.47 (± 0.592)	9.55	95% Student's t

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
ww, wet weight
NC, UCL_{mean} was not calculated due to low sample size.

Table 6-8
Summary of Spider Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Family	Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Acid Brook Delta									
Lycosidae	Total Mercury	ng/g ww	9	9	104	557	340 (± 55.7)	444	95% Student's t
	Methylmercury	ng/g ww	9	9	101	420	250 (± 37.8)	320	95% Student's t
Tetragnathidae	Total Mercury	ng/g ww	10	10	175	519	301 (± 29.5)	355	95% Student's t
	Methylmercury	ng/g ww	10	10	112	204	160 (± 10.5)	180	95% Student's t
Pompton Lake Study Area									
Lycosidae	Total Mercury	ng/g ww	10	10	28.5	385	149 (± 32.8)	209	95% Student's t
	Methylmercury	ng/g ww	10	10	28	256	120 (± 24.5)	165	95% Student's t
Tetragnathidae	Total Mercury	ng/g ww	10	10	86.7	135	109 (± 5.18)	118	95% Student's t
	Methylmercury	ng/g ww	10	10	39.5	95.8	70.5 (± 4.94)	79.6	95% Student's t
Reference Area									
Lycosidae	Total Mercury	ng/g ww	10	10	38.1	109	73.9 (± 6.93)	86.7	95% Student's t
	Methylmercury	ng/g ww	10	10	28.3	103	65.8 (± 6.35)	77.4	95% Student's t
Tetragnathidae	Total Mercury	ng/g ww	10	10	61.4	125	93.3 (± 6.6)	105	95% Student's t
	Methylmercury	ng/g ww	10	10	38.2	86.4	60.7 (± 4.8)	69.4	95% Student's t

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
ww, wet weight

Table 6-9
Summary of Young of Year Fish Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Species	Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Acid Brook Delta									
Bluegill	Total Mercury	ng/g ww	5	5	117	222	159 (± 18)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	70.8	102	85.8 (± 6)	--	NC, small sample size
Largemouth Bass	Total Mercury	ng/g ww	5	5	116	173	140 (± 13)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	98.2	154	124 (± 10.4)	--	NC, small sample size
Yellow Perch	Total Mercury	ng/g ww	2	2	51.9	120	86 (± 34.1)	--	NC, small sample size
	Methylmercury	ng/g ww	2	2	39.3	81	60.2 (± 20.9)	--	NC, small sample size
Pompton Lake Study Area									
Bluegill	Total Mercury	ng/g ww	5	5	28.2	45.8	36.2 (± 3.8)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	25.3	41.8	31.4 (± 2.77)	--	NC, small sample size
Largemouth Bass	Total Mercury	ng/g ww	5	5	58.9	81.8	70.5 (± 4)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	59.2	86.1	68.1 (± 4.9)	--	NC, small sample size
Yellow Perch	Total Mercury	ng/g ww	4	4	35.8	62.3	49.4 (± 6.1)	--	NC, small sample size
	Methylmercury	ng/g ww	4	4	29.3	55.9	43.5 (± 6.1)	--	NC, small sample size
Reference Area									
Bluegill	Total Mercury	ng/g ww	5	5	32.7	43.3	36.4 (± 1.82)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	29.6	40	34.3 (± 2.18)	--	NC, small sample size
Largemouth Bass	Total Mercury	ng/g ww	5	5	40.4	63.6	54.5 (± 3.8)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	33.1	54.1	47.1 (±3.7)	--	NC, small sample size
Yellow Perch	Total Mercury	ng/g ww	5	5	27.1	39	34.8 (± 2.2)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	23.5	34.8	29.5 (± 1.9)	--	NC, small sample size

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
ww, wet weight

Table 6-10
Summary of Adult Fish Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Species	Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Pompton Lake Study Area									
Largemouth Bass	Total Mercury	ng/g ww	20	20	69.8	364	144 (± 20)	232	95% Chebyshev (Mean, Sd)
	Methylmercury	ng/g ww	20	20	58.4	350	130 (± 18.9)	212	95% Chebyshev (Mean, Sd)
Yellow Perch	Total Mercury	ng/g ww	6	6	101	463	219 (± 54)	328	95% Student's t
	Methylmercury	ng/g ww	6	6	94	420	197 (± 48.3)	294	95% Student's t
Golden Shiner	Total Mercury	ng/g ww	5	5	94.5	131	105 (± 6.8)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	84.5	116	101 (± 5.86)	--	NC, small sample size
Bullhead Sp.	Total Mercury	ng/g ww	18	18	42.9	497	149 (± 30)	255	95% Chebyshev (MVUE)
	Methylmercury	ng/g ww	18	18	39.2	472	143 (± 28.5)	204	95% Adjusted Gamma
Reference Area									
Largemouth Bass	Total Mercury	ng/g ww	20	20	54.8	245	102 (± 9.93)	121	95% Adjusted Gamma
	Methylmercury	ng/g ww	20	20	31.6	233	89.2 (± 9.96)	109	95% Adjusted Gamma
Yellow Perch	Total Mercury	ng/g ww	6	6	81.1	178	117 (± 15.8)	149	95% Student's t
	Methylmercury	ng/g ww	6	6	73.3	162	113 (± 16.1)	145	95% Student's t
Golden Shiner	Total Mercury	ng/g ww	5	5	48.5	107	76.1 (± 10.3)	--	NC, small sample size
	Methylmercury	ng/g ww	5	5	44.9	117	77.8 (± 13.5)	--	NC, small sample size
Bullhead Sp.	Total Mercury	ng/g ww	9	9	20	77.7	43.8 (± 6.07)	55.1	95% Student's t
	Methylmercury	ng/g ww	9	9	17.7	70.1	43.5 (± 5.38)	53.5	95% Student's t

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
ww, wet weight

Table 6-11
Summary of American Bullfrog Tissue Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method
Acid Brook Delta								
Total Mercury	ng/g ww	7	7	29	166	106 (± 17.8)	--	NC, small sample size
Methylmercury	ng/g ww	7	7	14.7	160	84.2 (± 19.2)	--	NC, small sample size
Pompton Lake Study Area								
Total Mercury	ng/g ww	14	14	9.23	157	53.7 (± 12.6)	76.1	95% Student's t
Methylmercury	ng/g ww	14	14	7.34	134	42.2 (± 9.57)	59.2	95% Student's t
Reference Area								
Total Mercury	ng/g ww	5	5	18.4	65.4	39.3 (± 8.14)	--	NC, small sample size
Methylmercury	ng/g ww	5	5	17.1	66	37.7 (± 8.59)	--	NC, small sample size

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
ww, wet weight

Table 6-12
Summary of Exposure Point Concentrations for Deterministic Exposure Estimates
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte/Media	Units[b]	Number of Samples	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method	Exposure Point Concentration (EPC)[c]
Pompton Lake Study Area							
Inorganic Mercury							
Adult Chironomid	ng/g ww	20	35.7	10.6 (± 1.78)	14.2	95% Adjusted Gamma	14.2
Larval Chironomid	ng/g ww	17	294	42.2 (± 16.3)	205	99% Chebyshev (Mean, Sd)	205
Crayfish	ng/g ww	10	6.5	3.3 (± 0.7)	4.57	95% Student's t	4.57
Lycosidae	ng/g ww	10	129	29.6 (± 13.2)	109	95% Adjusted Gamma	109
Tetragnathidae	ng/g ww	10	47.2	38.2 (± 1.98)	41.8	95% Student's t	41.8
American Bullfrog	ng/g ww	14	84.9	11.6 (± 5.9)	30.9	95% Student's t	30.9
Fish (<130 mm TL)	ng/g ww	34	39.7	6.93 (± 1.43)	15.9	95% Chebyshev (Mean, Sd)	15.9
Fish (>130 mm TL)	ng/g ww	31	53	18.1 (± 20.5)	36.5	95% Chebyshev (Mean, Sd)	36.5
Surface Water	ng/L	14	21.5	5.36 (± 1.47)	8.74	95% Adjusted Gamma	8.74
Sediment	ng/g dw	39	13097	2949 (± 495)	4189	95% Adjusted Gamma	4189
Methylmercury							
Adult Chironomid	ng/g ww	20	29.7	13.5 (± 1.4)	15.9	95% Student's t	15.9
Larval Chironomid	ng/g ww	17	6.12	3.95 (± 0.33)	4.47	95% KM (t)	4.47
Crayfish	ng/g ww	10	35.7	19.9 (± 2.82)	25.1	95% Student's t	25.1
Lycosidae	ng/g ww	10	256	120 (± 24.5)	165	95% Student's t	165
Tetragnathidae	ng/g ww	10	95.8	70.5 (± 4.94)	79.6	95% Student's t	79.6
American Bullfrog	ng/g ww	14	134	42.2 (± 9.56)	59.2	95% Student's t	59.2
Fish (<130 mm TL)	ng/g ww	34	138	60.3 (± 4.34)	67.6	95% Student's t	67.6
Fish (>130 mm TL)	ng/g ww	31	472	179 (± 19.4)	263	95% Chebyshev (Mean, Sd)	263
Surface Water	ng/L	14	0.096	0.042 (± 0.005)	0.05	95% KM (%) Bootstrap	0.05
Sediment	ng/g dw	39	4.7	0.904 (± 0.14)	1.17	95% Adjusted Gamma	1.17
Reference Area							
Inorganic Mercury							
Adult Chironomid	ng/g ww	5	7.6	5.52 (± 0.73)	7.08	95% Student's t	7.6[d]
Larval Chironomid	ng/g ww	4	27.1	7.36 (± 6.58)	22.9	95% Student's t	27.1[d]
Crayfish	ng/g ww	10	14.1	4.3 (± 1.2)	7.37	95% Adjusted Gamma	7.37
Lycosidae	ng/g ww	10	16.9	9.71 (± 1.79)	13.0	95% Student's t	13.0
Tetragnathidae	ng/g ww	10	41	32.6 (± 2.42)	37.1	95% Student's t	37.1
American Bullfrog	ng/g ww	5	3.2	1.7 (± 0.6)	2.99	95% Student's t	3.2[d]
Fish (<130 mm TL)	ng/g ww	25	23.2	6.64 (± 1.09)	8.51	95% Student's t	8.51
Fish (>130 mm TL)	ng/g ww	29	23	8.54 (± 1.42)	17.5	95% Chebyshev (Mean, Sd)	17.5
Surface Water	ng/L	6	3.21	2.28 (± 0.264)	2.81	95% Student's t	3.21[d]
Sediment	ng/g dw	8	250	116 (± 30.8)	174	95% Student's t	174
Methylmercury							
Adult Chironomid	ng/g ww	5	12.3	9.16 (± 1.27)	11.9	95% Student's t	12.3[d]
Larval Chironomid[a]	ng/g ww	4	4.5	3.34 (± 1)	5.15	95% KM (t)	4.5[d]
Crayfish	ng/g ww	10	13.3	8.47 (± 0.59)	9.55	95% Student's t	9.55
Lycosidae	ng/g ww	10	103	65.8 (± 6.35)	77.4	95% Student's t	77.4
Tetragnathidae	ng/g ww	10	86.4	60.7 (± 4.79)	69.4	95% Student's t	69.4
American Bullfrog	ng/g ww	5	66	37.7 (± 8.59)	56.0	95% Student's t	66.0[d]
Fish (<130 mm TL)	ng/g ww	25	68.9	42.7 (± 2.75)	47.4	95% Student's t	47.4
Fish (>130 mm TL)	ng/g ww	29	233	92.4 (± 8.25)	106	95% Student's t	106
Surface Water	ng/L	6	0.038	0.031 (± 0.002)	0.034	95% KM (%) Bootstrap	0.038[d]
Sediment	ng/g dw	8	1.17	0.449 (± 0.12)	0.682	95% Student's t	0.682

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
a, Not sufficient data for Goodness of Fit (GOF) tests in ProUCL.
b, Units were expressed on an equal basis as parts per billion (ng/g or ng/L) for input into deterministic models
c, Unless noted otherwise, the basis for the EPCs are UCL_{mean}
d, EPCs were based on maximum detected concentrations due to insufficient data (N < 8) for UCL_{mean} determinations
SE, standard error of the mean concentration
TL, total length
dw, dry weight
ww, wet weight

Table 6-13
Summary of Methylmercury Exposure Point Concentrations Distributions for Probabilistic Exposure Estimates
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Media	Units[h]	Distribution Type[a]	Parameter Values for the Selected Distributions[b]	Notes
Pompton Lake Study Area (PLSA)				
Midge-Adult	ng/g ww	Lognormal	Mean = 13.5; SD = 6.5; Location = -1.81	d
Midge-Larvae	ng/g ww	Lognormal	Mean = 3.81; SD = 1.28; Location = -59.16	d
Crayfish	ng/g ww	Normal	Mean = 19.9; SD = 8.93	e
Lycosidae	ng/g ww	Normal	Mean = 120; SD = 77.8	e
Tetraghnidae	ng/g ww	Normal	Mean = 70.5; SD = 15.6	e
American Bullfrog	ng/g ww	Normal	Mean = 42.2; SD = 35.8	e
Fish (<130 mm TL)	ng/g ww	Lognormal	Mean = 60.5; SD = 26.2; Location = -7.43	d
Fish (>130 mm TL)	ng/g ww	Lognormal	Mean = 185; SD = 153; Location = 64.52	d
Surface Water	pg/L	Normal	Mean = 45.6; SD = 18.9	e
Sediment	ng/g dw	Lognormal[c]	Mean = 0.904; SD = 0.95; Location = -0.05	d
Reference Area (REF)				
Midge-Adult	ng/g ww	Point Estimate	EPC = 12.3	f
Midge-Larvae	ng/g ww	Point Estimate	EPC = 4.5	f
Crayfish	ng/g ww	Normal	Mean = 8.47; SD = 1.87	e
Lycosidae	ng/g ww	Normal	Mean = 65.8; SD = 20.1	e
Tetraghnidae	ng/g ww	Normal	Mean = 60.7; SD = 15.2	e
American Bullfrog	ng/g ww	Point Estimate	EPC = 66.0	f
Fish (<130 mm TL)	ng/g ww	Gamma	Scale = 10.88; Shape = 1.875; Location = 22.30	d
Fish (>130 mm TL)	ng/g ww	Lognormal	Mean = 92.6; SD = 44.2; Location = -40.99	d
Surface Water	pg/L	Point Estimate	EPC = 38.0	d
Sediment	ng/g dw	Normal	Mean = 0.45; SD = 0.35	e

Notes:

EPC - Exposure Point Concentration; represents maximum detected concentration (See Table 6-13)

SD - Standard Deviation

TL - Total Length

a, Distributions are continuous and truncated at 0 at the lower range (to avoid negative concentrations); Unless specified otherwise, site-specific concentrations data appeared normal, gamma-distributed, and lognormal at 5% significance level (based on ProUCL calculations).

b, The "location" parameter for lognormal distribution represents the shift in distribution relative to the standard lognormal distribution.

c, Data appeared to be gamma-distributed and lognormal at 5% significance level (based on ProUCL calculations)

d, Distributions were fitted to the site-specific data using Crystal Ball and the best of the three distributions (normal, gamma, and lognormal) that ProUCL indicated to be significant was selected.

e, Distributions were not fitted using Crystal Ball due to insufficient data (requires N ≥ 15); therefore, for datasets with N ≥ 10, normal distributions were assumed consistent with ProUCL calculations.

f, Distributions were not estimated due to insufficient data (N < 8); therefore, point estimates were used based on EPCs.

h, Input values were expressed as ng/g (parts per billion) for solid matrices and pg/L (parts per trillion) for input into Crystal Ball.

Table 7-1
Summary of Exposure and Risk Estimates for Benthic Macroinvertebrates
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Exposure Medium and Analyte	Units	Number of Samples	Exposure Concentrations			Exposure Point Concentration (EPC)	No Effect Benchmark (NOEC)	NOEC Hazard Quotient (HQ_{NOEC})	Lowest Effect Benchmark (LOEC)	LOEC Hazard Quotient (HQ_{LOEC})
			Maximum Detected Concentration	Mean (±SE) Concentration	UCL_{mean} Concentration					
Sediment										
Total Mercury	µg/g dw	39	13.1	2.95 (± 0.495)	4.19	4.19	23.5	<1	ND	--
Methylmercury	ng/g dw	39	4.7	0.904 (± 0.145)	1.17	1.17	4.7	<1	ND	--
Pore Water										
Total Mercury	ng/L	39	12.7	2.61 (± 0.579)	6.22	6.22	4000	<1	7000	<1
Methylmercury	ng/L	39	1.31	0.138 (± 0.034)	0.287	0.287	4	<1	40	<1
Filtered Surface Water										
Total Mercury	ng/L	14	2.5	0.88 (± 0.15)	1.21	1.21	4000	<1	7000	<1
Methylmercury	ng/L	14	0.071	0.028 (± 0.004)	0.035	0.035	4	<1	40	<1
Larval Chironomid Tissue Residue										
Total Mercury	ng/g ww	17	300	46.2 (± 16.5)	118	118	1530	<1	2330	<1
Methylmercury	ng/g ww	17	6.12	3.95 (± 0.33)	4.47	4.47	36.7	<1	ND	--
Whole Body Crayfish Tissue Residue										
Total Mercury	ng/g ww	10	36.8	23.2 (± 2.78)	28.3	28.3	1530	<1	2330	<1
Methylmercury	ng/g ww	10	35.7	19.9 (± 2.83)	25.1	25.1	36.7	<1	ND	--

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
KM, Kaplan Meier
ww, wet weight
ND, Benchmark value was not derived
--, Hazard quotient not calculated

Table 7-2
Summary of Exposure and Risk Estimates for Young-of-Year and Adult Fish
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Exposure Medium and Analyte	Units	Number of Samples	Exposure Concentrations			Exposure Point Concentration (EPC)	No Effect Benchmark (NOEC)	NOEC Hazard Quotient (HQ_{NOEC})[1]	Lowest Effect Benchmark (LOEC)	LOEC Hazard Quotient (HQ_{LOEC})
			Maximum Detected Concentration	Mean (±SE) Concentration	UCL_{mean} Concentration					
Filtered Surface Water										
Total Mercury	ng/L	14	2.5	0.88 (± 0.15)	1.21	1.21	770	<1	ND	--
Methylmercury	ng/L	14	0.071	0.028 (± 0.004)	0.035	0.035	290	<1	ND	--
Young-of-Year Whole Body Tissue Residues - Total Mercury										
Bluegill	ng/g ww	5	45.8	36.2 (± 3.8)	NC	45.8	210	<1	436	<1
Largemouth Bass	ng/g ww	5	81.8	70.5 (± 4)	NC	81.8	210	<1	436	<1
Yellow Perch	ng/g ww	4	62.3	49.4 (± 6.1)	NC	62.3	210	<1	436	<1
Adult Whole Body Tissue Residues - Total Mercury										
Largemouth Bass	ng/g ww	20	364	144 (± 20)	232	232	210	**1.1**	436	<1
Yellow Perch	ng/g ww	6	463	219 (± 54)	328	328	210	**1.6**	436	<1
Golden Shiner	ng/g ww	5	131	105 (± 6.8)	NC	131	210	<1	436	<1
Bullhead Sp.	ng/g ww	18	497	149 (± 30)	255	255	210	**1.2**	436	<1

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.
KM, Kaplan Meier
ww, wet weight
ND, Benchmark value was not derived
--, Hazard quotient not calculated
1, Bold values indicate hazard quotient exceeding 1.0

Table 7-3
Summary of Exposure and Risk Estimates forAmphibians
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Exposure Medium and Analyte	Units	Number of Samples	Exposure Concentrations			Exposure Point Concentration (EPC)	No Effect Benchmark (NOEC)	NOEC Hazard Quotient (HQ_{NOEC})	Lowest Effect Benchmark (LOEC)	LOEC Hazard Quotient (HQ_{LOEC})
			Maximum Detected Concentration	Mean (±SE) Concentration	UCL_{mean} Concentration					
Sediment										
Total Mercury	µg/g dw	39	13.1	2.95 (± 0.495)	4.19	4.19	ND	--	ND	--
Methylmercury	ng/g dw	39	4.7	0.904 (± 0.145)	1.17	1.17	ND	--	ND	--
Pore Water										
Total Mercury	ng/L	39	12.7	2.61 (± 0.58)	6.22	6.22	770	<1	ND	<1
Methylmercury	ng/L	39	1.31	0.138 (± 0.034)	0.287	0.287	4	<1	40	<1
Filtered Surface Water										
Total Mercury	ng/L	14	2.5	0.88 (± 0.15)	1.21	1.21	770	<1	ND	<1
Methylmercury	ng/L	14	0.071	0.028 (± 0.004)	0.035	0.035	4	<1	40	<1
Whole Body American Bullfrog Tissue Residue										
Total Mercury	ng/g ww	14	157	53.7 (± 12.6)	76.1	76.1	210	<1	655	<1
Methylmercury	ng/g ww	14	134	42.2 (± 9.57)	59.2	59.2	210	<1	347	<1

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
KM, Kaplan Meier
ww, wet weight
ND, Benchmark value was not derived
--, Hazard quotient not calculated

Table 7-4
Summary of Deterministic Estimates of Dietary Exposures and Risk Characterization for Wildlife Receptors
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptors	Receptor Category	DMIR (mg/kg BW/day)				TRV (mg/kg BW/day)				HQ (=DMIR/TRV)[b]				$DMIR_{PLSA}$:$DMIR_{REF}$	
		IHg		MeHg		IHg		MeHg		IHg		MeHg			
		PLSA	REF	PLSA	REF	NOAEL	LOAEL	NOAEL	LOAEL[a]	HQ_{NOAEL}	HQ_{LOAEL}	HQ_{NOAEL}	HQ_{LOAEL}	IHg	MeHg
Avian Receptors															
Great blue heron (*Ardea herodias*)	Semi-aquatic piscivorous birds	0.011	0.003	0.037	0.017	0.45	0.90	0.017	0.055	<1	<1	**2.2**	<1	**3.6**	**2.1**
Belted kingfisher (*Megaceryle alcyon*)	Semi-aquatic piscivorous birds	0.016	0.005	0.037	0.027	0.45	0.90	0.017	0.055	<1	<1	**2.2**	<1	**3.2**	**1.4**
Double-crested cormorant (*Phalacrocorax auritus*)	Semi-aquatic piscivorous birds	0.006	0.003	0.036	0.017	0.45	0.90	0.024	0.078	<1	<1	**1.5**	<1	**2.1**	**2.1**
Mallard duck (*Anas platyrhynchos*)	Semi-aquatic invertivorous/ omnivorous birds	0.022	0.003	0.003	0.001	0.45	0.90	0.024	0.078	<1	<1	<1	<1	**7.8**	**2.0**
Carolina wren (*Thryothorus ludovicianus*)	Terrestrial invertivorous songbirds	0.024	0.009	0.035	0.023	0.45	0.90	0.025	0.078	<1	<1	**1.4**	<1	**2.5**	**1.6**
Tree swallow (*Tachycineta bicolor*)	Semi-aquatic aerial insectivorous birds	0.011	0.006	0.012	0.009	0.45	0.90	0.025	0.078	<1	<1	<1	<1	**1.9**	**1.3**
Mammalian Receptors															
Little brown bat (*Myotis lucifugus*)	Aerial insectivorous mammals	0.009	0.005	0.009	0.007	1.01	NA	0.027	0.045	<1	NA	<1	<1	**1.9**	**1.3**
River otter (*Lontra canadensis*)	Piscivorous mammals	0.005	0.002	0.019	0.009	1.01	NA	0.053	0.090	<1	NA	<1	<1	**2.9**	**2.1**
Mink (*Mustela vison*)	Piscivorous mammals	0.005	0.002	0.013	0.008	1.01	NA	0.053	0.090	<1	NA	<1	<1	**3.3**	**1.6**

Notes:
DMIR - Estimated Daily Mercury Intake Rate
TRV - Toxicity Reference Value
HQ = Hazard Quotient
IHg - Inorganic Mercury
MeHg - Methylmercury
PLSA - Pompton Lakes Study Area
REF - Reference Area
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
HQ_{NOAEL} = Corresponding DMIR/NOAEL
HQ_{LOAEL} = Corresponding DMIR/LOAEL
NA - Not Applicable
a, LOAEL for Carolina wren and tree swallow represents the upper bound NOAEL of 0.078 mg/kg BW/day
b, Bold values indicate hazard quotient exceeding 1.0

$$DMIR = CF \times \frac{1}{BW} \times \left(FIR \times \sum_{j=1}^{N}\left(f_j \times C_j\right) + SIR \times C_{SED} + WIR \times C_{SW}\right) \times AUF$$

$DMIR$ = Estimated Daily Mercury Intake Rate (mg Hg or MeHg/kg BW/day)
CF = Conversion factor (= 0.001 for ng Hg/g BW/day to mg Hg/kg BW/day conversion)
BW = Body Weight (g)
FIR = Food Ingestion Rate (g ww/day)
f_j = Dietary Preference for Diet Item j (fraction)
C_j = Concentration of IHg or MeHg in the Diet Item j (ng/g ww)
SIR = Incidental Sediment Ingestion Rate (g dw/day)
C_{SED} = Concentration of IHg or MeHg in the Sediment (ng/g dw)
WIR = Water Ingestion Rate (L/day)
C_{SW} = Concentration of IHg or MeHg in the Surface Water (ng/L)
AUF = Area Use Factor (= 1.0, assumed)

Table 7-5
Summary of Probabilistic Estimates of Dietary Methylmercury Exposures and Risk Characterization for Wildlife Receptors
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptors/Exposure Areas[a]	Exposure Estimates (mg/kg BW/day)			TRVs (mg/kg BW/day)		Risk Estimation					
	Point Estimates[c]	Probabilistic Estimates 95th Percentile				Point Estimates[e]		Probabilistic Estimates			
								p (DMIR >TRV)[f]		p (ADMIR >TRV)[g]	
		DMIR	ADMIR	NOAEL	LOAEL[d]	HQ_{NOAEL}	HQ_{LOAEL}	NOAEL	LOAEL	NOAEL	LOAEL
Great blue heron (*Ardea herodias*)											
PLSA	0.037	0.054	0.029	0.017	0.055	**2.2**	0.7	**< 80% (HQ = 3.2)**	< 5% (HQ = 1.0)	**100% (HQ = 1.7)**	0% (HQ = 0.5)
REF	0.017	0.025	0.016	0.017	0.055	1.0	0.3	**< 30% (HQ = 1.5)**	0% (HQ = 0.5)	0% (HQ = 0.9)	0% (HQ = 0.3)
AUF-Adjusted	--	0.026	0.017	0.017	0.055	--	--	**< 40% (HQ = 1.5)**	0% (HQ = 0.5)	< 1% (HQ = 1.0)	0% (HQ = 0.3)
Belted kingfisher (*Megaceryle alcyon*)[b]											
PLSA	0.037	0.056	0.033	0.017	0.055	**2.2**	0.7	**< 95% (HQ = 3.3)**	< 10% (HQ = 1.0)	**100% (HQ = 1.9)**	0% (HQ = 0.6)
REF	0.027	0.037	0.023	0.017	0.055	**1.6**	0.5	**< 80% (HQ = 2.2)**	0% (HQ = 0.7)	**100% (HQ = 1.4)**	0% (HQ = 0.4)
Double-crested cormorant (*Phalacrocorax auritus*)											
PLSA	0.036	0.055	0.028	0.024	0.078	**1.5**	0.5	**< 50% (HQ = 2.3)**	< 5% (HQ = 0.7)	**100% (HQ = 1.2)**	0% (HQ = 0.4)
REF	0.017	0.025	0.016	0.024	0.078	0.7	0.2	< 10% (HQ = 1.0)	0% (HQ = 0.3)	0% (HQ = 0.7)	0% (HQ = 0.2)
AUF-Adjusted	--	0.025	0.017	0.024	0.078	--	--	< 10% (HQ = 1.0)	0% (HQ = 0.3)	<1% (HQ = 0.7)	0% (HQ = 0.2)
Carolina wren (*Thryothorus ludovicianus*)[2]											
PLSA	0.035	0.036	0.021	0.025	0.078	**1.4**	0.5	**< 30% (HQ = 1.4)**	0% (HQ = 0.5)	0% (HQ = 0.8)	0% (HQ = 0.3)
REF	0.023	0.022	0.015	0.025	0.078	0.9	0.3	< 1% (HQ = 0.9)	0% (HQ = 0.3)	0% (HQ = 0.6)	0% (HQ = 0.2)

Notes:
PLSA - Pompton Lakes Study Area; REF - Reference Area; AUF - Area Use Factor; DMIR - Daily Mercury Intake Rate; ADMIR - Average Daily Mercury Intake Rate; TRVs - Toxicity Reference Values; NOAEL - No Observed Adverse Effects Level; LOAEL - Lowest Observed Adverse Effects Level; HQ - Hazard Quotient
a, Exposure estimates assumed that the receptor foraged exclusively within PLSA (PLSA), exclusively within the REF (REF), and within both PLSA and REF proportional to their areas relative to the receptor home ranges
b, AUF-Adjusted Exposures are not applicable for the Belted kingfisher and the Carolina wren as the PLSA provides sufficient home range (i.e., an AUF = 1).
c, Deterministic (Point) estimates of DMIR from Table 7-4.
d, LOAEL for Carolina wren represents the upper bound NOAEL of 0.078 mg/kg BW/day.
e, Deterministic estimates; HQ = Point Estimates of DMIR/TRVs.
f, Represents the probability that DMIR exceeds the respective TRVs; where p > 20%, the HQ (= 95th Percentile DMIR/TRV) is shown to indicate the severity of the exceedance. Bold values indicate hazard quotient exceeding
g, Represents the probability that ADMIR exceeds the respective TRVs; where p > 20%, the HQ (= 95th Percentile ADMIR/TRV) is shown to indicate the severity of the exceedance. Bold values indicate hazard quotient exceedi

Table 7-6
Percentage of Spiders as Dietary Components for Avian Species Observed in Pompton Lake and Reference Areas
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Common Name	Scientific Name	Percentage of Spiders in Diet
Orchard Oriole	*Icterus spurius*	12-14
Carolina Wren	***Thryothorus ludovicianus***	**11**
Red-bellied Woodpecker	*Melanerpes carolinus*	<7.5
Red-winged Blackbird	*Agelaius phoeniceus*	<7.5
Eastern Phoebe	*Sayornis phoebe*	<6
Tufted Titmouse	*Baeolophus bicolor*	<4.3
Downy Woodpecker	*Picoides pubescens*	<4
Baltimore Oriole	*Icterus galbula*	~4
Yellow Warbler	*Setophaga petechia*	6
Eastern Wood-Pewee	*Contopus virens*	5
Blue Jay	*Cyanocitta cristata*	5
Tree Swallow	*Tachycineta bicolor*	4
Warbling Vireo	*Vireo gilvus*	2
Northern Cardinal	*Cardinalis cardinalis*	1
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	<1
Chipping Sparrow	*Spizella passerina*	present
Great Crested Flycatcher	*Myiarchus crinitus*	present
Chimney Swift	*Chaetura pelagica*	present
Hairy Woodpecker	*Picoides villosus*	present
American Robin	*Turdus migratorius*	present
Common Yellowthroat	*Geothlypis trichas*	present
Spotted Sandpiper	*Actitis macularius*	present
White-breasted Nuthatch	*Sitta carolinensis*	present
Black-capped Chickadee	*Poecile atricapillus*	present
Common Grackle	*Quiscalus quiscula*	present
Gray Catbird	*Dumetella carolinensis*	present
European Starling	*Sturnus vulgaris*	present
Indigo Bunting	*Passerina cyanea*	present

Notes:
Bold cells indicate that dietary exposure was modeled in the Ecological Investigation.

Table 8-1
Uncertainty Analyses for Methylmercury Exposures and Risk Characterization for Wildlife Receptors
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptors/Exposure Areas[a]	ADMIR Range[c] (mg/kg BW/day)		Adjusted-ADMIR Range[d] (mg/kg BW/day)		TRVs (mg/kg BW/day)	
	Minimum	Maximum	Minimum	Maximum	NOAEL	LOAEL[e]
Great blue heron (*Ardea herodias*)						
PLSA	**0.024**	**0.032**	**0.031**	**0.041**	0.017	0.055
REF	0.014	0.017	**0.018**	**0.022**	0.017	0.055
AUF-Adjusted	*0.015*	*0.018*	**0.019**	**0.023**	0.017	0.055
Belted kingfisher (*Megaceryle alcyon*)[b]						
PLSA	**0.029**	**0.035**	**0.037**	**0.045**	0.017	0.055
REF	**0.020**	**0.024**	**0.026**	**0.031**	0.017	0.055
Double-crested cormorant (*Phalacrocorax auritus*)						
PLSA	*0.023*	*0.031*	**0.029**	**0.040**	0.024	0.078
REF	0.014	0.017	0.018	0.022	0.024	0.078
AUF-Adjusted	0.015	0.018	0.019	0.023	0.024	0.078
Carolina wren (*Thryothorus ludovicianus*)[2]						
PLSA	0.019	0.022	**0.025**	**0.029**	0.025	0.078
REF	0.014	0.016	0.018	0.021	0.025	0.078

Notes:

PLSA - Pompton Lakes Study Area; REF - Reference Area; AUF - Area Use Factor; ADMIR - Average Daily Mercury Intake Rate; TRVs - Toxicity Reference Values; NOAEL - No Observed Adverse Effects Level; LOAEL - Lowest Observed Adverse Effects Level; HQ - Hazard Quotient

a, Exposure estimates assumed that the receptor foraged exclusively within PLSA (PLSA), exclusively within the reference area (REF), and within both PLSA and REF proportional to their areas relative to the receptor home ranges (AUF-Adjusted).

b, AUF-Adjusted Exposures are not applicable for the belted kingfisher and the Carolina wren because the PLSA was assumed to provide sufficient home range (i.e., an AUF = 1).

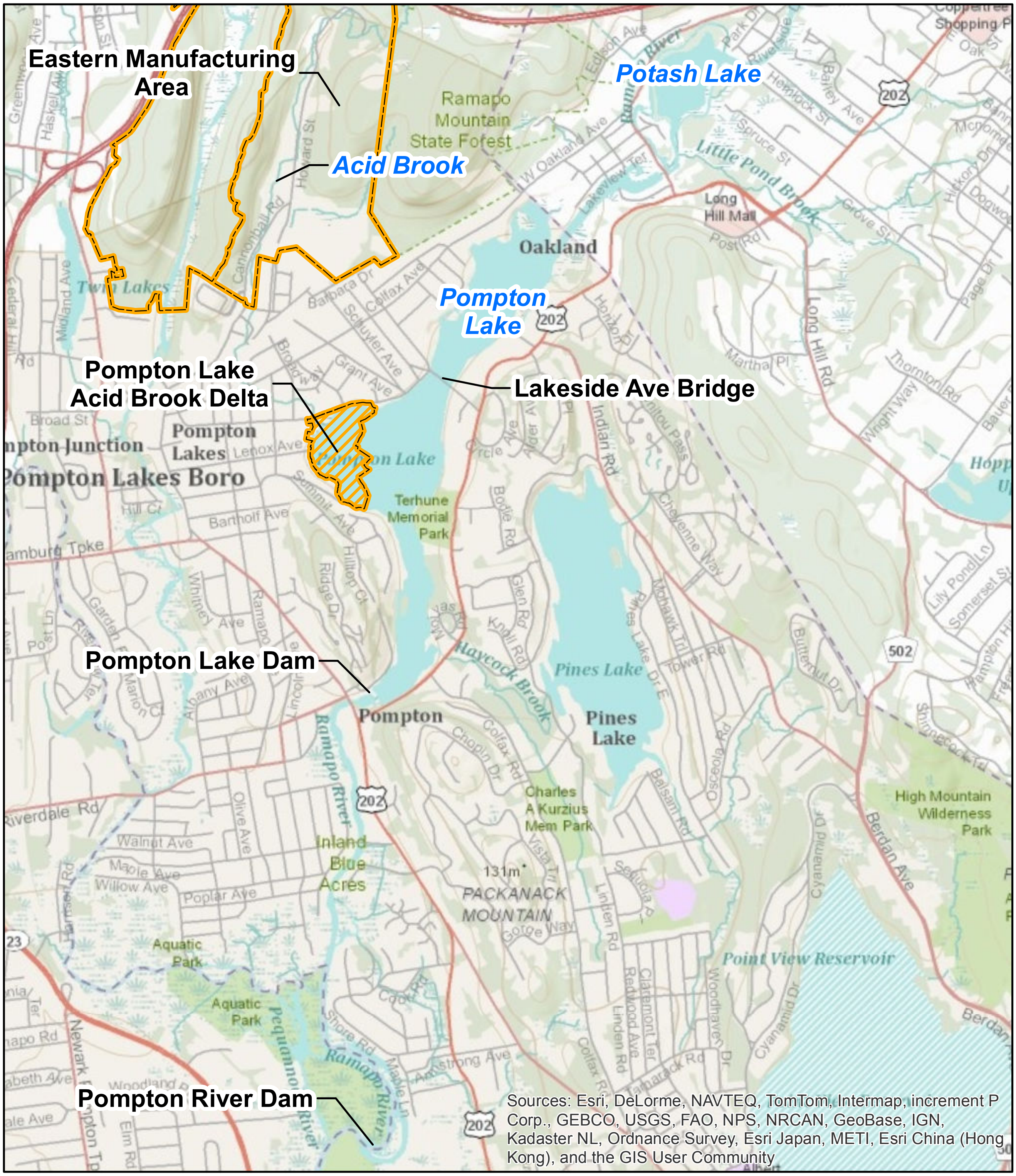
c, Estimated ranges (minimum and maximum) correspond to predicted values in the Monte Carlo simulations (See Appendix F)

d, Estimated ranges were conservatively adjusted upward by a factor of 1.32 for the Carolina wren and 1.28 for the rest of the birds to account for potential uncertainty of 32% and 28%, respectively, in the food ingestion rates estimated using allometric equations from Nagy (2001).

e, LOAEL for Carolina wren represents the upper bound NOAEL of 0.078 mg/kg BW/day.

Figures

N



Legend

- Site Boundary
- 2011 CMI WP Removal Limit

N

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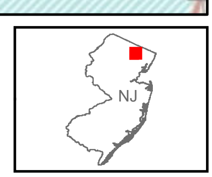

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Job: 18986427.00001

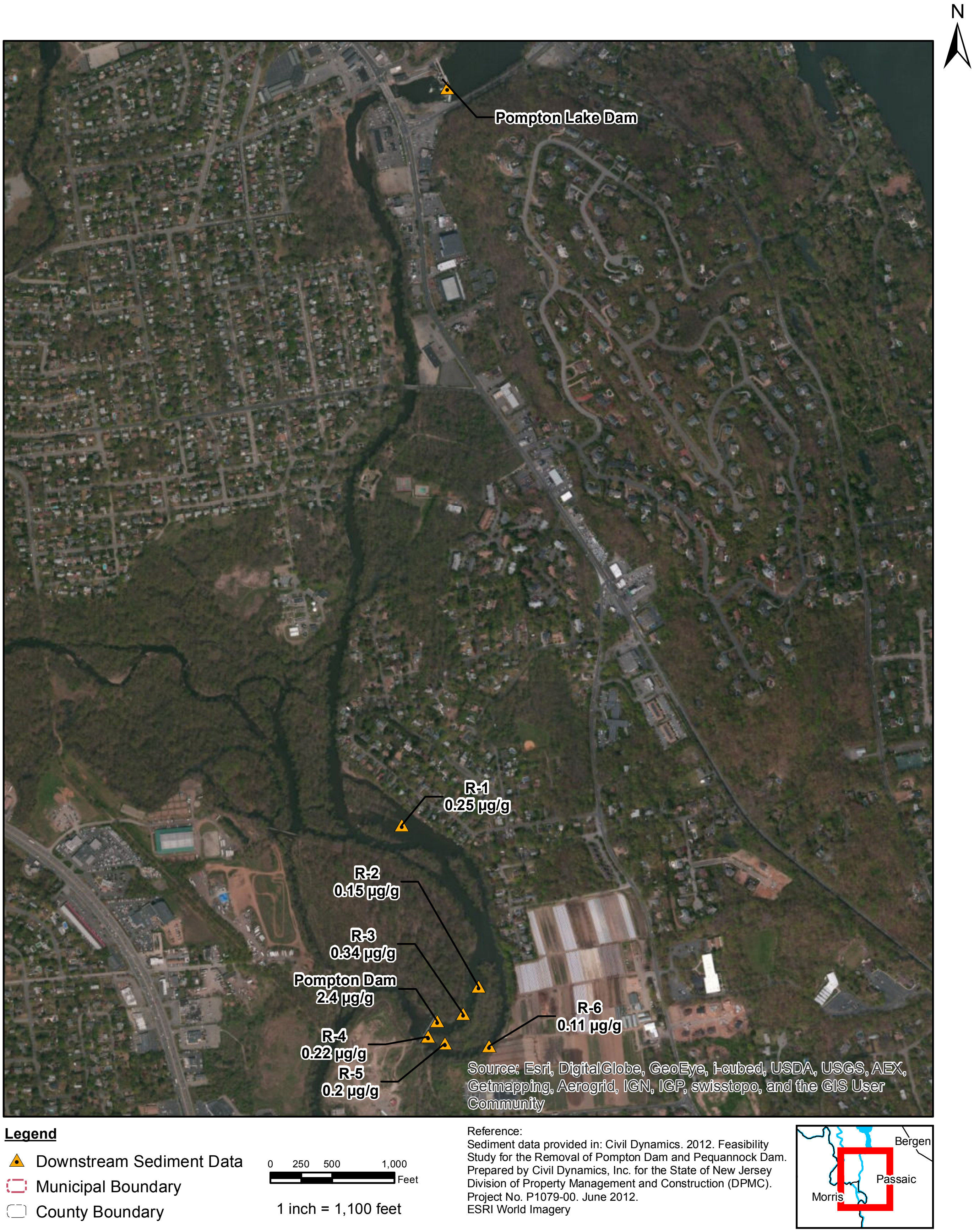
Prepared by: RRM III

Checked by: GL

Date: 2/4/2014

Figure 1-1
Site Location Map
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 1-1 Site Location Map.mxd



Reference:
Sediment data provided in: Civil Dynamics. 2012. Feasibility Study for the Removal of Pompton Dam and Pequannock Dam. Prepared by Civil Dynamics, Inc. for the State of New Jersey Division of Property Management and Construction (DPMC). Project No. P1079-00. June 2012.
ESRI World Imagery

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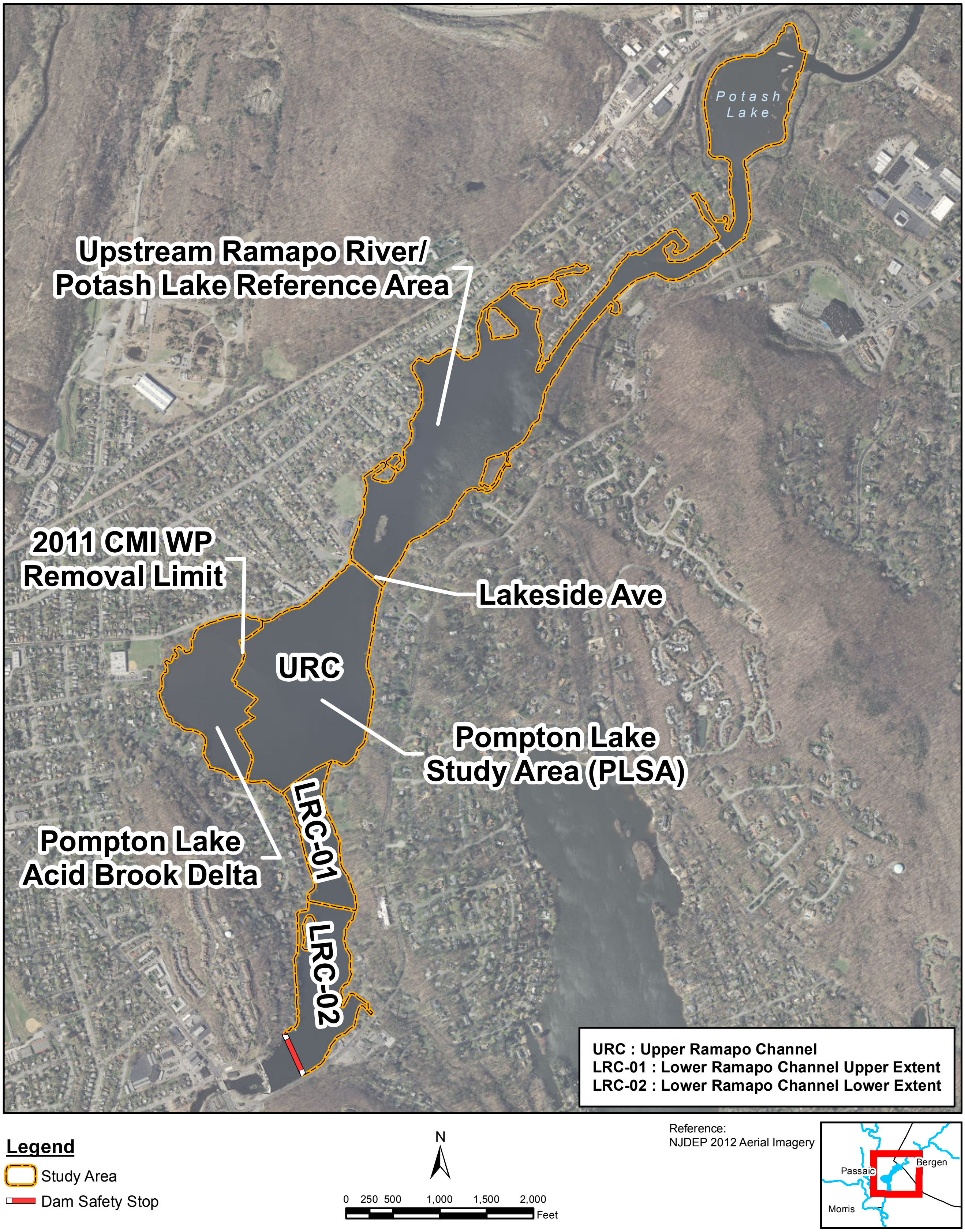
Job: 18986427.00001	Figure 2-1 Total Mercury Concentrations in Surface Sediment in the Ramapo River Downstream of the Pompton Lake Dam 2013 Pompton Lake Ecological Investigation Report DuPont Pompton Lakes Works Pompton Lakes, New Jersey
Prepared by: RRM III	
Checked by: GRL	
Date: 3/11/2014	

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 2-1 Downstream Sediment Data Ramapo.mxd



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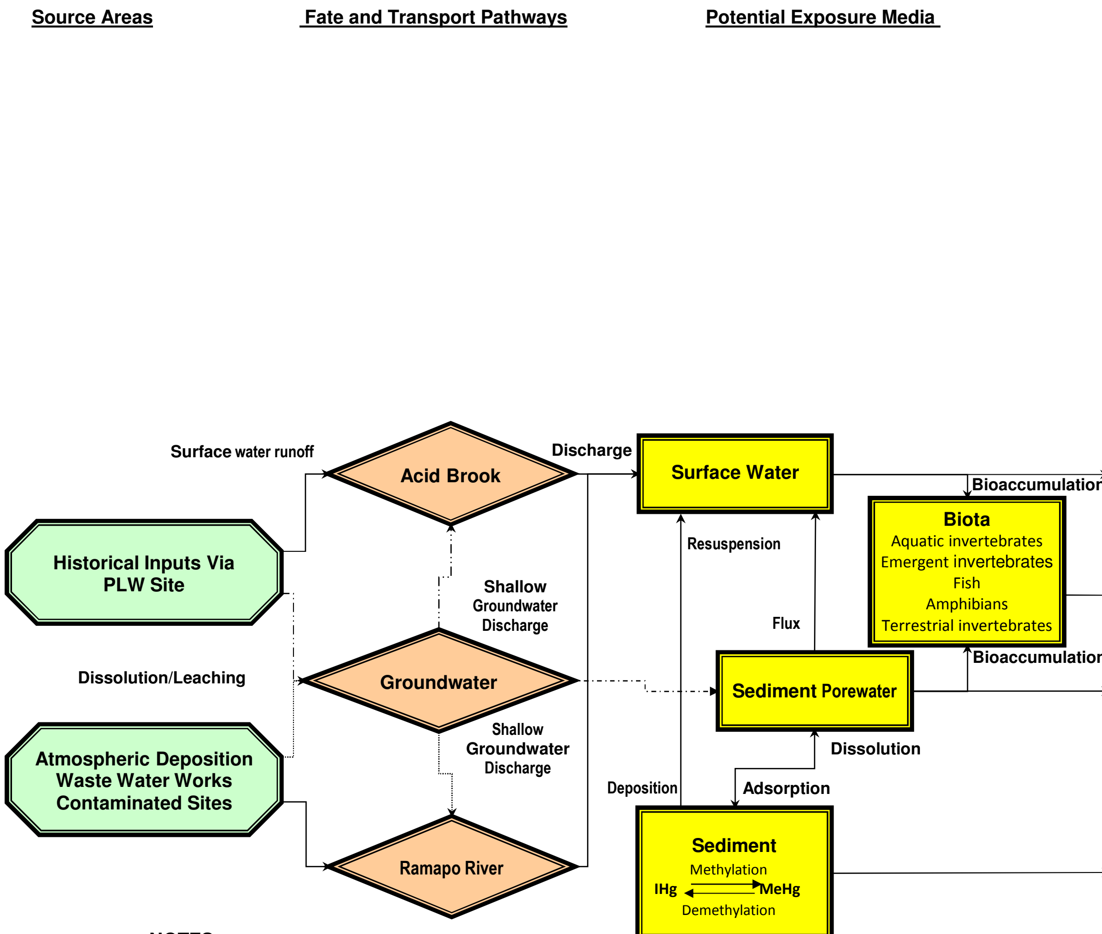
Job: 18986427.00001	Figure 2-2 Study Area Map 2013 Pompton Lake Ecological Investigation Report DuPont Pompton Lakes Works Pompton Lakes, New Jersey
Prepared by: RRM III	
Checked by: GL	
Date: 3/11/2014	

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 2-2 Study Area Map.mxd

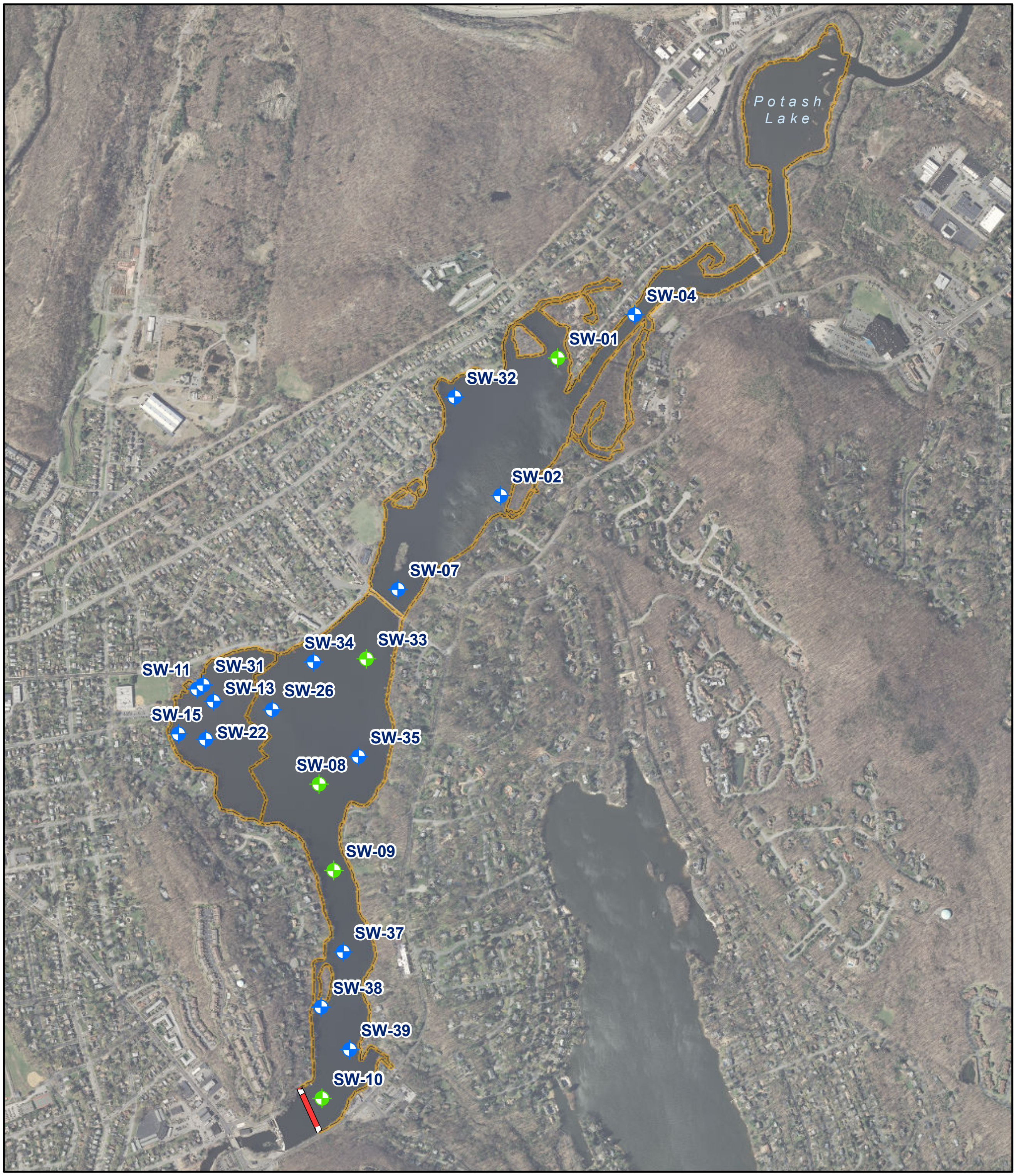
Figure 3-1
Ecological Conceptual Site Model - Pompton Lake Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Potential Exposure Routes / **Ecological Receptor Categories**

Exposure Media	Potential Exposure Routes	Benthic Invertebrates	Fish	Amphibians	Reptiles	Piscivorous birds	Inverti-/omnivorous birds	Aerial insectivorous birds	Invertivorous songbirds	Aerial insectivorous mammals	Piscivorous mammals
Surface Water	Direct Contact/Absorption	●	●	●	❍	--	--	--		--	
Surface Water	Direct Ingestion	--	--	--	--	●	●	●	●	●	●
Surface Water	Incidental Ingestion	--	--	--	--	--	--			--	
Biota	Direct Ingestion	●	●	●	❍	●	●	●	●	●	●
Sediment Porewater	Direct Contact/Absorption	●	●	●	❍	--	--				
Sediment Porewater	Direct Ingestion										
Sediment Porewater	Incidental Ingestion	●	●	●	❍	--	--				
Sediment	Direct Contact/Absorption	●	●	●	❍	--	--				
Sediment	Direct Ingestion										
Sediment	Incidental Ingestion	●	●	●	❍	◐	●		●		●

NOTES:
→ CONTAMINANT MIGRATION PATHWAY
-·-·→ INSIGNIFICANT CONTAMINANT MIGRATION PATHWAY
·····→ UNDEFINED POTENTIAL CONTAMINANT MIGRATION PATHWAY
● COMPLETE PRIMARY EXPOSURE PATHWAY - EVALUATED QUANTITATIVELY
❍ COMPLETE EXPOSURE PATHWAY EVALUATED QUALITATIVELY
-- EXPOSURE PATHWAY IS INSIGNIFICANT
BLANK = INCOMPLETE EXPOSURE PATHWAY



Legend

Near Surface Water Sample

Near Surface and Near Bottom Surface Water Samples

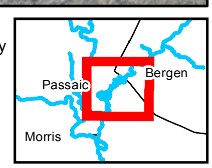
Dam Safety Stop

Study Area

N

0 250 500 1,000 1,500 2,000 Feet

Reference:
NJDEP 2012 Aerial Imagery



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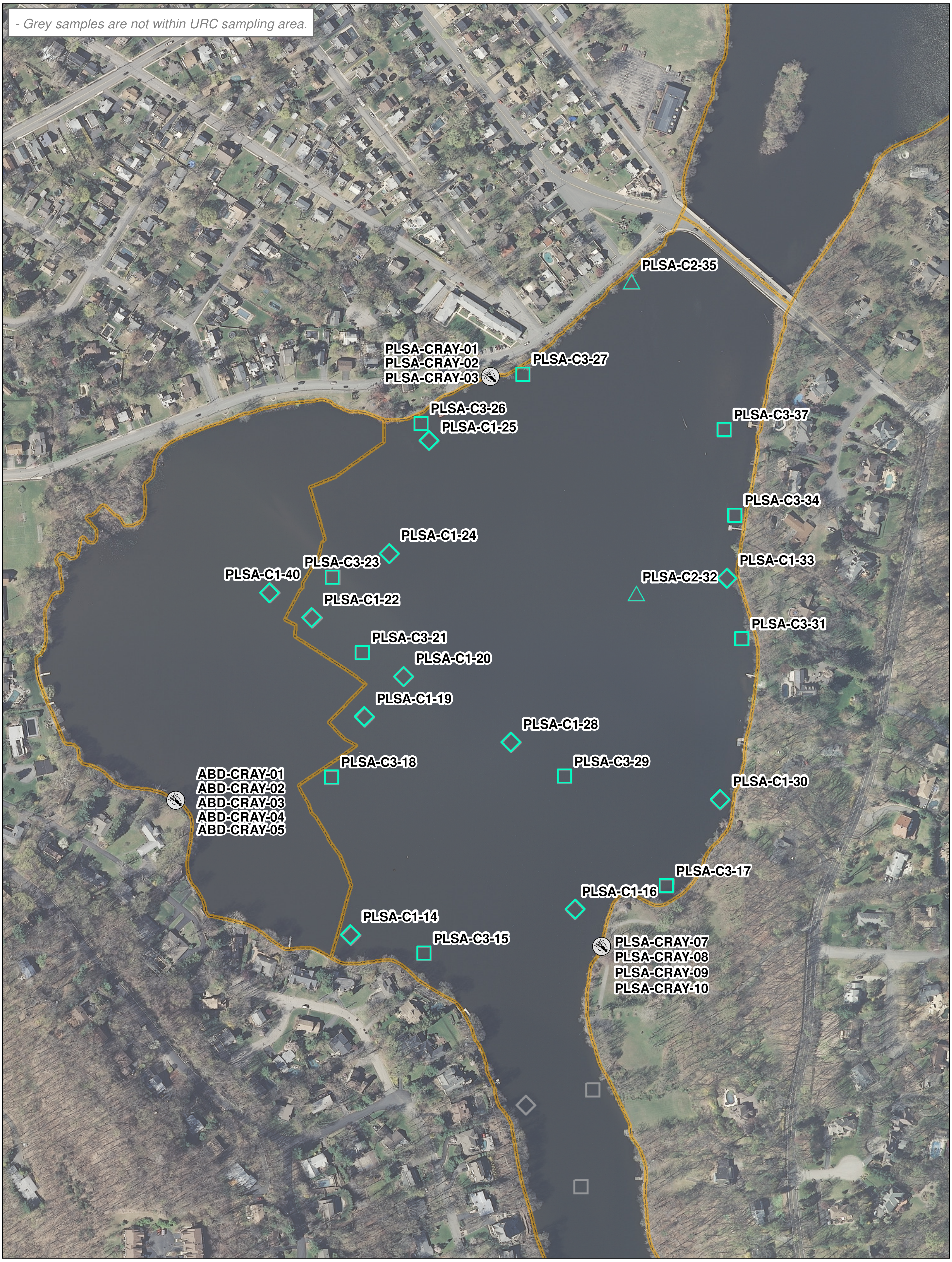
Prepared by: RRM III

Checked by: GL

Date: 3/11/2014

Figure 4-1
Surface Water Sampling Stations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 4-1 Surface Water Sampling Stations.mxd



Legend

- ◇ Category 1
- △ Category 2
- □ Category 3
- Crayfish
- Study Area

Lines of Evidence	Station Category		
	1 (◇)	2 (△)	3 (□)
Benthic community analyses	●		
Sediment toxicity testing	●		
Bulk sediment analyses[1]	●[2]	●[3]	●[3]
Pore water analyses – THg and MeHg	●	●	●
Aquatic/emergent invertebrate tissue analyses	●	●	

Note:
1. Bulk sediment analyses included analyses of grain size distribution and total organic carbon
2. Bulk sediment analytical suite included analyses of THg/MeHg, metals, acid volatile sulfides (AVS), simultaneously extractable metals (SEM), pesticides/herbicides, and semi-volatile organic compounds (SVOCs)
3. Bulk sediment analytical suite included only analyses of THg and MeHg

N

0 125 250 500 Feet

Reference:
NJDEP 2012 Aerial Imagery

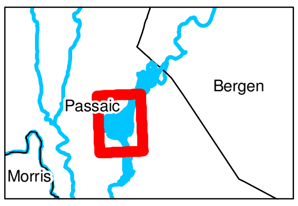


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Figure 4-2a
Sediment/Pore Water Characterization and Invertebrate Tissue Sampling Stations - PLSA URC
2013 Pompton Lake Ecological Investigation Report
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Pompton Lakes, New Jersey

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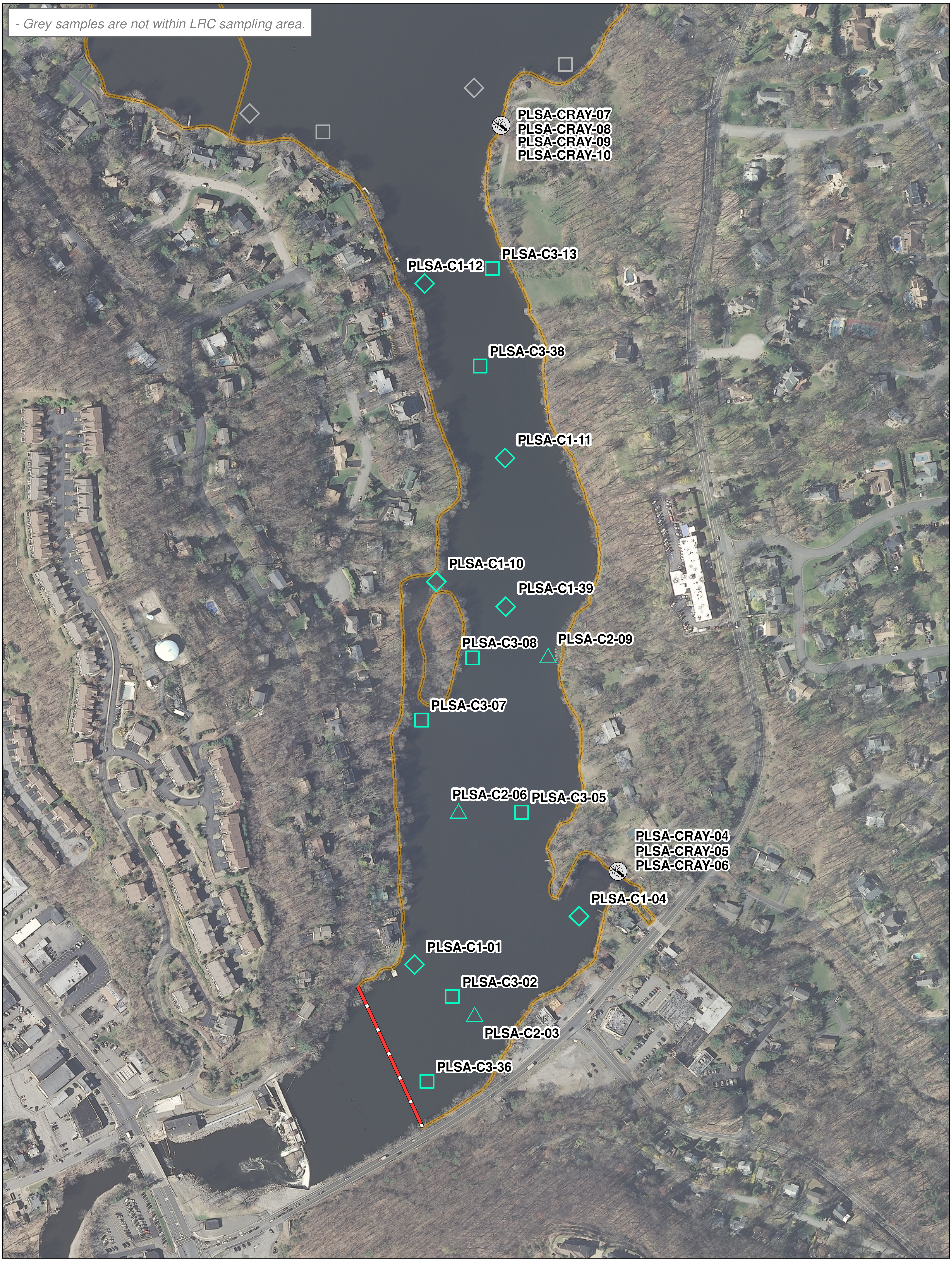

Legend

Category 1 — Crayfish
Category 2 — Dam Safety Stop
Category 3 — Study Area

Lines of Evidence	Station Category 1 (◇)	Station Category 2 (△)	Station Category 3 (□)
Benthic community analyses	●		
Sediment toxicity testing	●		
Bulk sediment analyses[1]	●[2]	●[3]	●[3]
Pore water analyses – THg and MeHg	●	●	●
Aquatic/emergent invertebrate tissue analyses	●	●	

Note:
1. Bulk sediment analyses included analyses of grain size distribution and total organic carbon
2. Bulk sediment analytical suite included analyses of THg/MeHg, metals, acid volatile sulfides (AVS), simultaneously extractable metals (SEM), pesticides/herbicides, and semi-volatile organic compounds (SVOCs)
3. Bulk sediment analytical suite included only analyses of THg and MeHg

N

0 125 250 500 Feet

Reference:
NJDEP 2012 Aerial Imagery

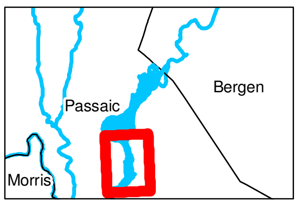

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Figure 4-2b
Sediment/Pore Water Characterization
and Invertebrate Tissue Sampling Stations - PLSA LRC
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Pompton Lakes, New Jersey

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Legend

- Category 1
- Category 2
- Category 3
- Crayfish
- Study Area

Lines of Evidence	Station Category		
	1 (◇)	2 (△)	3 (□)
Benthic community analyses	●		
Sediment toxicity testing	●		
Bulk sediment analyses[1]	●[2]	●[3]	●[3]
Pore water analyses – THg and MeHg	●	●	●
Aquatic/emergent invertebrate tissue analyses	●	●	

Note:
1. Bulk sediment analyses included analyses of grain size distribution and total organic carbon
2. Bulk sediment analytical suite included analyses of THg/MeHg, metals, acid volatile sulfides (AVS), simultaneously extractable metals (SEM), pesticides/herbicides, and semi-volatile organic compounds (SVOCs)
3. Bulk sediment analytical suite included only analyses of THg and MeHg

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

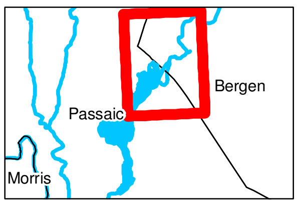

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Figure 4-2c
Sediment/Pore Water Characterization
and Invertebrate Tissue Sampling Stations - Reference Areas
2013 Pompton Lake Ecological Investigation Report
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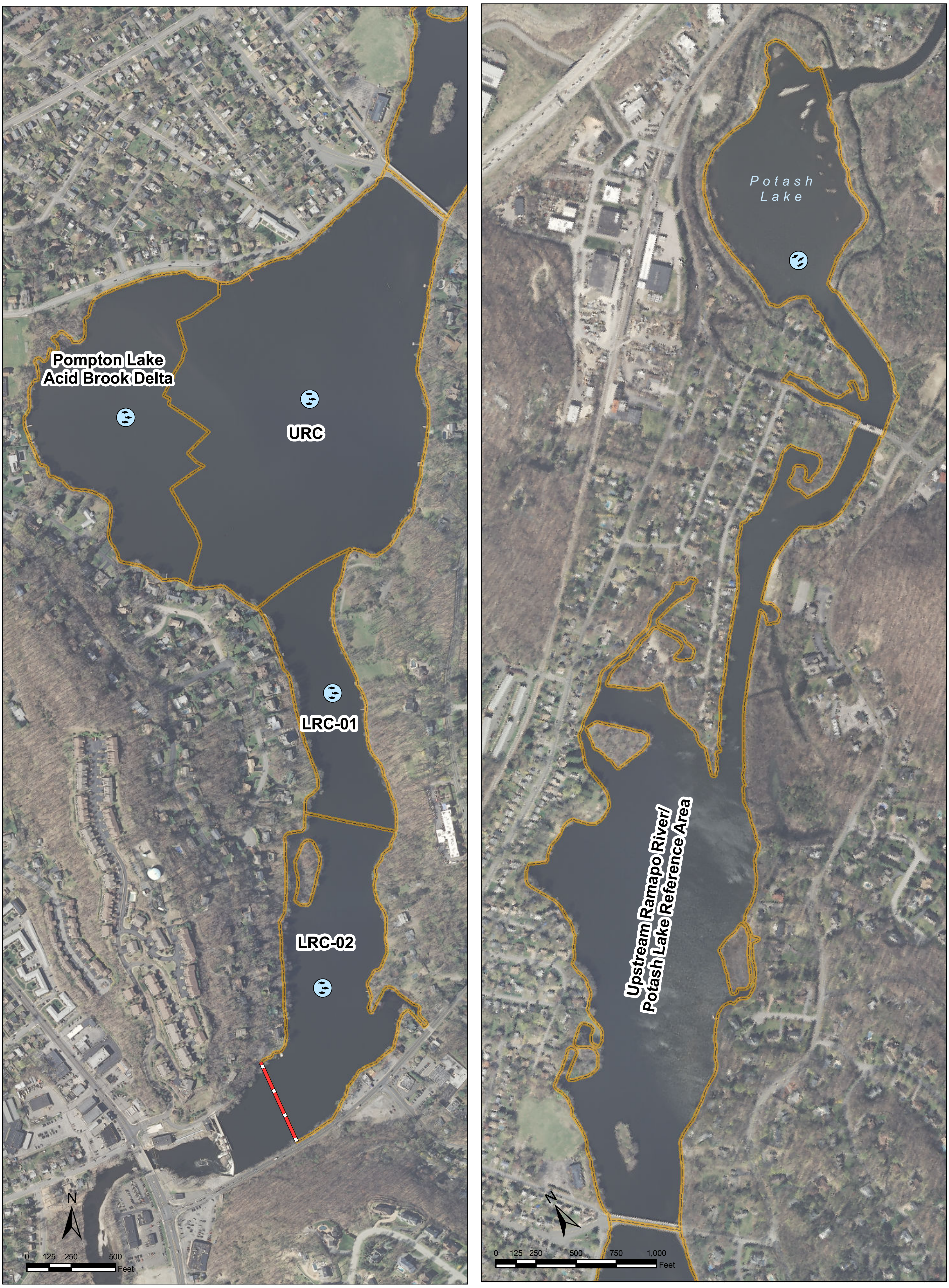
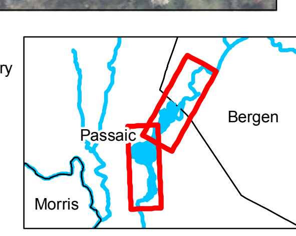


Reference:
NJDEP 2012 Aerial Imagery



Legend

- Fish Sampling Extents
- Dam Safety Stop
- Study Area

URC : Upper Ramapo Channel
LRC-01 : Lower Ramapo Channel Upper Extent
LRC-02 : Lower Ramapo Channel Lower Extent

URS 335 Commerce Drive, Suite 300 Fort Washington, PA 19034 Phone: (215) 367-2500 Fax: (215) 367-1000	Job: 18986427.00001 Prepared by: RRM III Checked by: GL Date: 3/11/2014	Figure 4-3 Fish Tissue Sampling Extents 2013 Pompton Lake Ecological Investigation Report DuPont Pompton Lakes Works Pompton Lakes, New Jersey

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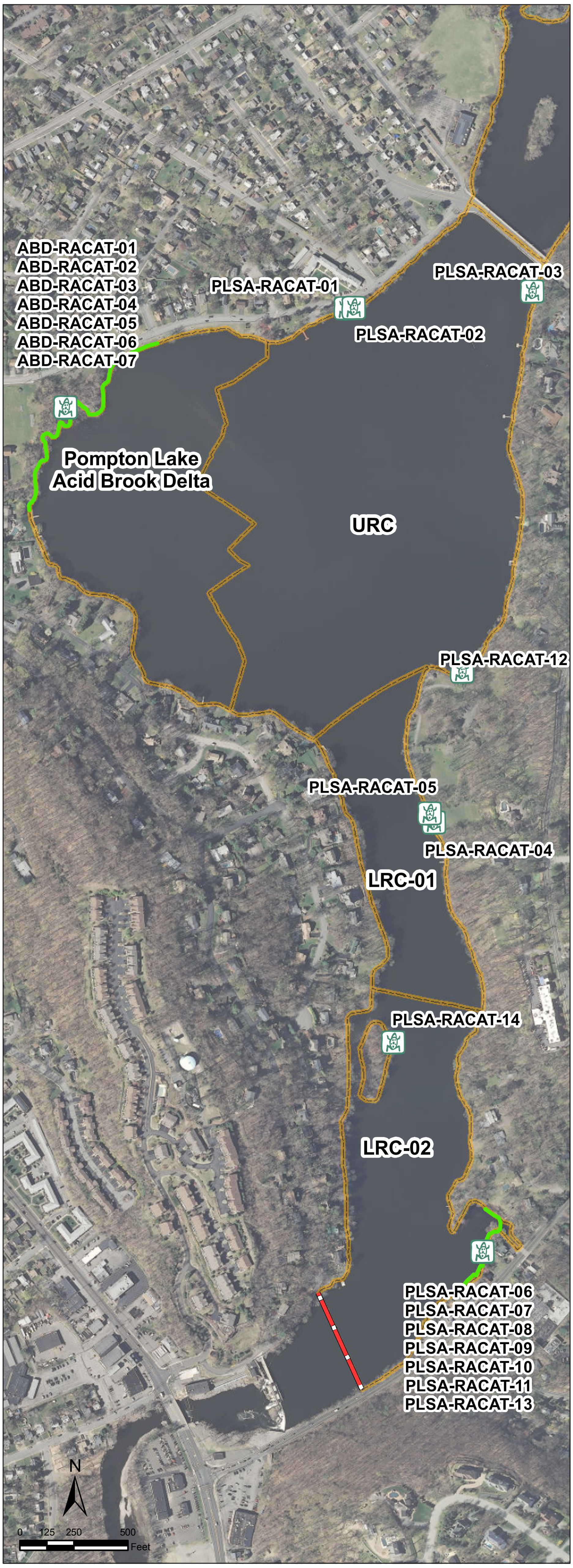

Legend

- American Bullfrog Location
- American Bullfrog Sampling Extent
- Dam Safety Stop
- Study Area

Reference:
NJDEP 2012 Aerial Imagery

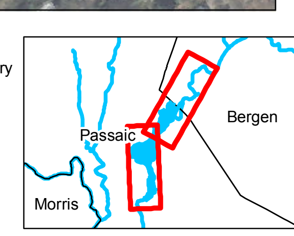

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Figure 4-4
Amphibian Tissue Sampling Stations
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Pompton Lakes, New Jersey

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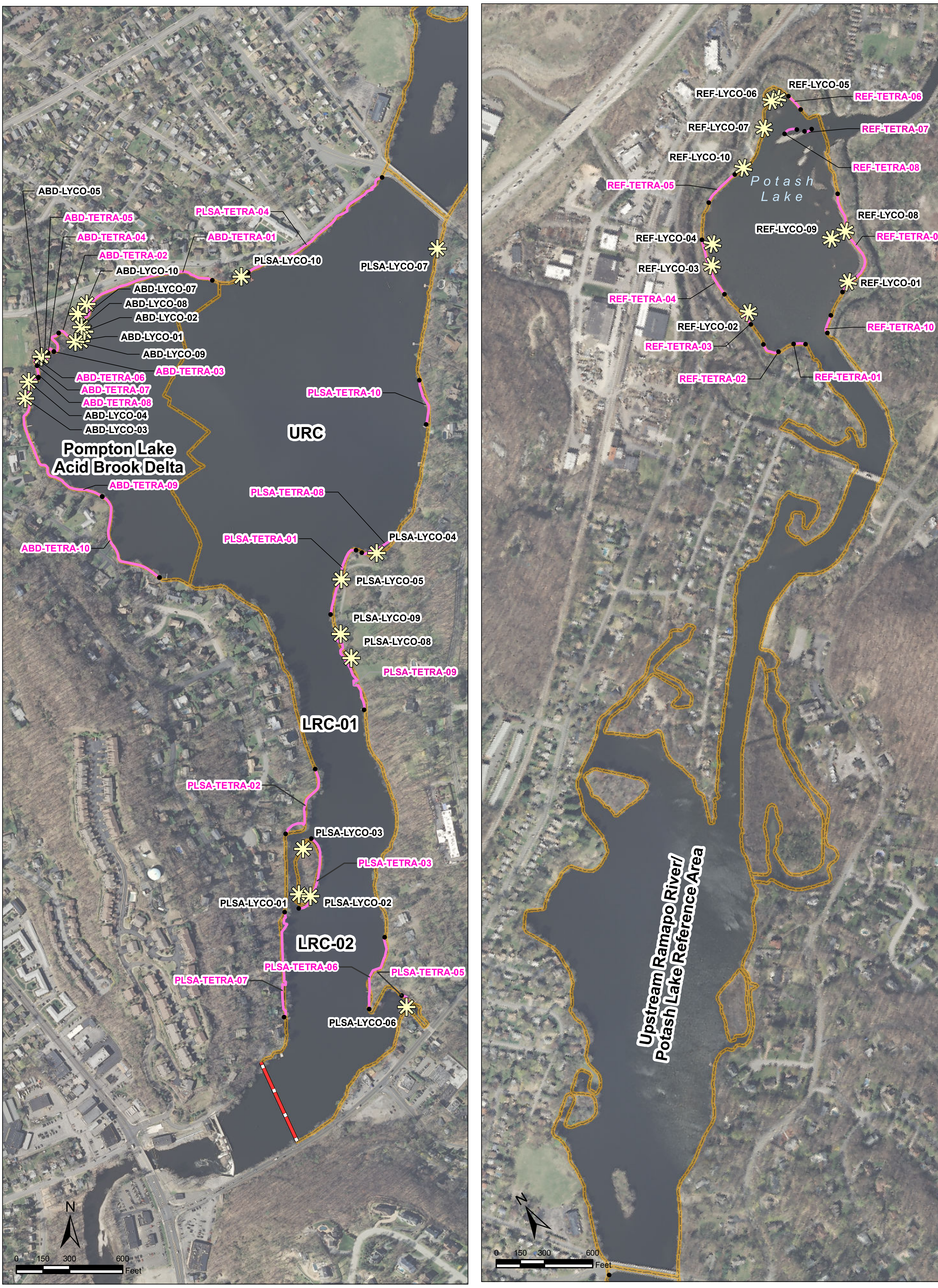

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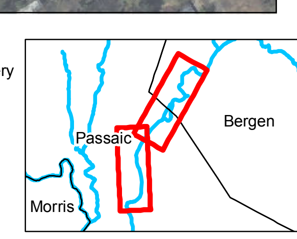

Legend

- Lycosid Spider Trap Location
- Tetragnathid Spider Sampling Extent
- Dam Safety Stop
- Study Area

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Figure 4-5
Spider Tissue Sampling Stations
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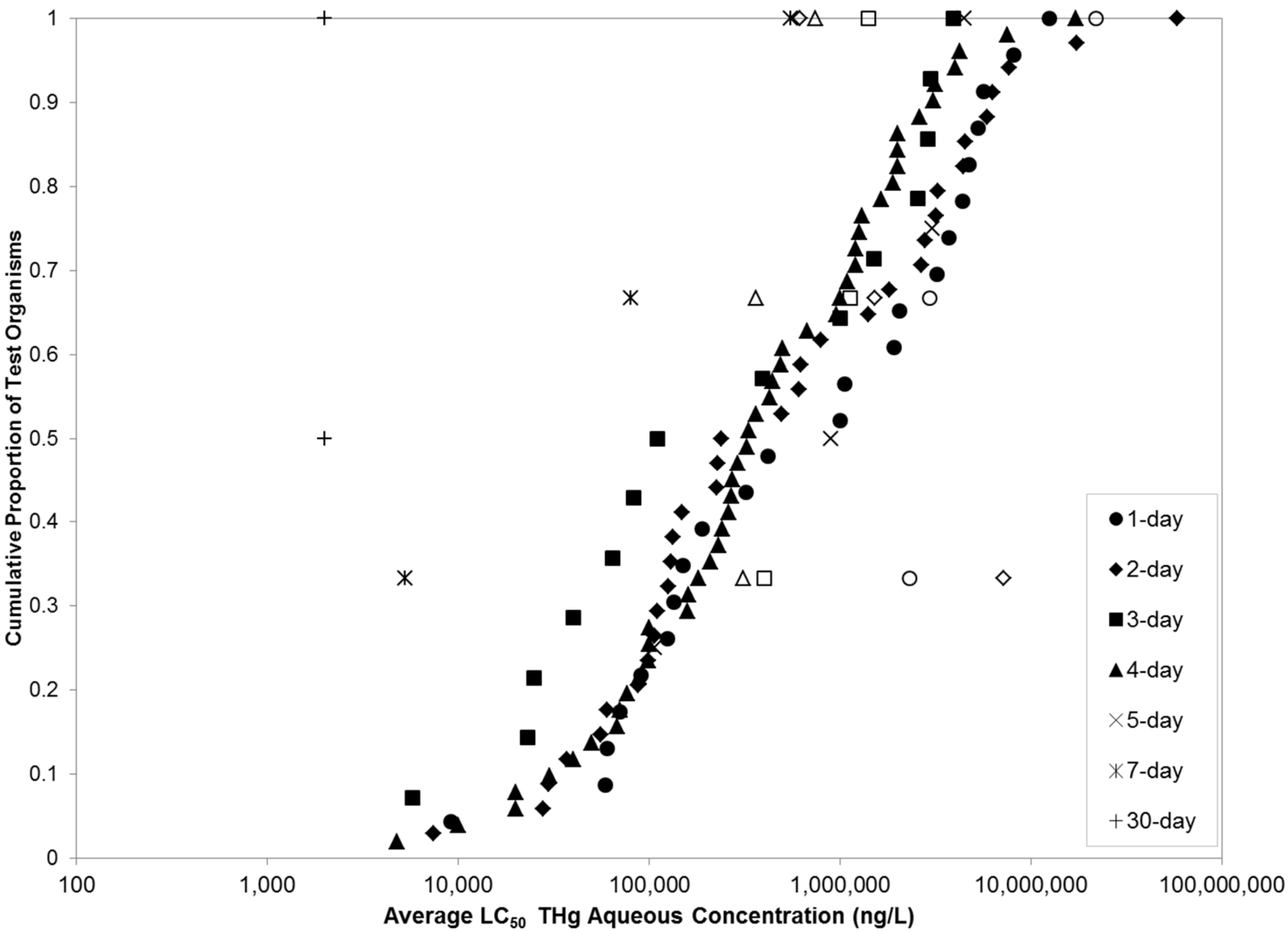
S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 4-5 Spider Tissue Sampling Stations.mxd

Figure 5-1
Cumulative Frequency Distribution of Median Lethal Concentrations (LC_{50}) for Aqueous THg Averaged by Benthic Macroinvertebrate Test Species
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the cumulative frequencies of median lethal concentrations (LC_{50}) averaged by test species for various durations of exposure (in days) to aqueous concentrations of total mercury (THg). Open symbols indicate aqueous concentration was based on filtered results and closed symbols indicate aqueous concentration was based on unfiltered results; concentrations representing exposures of 5 days or more were based on unfiltered sample results. Data were obtained from the EPA ECOTOX (ECOTOXicology) database. Test organisms associated with benthic environments were preferentially selected for inclusion in the cumulative frequency distribution plot.

Figure 5-2
Relative Growth of Benthic Test Organisms Exposed to Total Mercury in Aqueous Media
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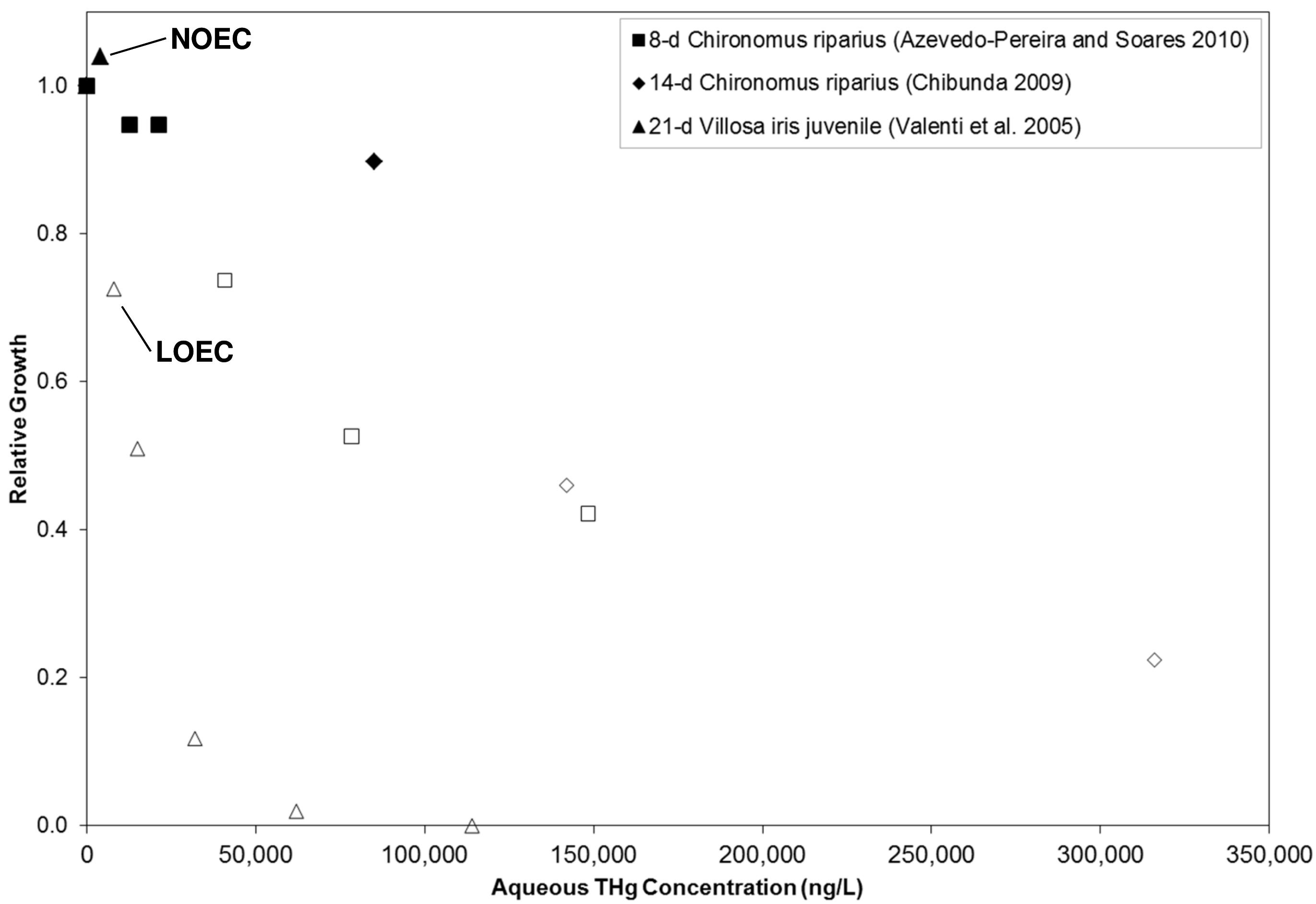

<u>Notes</u>: Data shown are the relative growth of benthic macroinvertebrate test organisms exposed to aqueous total mercury concentrations (THg). Relative growth was calculated as the ratio of the growth endpoint in the study treatment (e.g., total body length, dry weight) to the growth endpoint in the study control. Open symbols represent growth endpoints that were statistically different than control treatments ($p < 0.05$), as reported in each respective study. The minimum bounded no observed effect concentration (NOEC) was identified as 4,000 ng/L from the 21-day exposure of juvenile *Villosa iris* (Valenti et al., 2005); the lowest observed effect concentration (LOEC) of 8,000 ng THg/L was identified as the lowest concentration in Valenti et al. (2005) at which a statistically significant reduction in growth was reported. Relative growth calculations for endpoints reported by Azevedo-Pereira and Soares (2010) were estimated from Figure 2 presented in the study; the raw data recorded for these growth endpoints were requested from the authors, but were not received as of the date of this report.

Figure 5-3
Total and Methylmercury Concentrations in Toxicity Test Day 7 and Field Pore Water Samples
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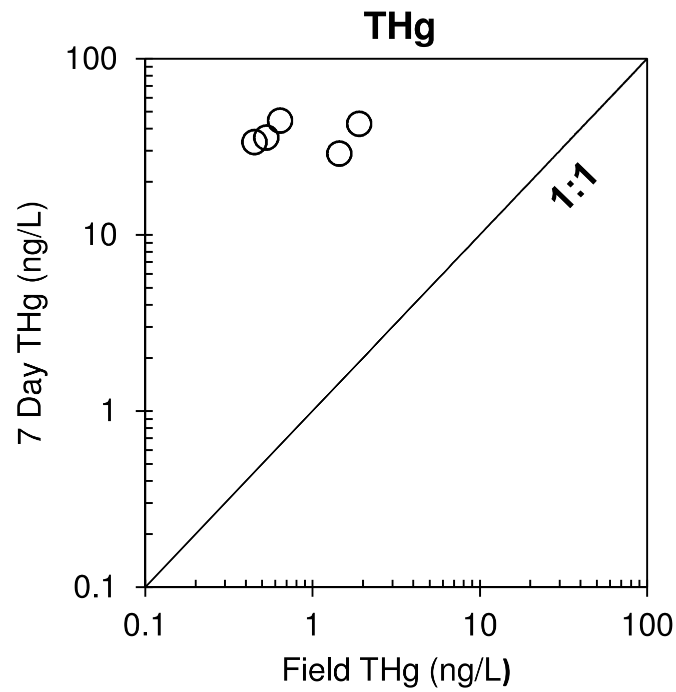

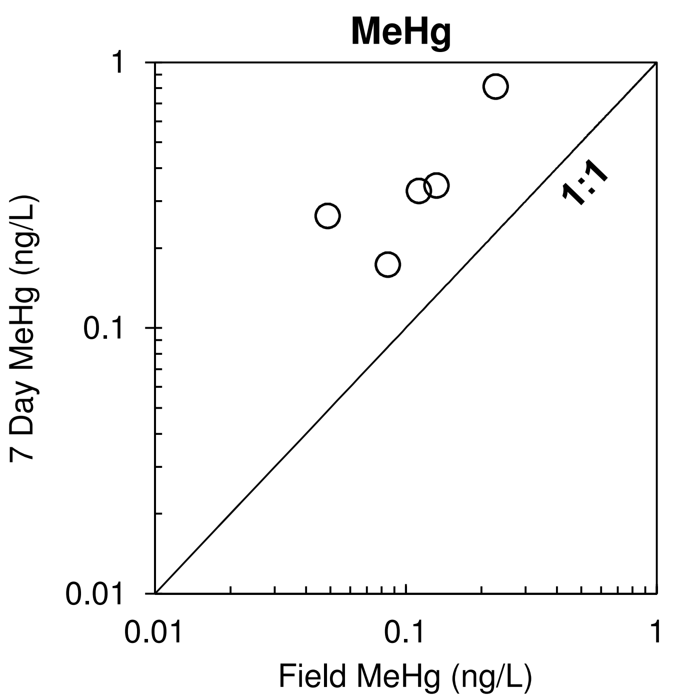

Notes: Data shown are a comparison of THg and MeHg concentrations measured in pore water samples collected from surrogate test chambers on Day 7 of the sediment toxicity test and pore water samples extracted from bulk sediment samples collected in the field. The line represents a 1:1 relationship between Day 7 toxicity test pore water concentrations and field pore water concentrations.

Figure 5-4
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Sediment THg Concentrations
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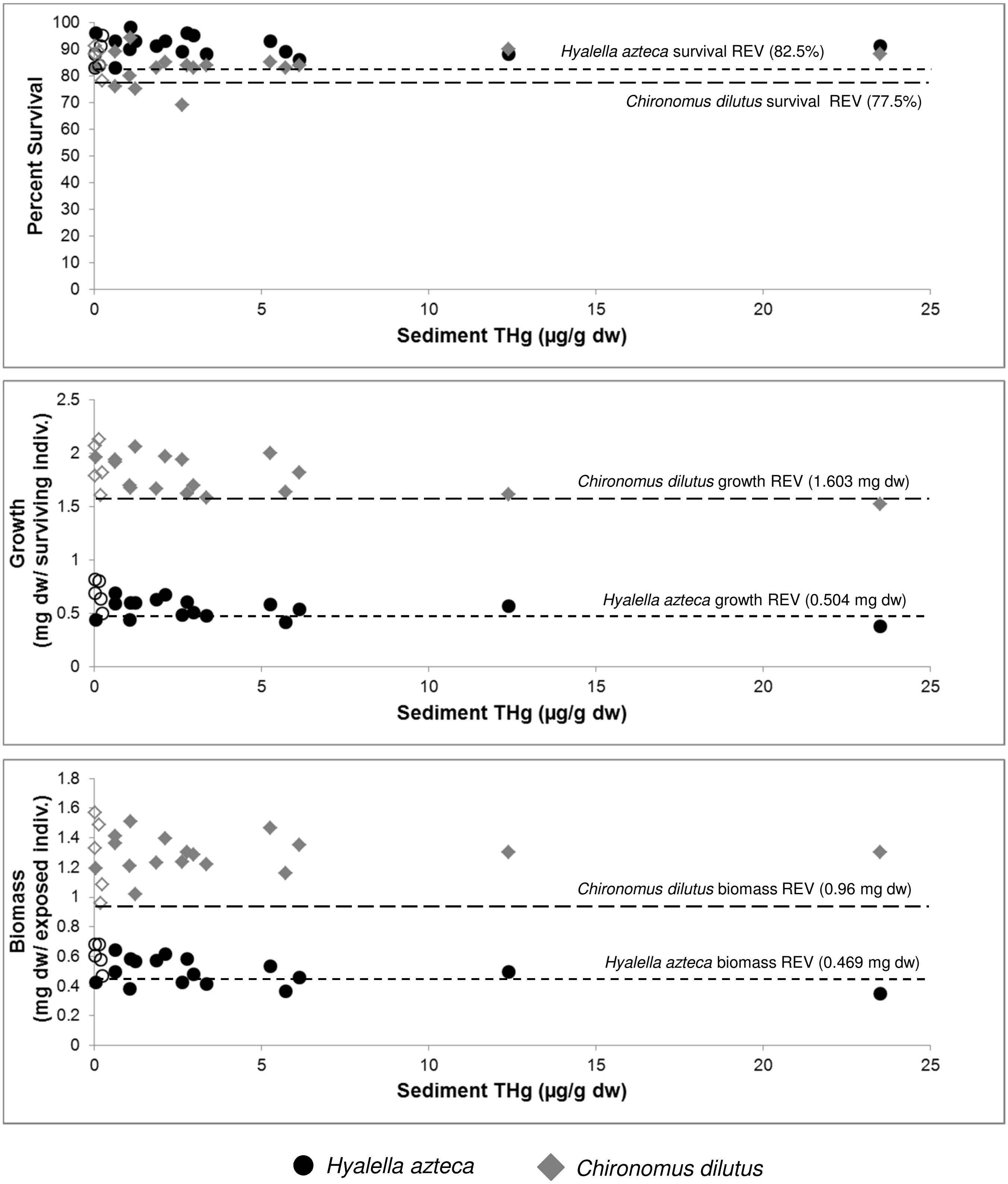

Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure 5-5
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Sediment MeHg Concentrations
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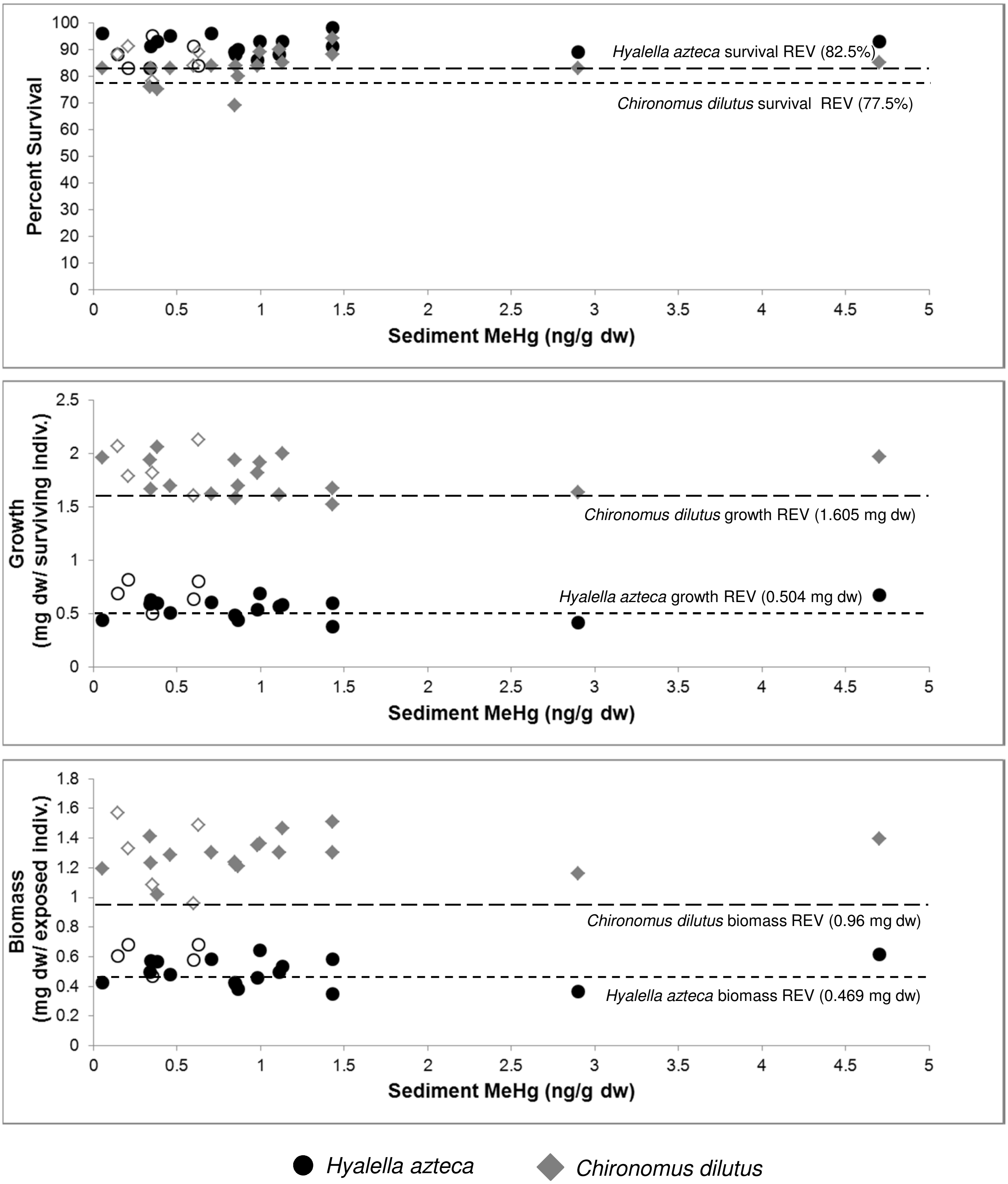
Pompton Lakes, New Jersey



Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure 5-6
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Pore Water MeHg Concentrations
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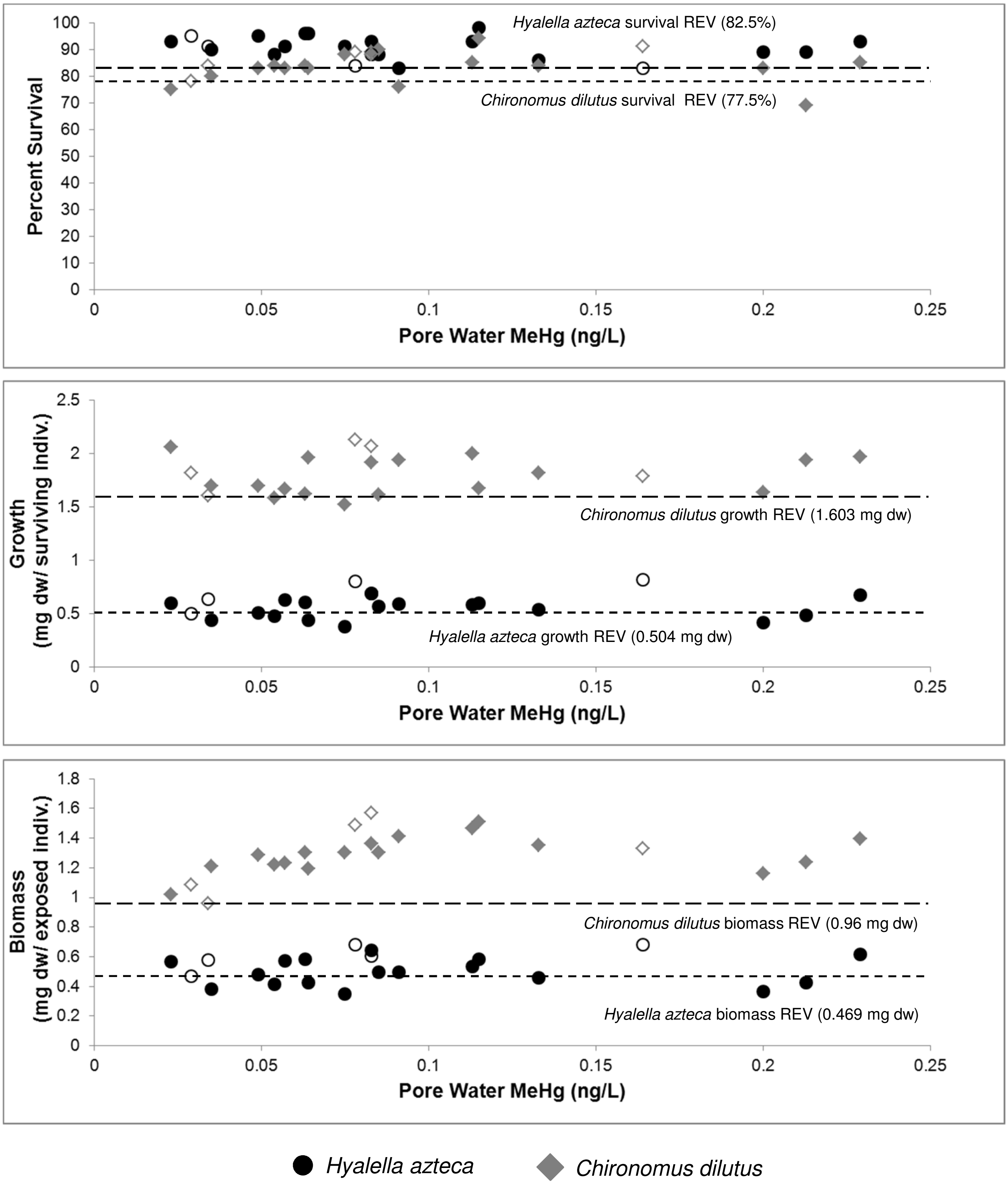
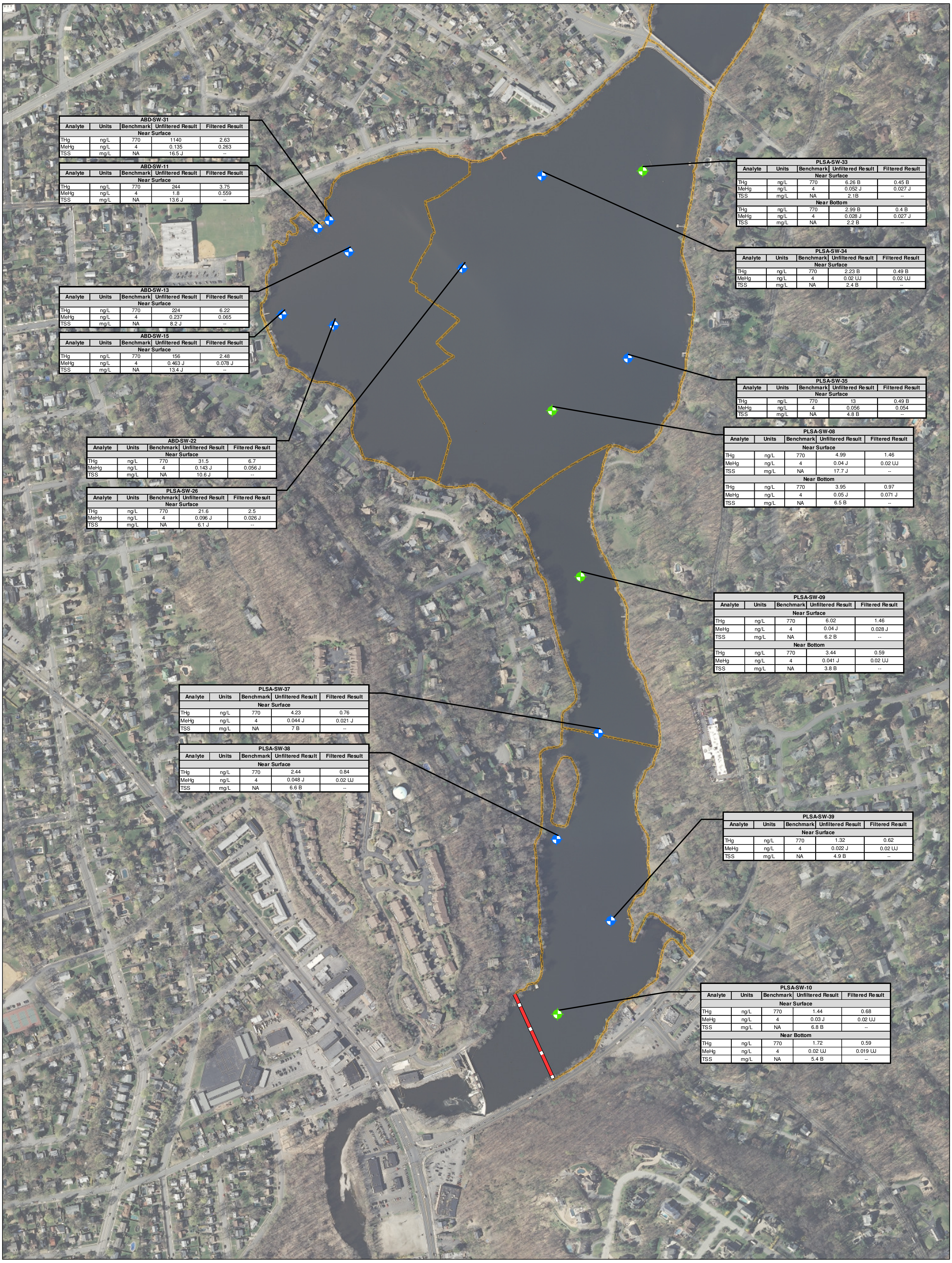
Pompton Lakes, New Jersey



Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.



ABD-SW-31

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	1140	2.63
MeHg	ng/L	4	0.135	0.263
TSS	mg/L	NA	16.5 J	--

ABD-SW-11

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	244	3.75
MeHg	ng/L	4	1.8	0.559
TSS	mg/L	NA	13.6 J	--

ABD-SW-13

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	224	6.22
MeHg	ng/L	4	0.237	0.065
TSS	mg/L	NA	8.2 J	--

ABD-SW-15

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	156	2.48
MeHg	ng/L	4	0.463 J	0.078 J
TSS	mg/L	NA	13.4 J	--

ABD-SW-22

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	31.5	6.7
MeHg	ng/L	4	0.143 J	0.056 J
TSS	mg/L	NA	10.6 J	--

PLSA-SW-26

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	21.6	2.5
MeHg	ng/L	4	0.096 J	0.026 J
TSS	mg/L	NA	6.1 J	--

PLSA-SW-33

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	6.26 B	0.45 B
MeHg	ng/L	4	0.052 J	0.027 J
TSS	mg/L	NA	2.1B	--
Near Bottom				
THg	ng/L	770	2.99 B	0.4 B
MeHg	ng/L	4	0.028 J	0.027 J
TSS	mg/L	NA	2.2 B	--

PLSA-SW-34

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	2.23 B	0.49 B
MeHg	ng/L	4	0.02 UJ	0.02 UJ
TSS	mg/L	NA	2.4 B	--

PLSA-SW-35

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	13	0.49 B
MeHg	ng/L	4	0.056	0.054
TSS	mg/L	NA	4.8 B	--

PLSA-SW-08

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	4.99	1.46
MeHg	ng/L	4	0.04 J	0.02 UJ
TSS	mg/L	NA	17.7 J	--
Near Bottom				
THg	ng/L	770	3.95	0.97
MeHg	ng/L	4	0.05 J	0.071 J
TSS	mg/L	NA	6.5 B	--

PLSA-SW-09

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	6.02	1.46
MeHg	ng/L	4	0.04 J	0.028 J
TSS	mg/L	NA	6.2 B	--
Near Bottom				
THg	ng/L	770	3.44	0.59
MeHg	ng/L	4	0.041 J	0.02 UJ
TSS	mg/L	NA	3.8 B	--

PLSA-SW-37

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	4.23	0.76
MeHg	ng/L	4	0.044 J	0.021 J
TSS	mg/L	NA	7 B	--

PLSA-SW-38

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	2.44	0.84
MeHg	ng/L	4	0.048 J	0.02 UJ
TSS	mg/L	NA	6.6 B	--

PLSA-SW-39

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	1.32	0.62
MeHg	ng/L	4	0.022 J	0.02 UJ
TSS	mg/L	NA	4.9 B	--

PLSA-SW-10

Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	1.44	0.68
MeHg	ng/L	4	0.03 J	0.02 UJ
TSS	mg/L	NA	6.8 B	--
Near Bottom				
THg	ng/L	770	1.72	0.59
MeHg	ng/L	4	0.02 UJ	0.019 UJ
TSS	mg/L	NA	5.4 B	--

Legend

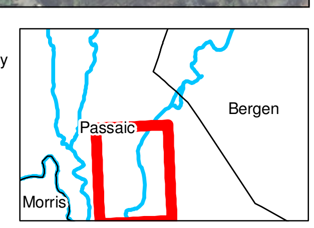
- Near Surface Water Sample
- Near Surface and Near Bottom Surface Water Samples
- Dam Safety Stop
- Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

Data Qualifiers:
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
UJ - Not detected. Reporting limit may not be accurate or precise.



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Prepared by: RRM III

Checked by: GL

Date: 3/11/2014

Figure 6-1a
Surface Water Analytical Results - Pompton Lake Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

REF-SW-01				
Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	2.53 B	0.67 B
MeHg	ng/L	4	0.032 J	0.026 J
TSS	mg/L	NA	2.5 J	--
Near Bottom				
THg	ng/L	770	1.33 B	0.48 B
MeHg	ng/L	4	0.028 J	0.02 U
TSS	mg/L	NA	2.4 J	--

REF-SW-32				
Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	2.46 B	0.57 B
MeHg	ng/L	4	0.031 J	0.021 J
TSS	mg/L	NA	2.6 J	--

REF-SW-04				
Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	1.88 B	0.068 B
MeHg	ng/L	4	0.038 J	0.02 U
TSS	mg/L	NA	2.7 J	--

REF-SW-02				
Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	2.4 B	0.53 B
MeHg	ng/L	4	0.034 J	0.03 J
TSS	mg/L	NA	5.1 J	--

REF-SW-07				
Analyte	Units	Benchmark	Unfiltered Result	Filtered Result
Near Surface				
THg	ng/L	770	3.23 B	0.55 B
MeHg	ng/L	4	0.02 U	0.02 U
TSS	mg/L	NA	3.2 J	--

Legend

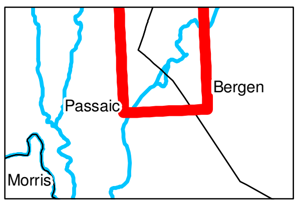
- Near Surface Water Sample
- Near Surface and Near Bottom Surface Water Sample
- Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

Data Qualifiers:
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.



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Prepared by: RRM III

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Date: 3/11/2014

Figure 6-1b
Surface Water Analytical Results - Reference Area
2013 Pompton Lake Ecological Investigation Report
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S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 6-1b Surface Water Analytical Results - Reference Area.mxd

Figure 6-2
Average Total Mercury and Methylmercury Concentrations in Surface Water by Study Area
2013 Pompton Lake Ecological Investigation Report
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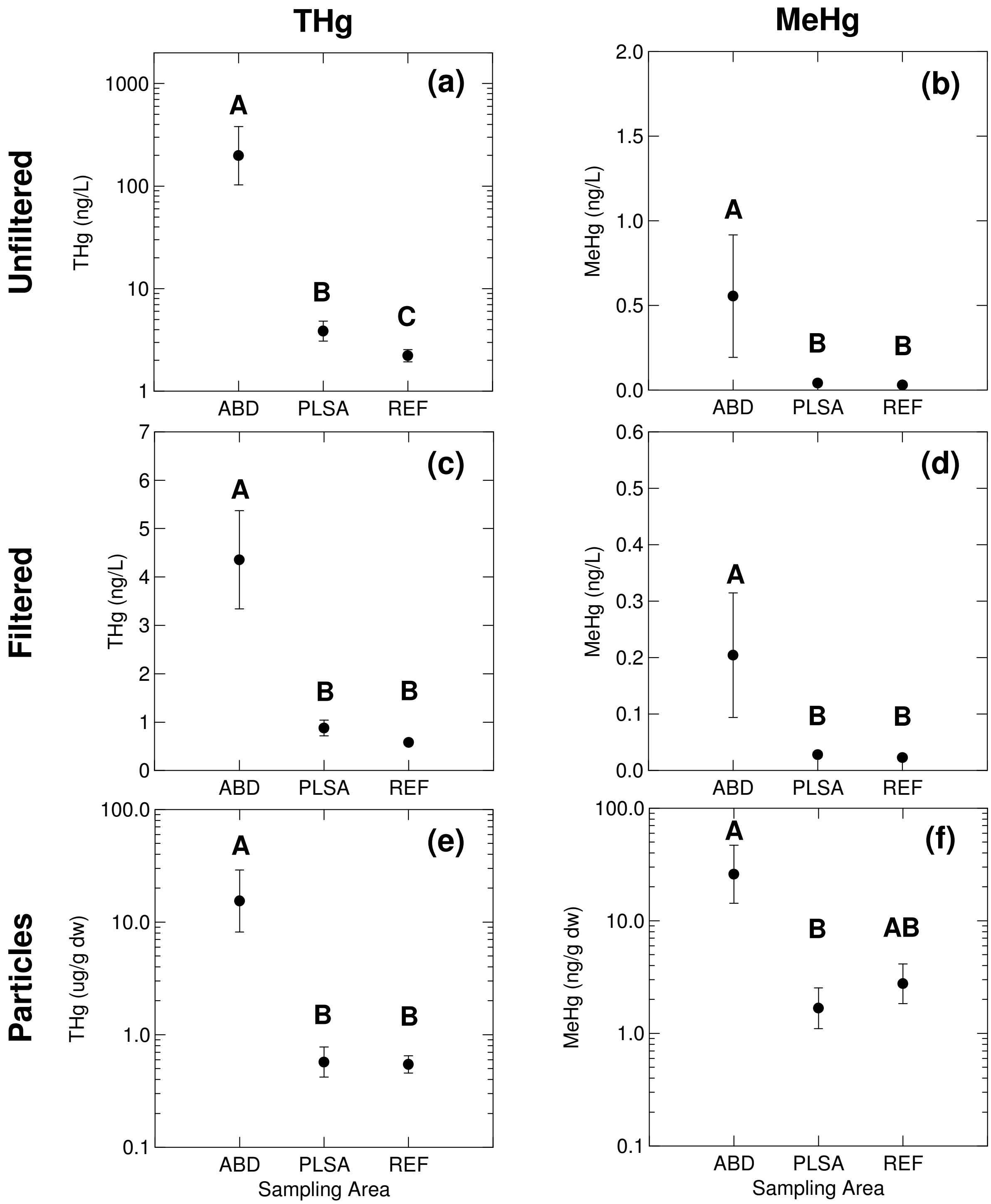
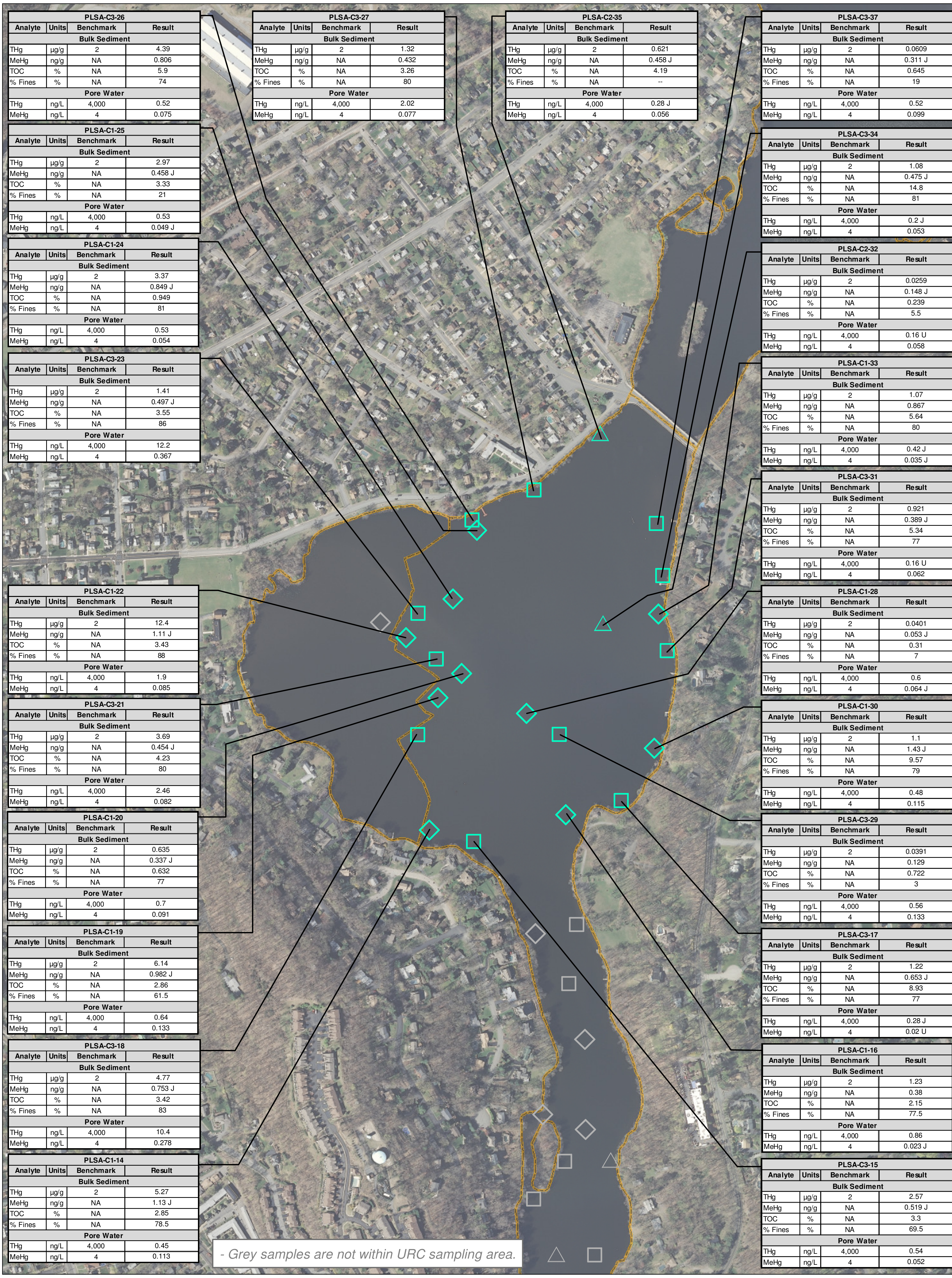
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in unfiltered and filtered (0.45µm filter) surface water samples, as well as on particles associated with surface water collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on parametric analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) post hoc analysis or non-parametric Kruskal-Wallis with Mann-Whitney pairwise comparisons; to maximize statistical power additional one-tailed t-test or Mann-Whitney comparisons were conducted to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences between areas ($\alpha = 0.05$) are represented by different letters; identical letters indicate no statistical differences between areas.



PLSA-C3-26

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	4.39
MeHg	ng/g	NA	0.806
TOC	%	NA	5.9
% Fines	%	NA	74
Pore Water			
THg	ng/L	4,000	0.52
MeHg	ng/L	4	0.075

PLSA-C3-27

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.32
MeHg	ng/g	NA	0.432
TOC	%	NA	3.26
% Fines	%	NA	80
Pore Water			
THg	ng/L	4,000	2.02
MeHg	ng/L	4	0.077

PLSA-C2-35

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.621
MeHg	ng/g	NA	0.458 J
TOC	%	NA	4.19
% Fines	%	NA	--
Pore Water			
THg	ng/L	4,000	0.28 J
MeHg	ng/L	4	0.056

PLSA-C3-37

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0609
MeHg	ng/g	NA	0.311 J
TOC	%	NA	0.645
% Fines	%	NA	19
Pore Water			
THg	ng/L	4,000	0.52
MeHg	ng/L	4	0.099

PLSA-C1-25

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.97
MeHg	ng/g	NA	0.458 J
TOC	%	NA	3.33
% Fines	%	NA	21
Pore Water			
THg	ng/L	4,000	0.53
MeHg	ng/L	4	0.049 J

PLSA-C3-34

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.08
MeHg	ng/g	NA	0.475 J
TOC	%	NA	14.8
% Fines	%	NA	81
Pore Water			
THg	ng/L	4,000	0.2 J
MeHg	ng/L	4	0.053

PLSA-C1-24

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	3.37
MeHg	ng/g	NA	0.849 J
TOC	%	NA	0.949
% Fines	%	NA	81
Pore Water			
THg	ng/L	4,000	0.53
MeHg	ng/L	4	0.054

PLSA-C2-32

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0259
MeHg	ng/g	NA	0.148 J
TOC	%	NA	0.239
% Fines	%	NA	5.5
Pore Water			
THg	ng/L	4,000	0.16 U
MeHg	ng/L	4	0.058

PLSA-C3-23

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.41
MeHg	ng/g	NA	0.497 J
TOC	%	NA	3.55
% Fines	%	NA	86
Pore Water			
THg	ng/L	4,000	12.2
MeHg	ng/L	4	0.367

PLSA-C1-33

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.07
MeHg	ng/g	NA	0.867
TOC	%	NA	5.64
% Fines	%	NA	80
Pore Water			
THg	ng/L	4,000	0.42 J
MeHg	ng/L	4	0.035 J

PLSA-C3-31

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.921
MeHg	ng/g	NA	0.389 J
TOC	%	NA	5.34
% Fines	%	NA	77
Pore Water			
THg	ng/L	4,000	0.16 U
MeHg	ng/L	4	0.062

PLSA-C1-22

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	12.4
MeHg	ng/g	NA	1.11 J
TOC	%	NA	3.43
% Fines	%	NA	88
Pore Water			
THg	ng/L	4,000	1.9
MeHg	ng/L	4	0.085

PLSA-C1-28

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0401
MeHg	ng/g	NA	0.053 J
TOC	%	NA	0.31
% Fines	%	NA	7
Pore Water			
THg	ng/L	4,000	0.6
MeHg	ng/L	4	0.064 J

PLSA-C3-21

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	3.69
MeHg	ng/g	NA	0.454 J
TOC	%	NA	4.23
% Fines	%	NA	80
Pore Water			
THg	ng/L	4,000	2.46
MeHg	ng/L	4	0.082

PLSA-C1-30

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.1
MeHg	ng/g	NA	1.43 J
TOC	%	NA	9.57
% Fines	%	NA	79
Pore Water			
THg	ng/L	4,000	0.48
MeHg	ng/L	4	0.115

PLSA-C1-20

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.635
MeHg	ng/g	NA	0.337 J
TOC	%	NA	0.632
% Fines	%	NA	77
Pore Water			
THg	ng/L	4,000	0.7
MeHg	ng/L	4	0.091

PLSA-C3-29

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0391
MeHg	ng/g	NA	0.129
TOC	%	NA	0.722
% Fines	%	NA	3
Pore Water			
THg	ng/L	4,000	0.56
MeHg	ng/L	4	0.133

PLSA-C1-19

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	6.14
MeHg	ng/g	NA	0.982 J
TOC	%	NA	2.86
% Fines	%	NA	61.5
Pore Water			
THg	ng/L	4,000	0.64
MeHg	ng/L	4	0.133

PLSA-C3-17

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.22
MeHg	ng/g	NA	0.653 J
TOC	%	NA	8.93
% Fines	%	NA	77
Pore Water			
THg	ng/L	4,000	0.28 J
MeHg	ng/L	4	0.02 U

PLSA-C3-18

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	4.77
MeHg	ng/g	NA	0.753 J
TOC	%	NA	3.42
% Fines	%	NA	83
Pore Water			
THg	ng/L	4,000	10.4
MeHg	ng/L	4	0.278

PLSA-C1-16

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.23
MeHg	ng/g	NA	0.38
TOC	%	NA	2.15
% Fines	%	NA	77.5
Pore Water			
THg	ng/L	4,000	0.86
MeHg	ng/L	4	0.023 J

PLSA-C1-14

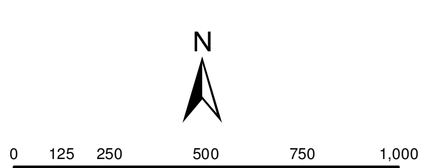
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	5.27
MeHg	ng/g	NA	1.13 J
TOC	%	NA	2.85
% Fines	%	NA	78.5
Pore Water			
THg	ng/L	4,000	0.45
MeHg	ng/L	4	0.113

PLSA-C3-15

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.57
MeHg	ng/g	NA	0.519 J
TOC	%	NA	3.3
% Fines	%	NA	69.5
Pore Water			
THg	ng/L	4,000	0.54
MeHg	ng/L	4	0.052

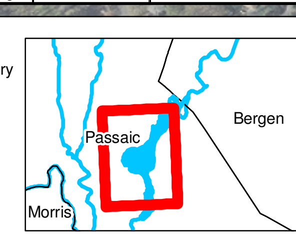
Legend

- Category 1 Sediment/Pore Water Locations
- Category 2 Sediment/Pore Water Locations
- Category 3 Sediment/Pore Water Locations
- Study Area
- NA - Benchmark not available



Reference:
NJDEP 2012 Aerial Imagery

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.



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Date: 3/11/2014

Figure 6-3a
Sediment and Pore Water Analytical Results - PLSA URC
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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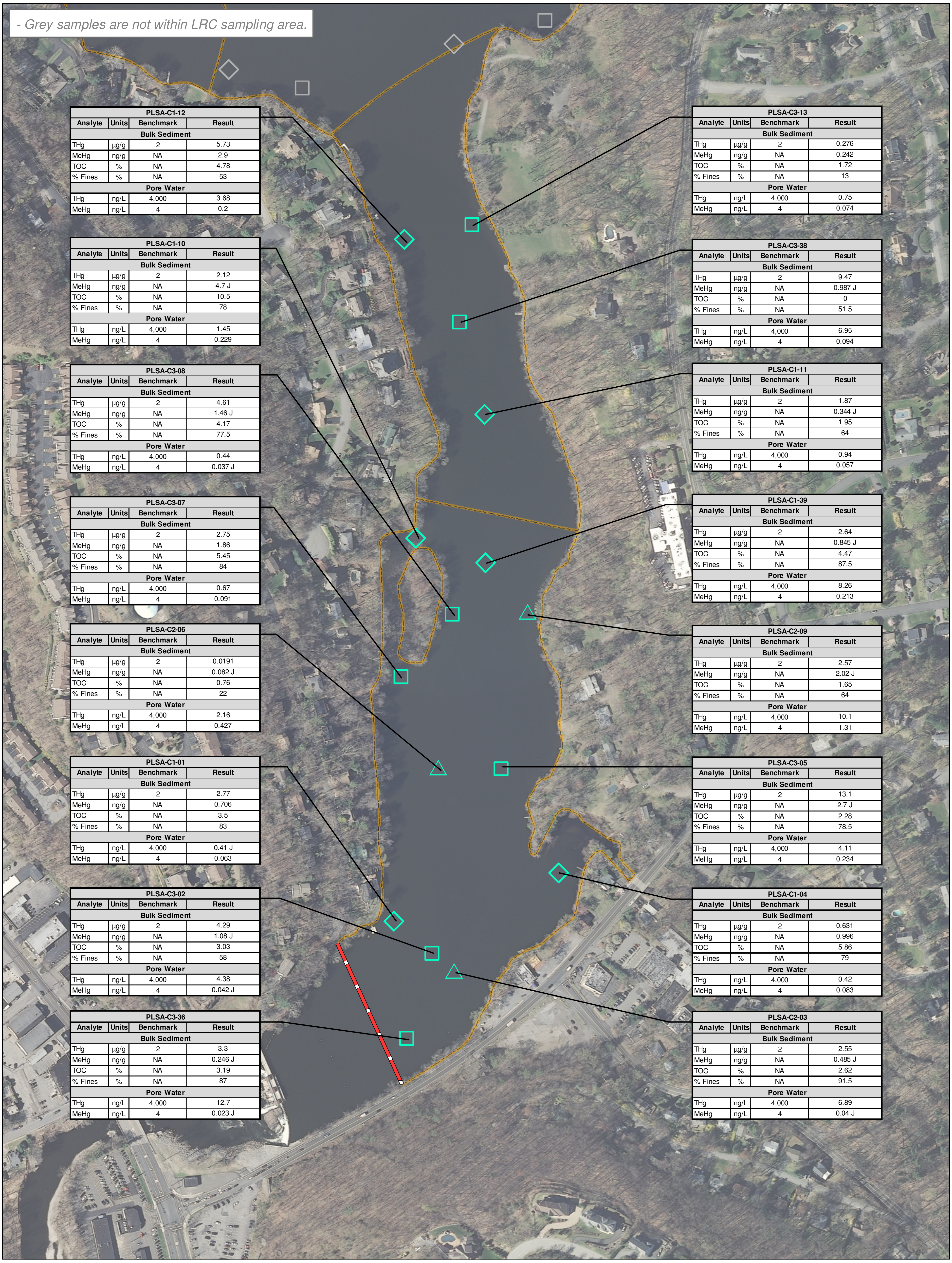


PLSA-C1-12

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	5.73
MeHg	ng/g	NA	2.9
TOC	%	NA	4.78
% Fines	%	NA	53
Pore Water			
THg	ng/L	4,000	3.68
MeHg	ng/L	4	0.2

PLSA-C1-10

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.12
MeHg	ng/g	NA	4.7 J
TOC	%	NA	10.5
% Fines	%	NA	78
Pore Water			
THg	ng/L	4,000	1.45
MeHg	ng/L	4	0.229

PLSA-C3-08

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	4.61
MeHg	ng/g	NA	1.46 J
TOC	%	NA	4.17
% Fines	%	NA	77.5
Pore Water			
THg	ng/L	4,000	0.44
MeHg	ng/L	4	0.037 J

PLSA-C3-07

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.75
MeHg	ng/g	NA	1.86
TOC	%	NA	5.45
% Fines	%	NA	84
Pore Water			
THg	ng/L	4,000	0.67
MeHg	ng/L	4	0.091

PLSA-C2-06

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0191
MeHg	ng/g	NA	0.082 J
TOC	%	NA	0.76
% Fines	%	NA	22
Pore Water			
THg	ng/L	4,000	2.16
MeHg	ng/L	4	0.427

PLSA-C1-01

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.77
MeHg	ng/g	NA	0.706
TOC	%	NA	3.5
% Fines	%	NA	83
Pore Water			
THg	ng/L	4,000	0.41 J
MeHg	ng/L	4	0.063

PLSA-C3-02

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	4.29
MeHg	ng/g	NA	1.08 J
TOC	%	NA	3.03
% Fines	%	NA	58
Pore Water			
THg	ng/L	4,000	4.38
MeHg	ng/L	4	0.042 J

PLSA-C3-36

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	3.3
MeHg	ng/g	NA	0.246 J
TOC	%	NA	3.19
% Fines	%	NA	87
Pore Water			
THg	ng/L	4,000	12.7
MeHg	ng/L	4	0.023 J

PLSA-C3-13

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.276
MeHg	ng/g	NA	0.242
TOC	%	NA	1.72
% Fines	%	NA	13
Pore Water			
THg	ng/L	4,000	0.75
MeHg	ng/L	4	0.074

PLSA-C3-38

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	9.47
MeHg	ng/g	NA	0.987 J
TOC	%	NA	0
% Fines	%	NA	51.5
Pore Water			
THg	ng/L	4,000	6.95
MeHg	ng/L	4	0.094

PLSA-C1-11

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	1.87
MeHg	ng/g	NA	0.344 J
TOC	%	NA	1.95
% Fines	%	NA	64
Pore Water			
THg	ng/L	4,000	0.94
MeHg	ng/L	4	0.057

PLSA-C1-39

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.64
MeHg	ng/g	NA	0.845 J
TOC	%	NA	4.47
% Fines	%	NA	87.5
Pore Water			
THg	ng/L	4,000	8.26
MeHg	ng/L	4	0.213

PLSA-C2-09

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.57
MeHg	ng/g	NA	2.02 J
TOC	%	NA	1.65
% Fines	%	NA	64
Pore Water			
THg	ng/L	4,000	10.1
MeHg	ng/L	4	1.31

PLSA-C3-05

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	13.1
MeHg	ng/g	NA	2.7 J
TOC	%	NA	2.28
% Fines	%	NA	78.5
Pore Water			
THg	ng/L	4,000	4.11
MeHg	ng/L	4	0.234

PLSA-C1-04

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.631
MeHg	ng/g	NA	0.996
TOC	%	NA	5.86
% Fines	%	NA	79
Pore Water			
THg	ng/L	4,000	0.42
MeHg	ng/L	4	0.083

PLSA-C2-03

Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	2.55
MeHg	ng/g	NA	0.485 J
TOC	%	NA	2.62
% Fines	%	NA	91.5
Pore Water			
THg	ng/L	4,000	6.89
MeHg	ng/L	4	0.04 J

Legend

- Category 1 Sediment/Pore Water Locations
- Category 2 Sediment/Pore Water Locations
- Category 3 Sediment/Pore Water Locations
- Dam Safety Stop
- Study Area

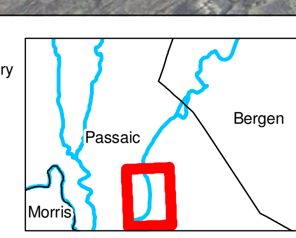
NA - Benchmark not available

N

0 125 250 500 Feet

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.

Reference:
NJDEP 2012 Aerial Imagery



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Checked by: GL

Date: 3/11/2014

Figure 6-3b
Sediment and Pore Water Analytical Results - PLSA LRC
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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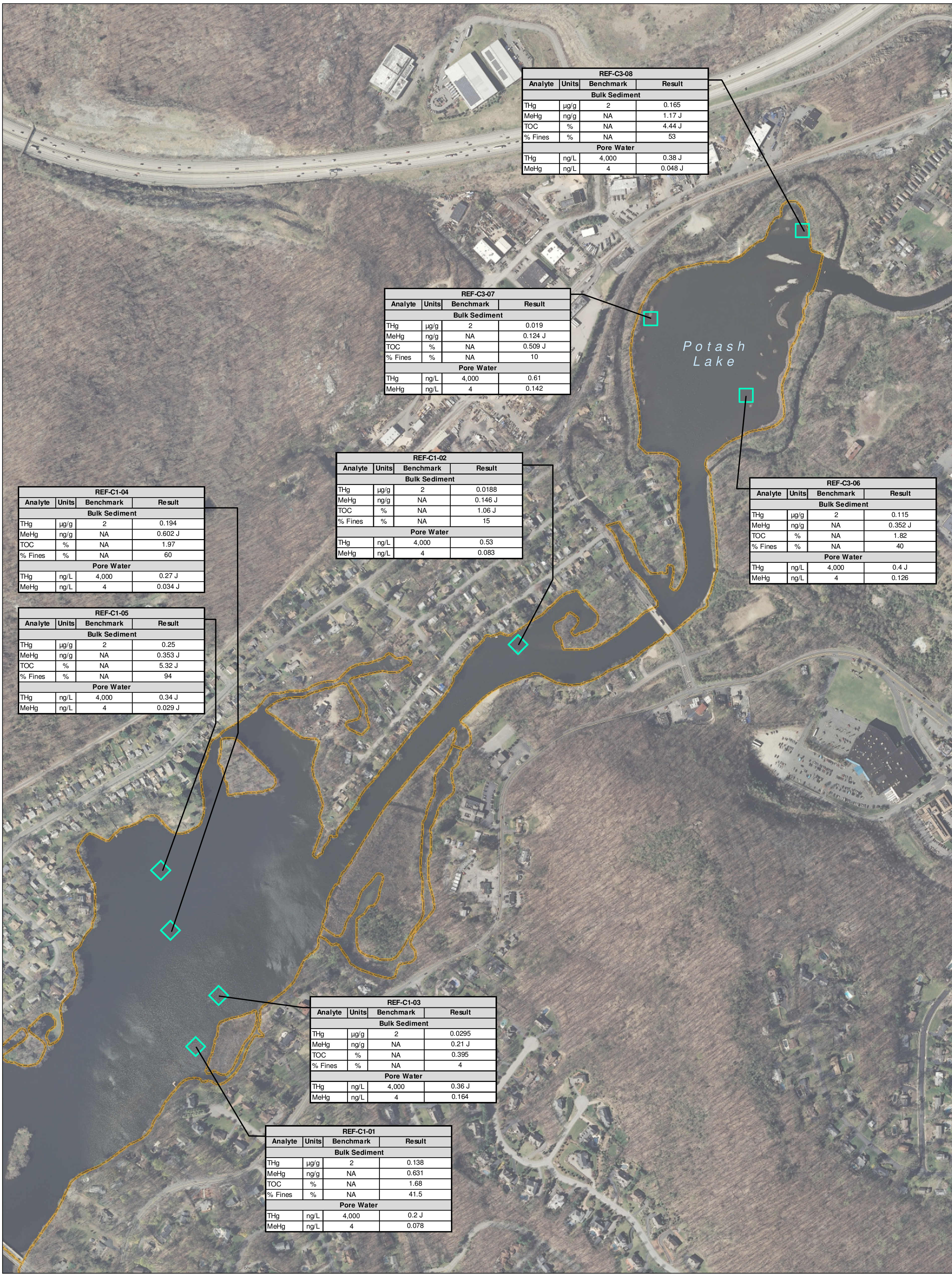


REF-C3-08			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.165
MeHg	ng/g	NA	1.17 J
TOC	%	NA	4.44 J
% Fines	%	NA	53
Pore Water			
THg	ng/L	4,000	0.38 J
MeHg	ng/L	4	0.048 J

REF-C3-07			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.019
MeHg	ng/g	NA	0.124 J
TOC	%	NA	0.509 J
% Fines	%	NA	10
Pore Water			
THg	ng/L	4,000	0.61
MeHg	ng/L	4	0.142

REF-C1-02			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0188
MeHg	ng/g	NA	0.146 J
TOC	%	NA	1.06 J
% Fines	%	NA	15
Pore Water			
THg	ng/L	4,000	0.53
MeHg	ng/L	4	0.083

REF-C3-06			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.115
MeHg	ng/g	NA	0.352 J
TOC	%	NA	1.82
% Fines	%	NA	40
Pore Water			
THg	ng/L	4,000	0.4 J
MeHg	ng/L	4	0.126

REF-C1-04			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.194
MeHg	ng/g	NA	0.602 J
TOC	%	NA	1.97
% Fines	%	NA	60
Pore Water			
THg	ng/L	4,000	0.27 J
MeHg	ng/L	4	0.034 J

REF-C1-05			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.25
MeHg	ng/g	NA	0.353 J
TOC	%	NA	5.32 J
% Fines	%	NA	94
Pore Water			
THg	ng/L	4,000	0.34 J
MeHg	ng/L	4	0.029 J

REF-C1-03			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.0295
MeHg	ng/g	NA	0.21 J
TOC	%	NA	0.395
% Fines	%	NA	4
Pore Water			
THg	ng/L	4,000	0.36 J
MeHg	ng/L	4	0.164

REF-C1-01			
Analyte	Units	Benchmark	Result
Bulk Sediment			
THg	µg/g	2	0.138
MeHg	ng/g	NA	0.631
TOC	%	NA	1.68
% Fines	%	NA	41.5
Pore Water			
THg	ng/L	4,000	0.2 J
MeHg	ng/L	4	0.078

Legend

- Category 1 Sediment/Pore Water Locations
- Category 2 Sediment/Pore Water Locations
- Category 3 Sediment/Pore Water Locations
- Study Area

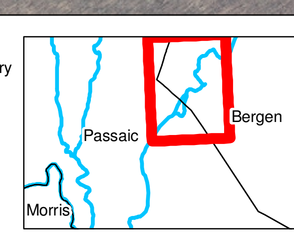
NA - Benchmark not available

N

0 125 250 500 750 1,000 Feet

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.

Reference:
NJDEP 2012 Aerial Imagery



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Prepared by: RRM III

Checked by: GL

Date: 3/11/2014

Figure 6-3c
Sediment and Pore Water Analytical Results - Reference Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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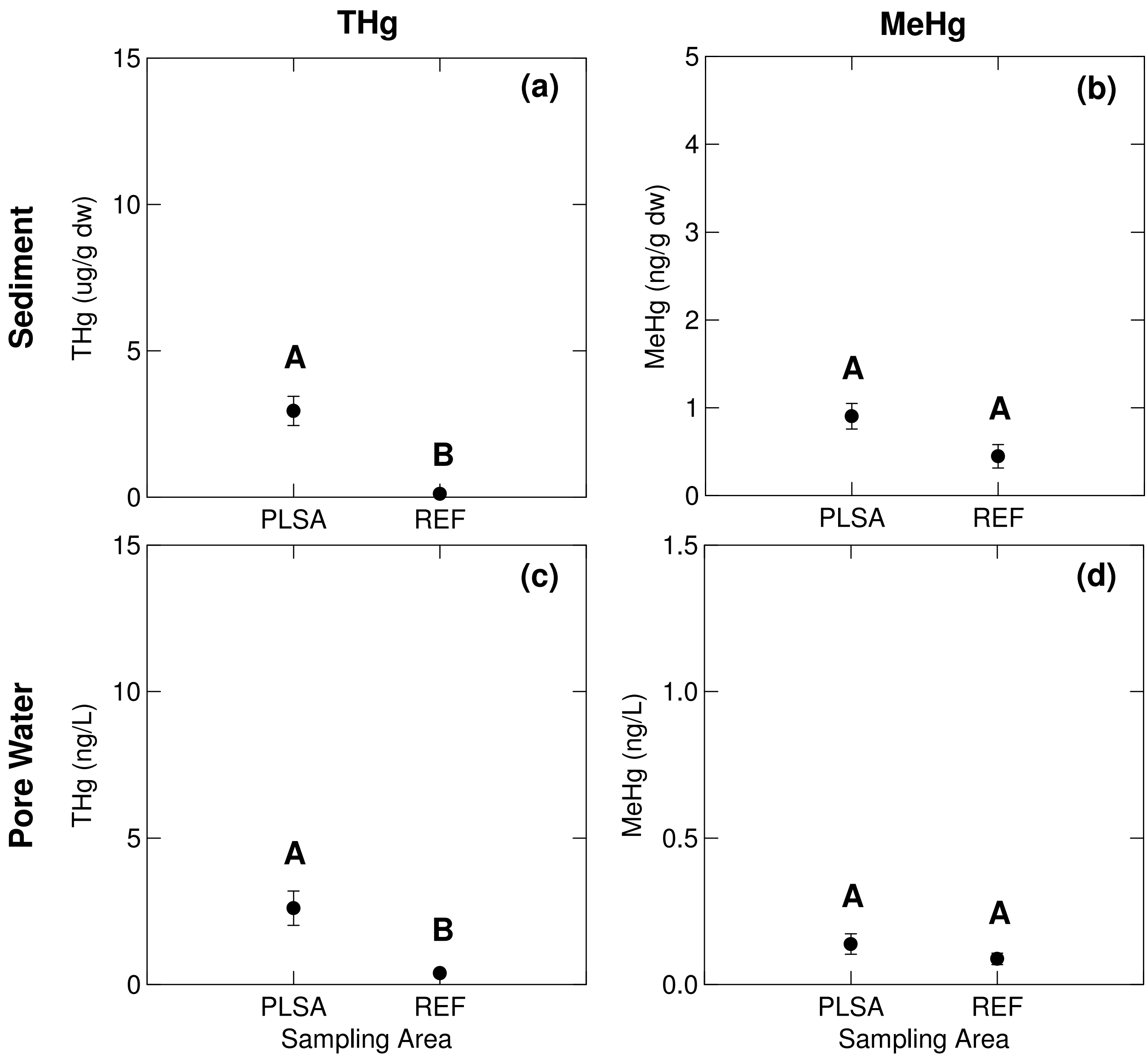
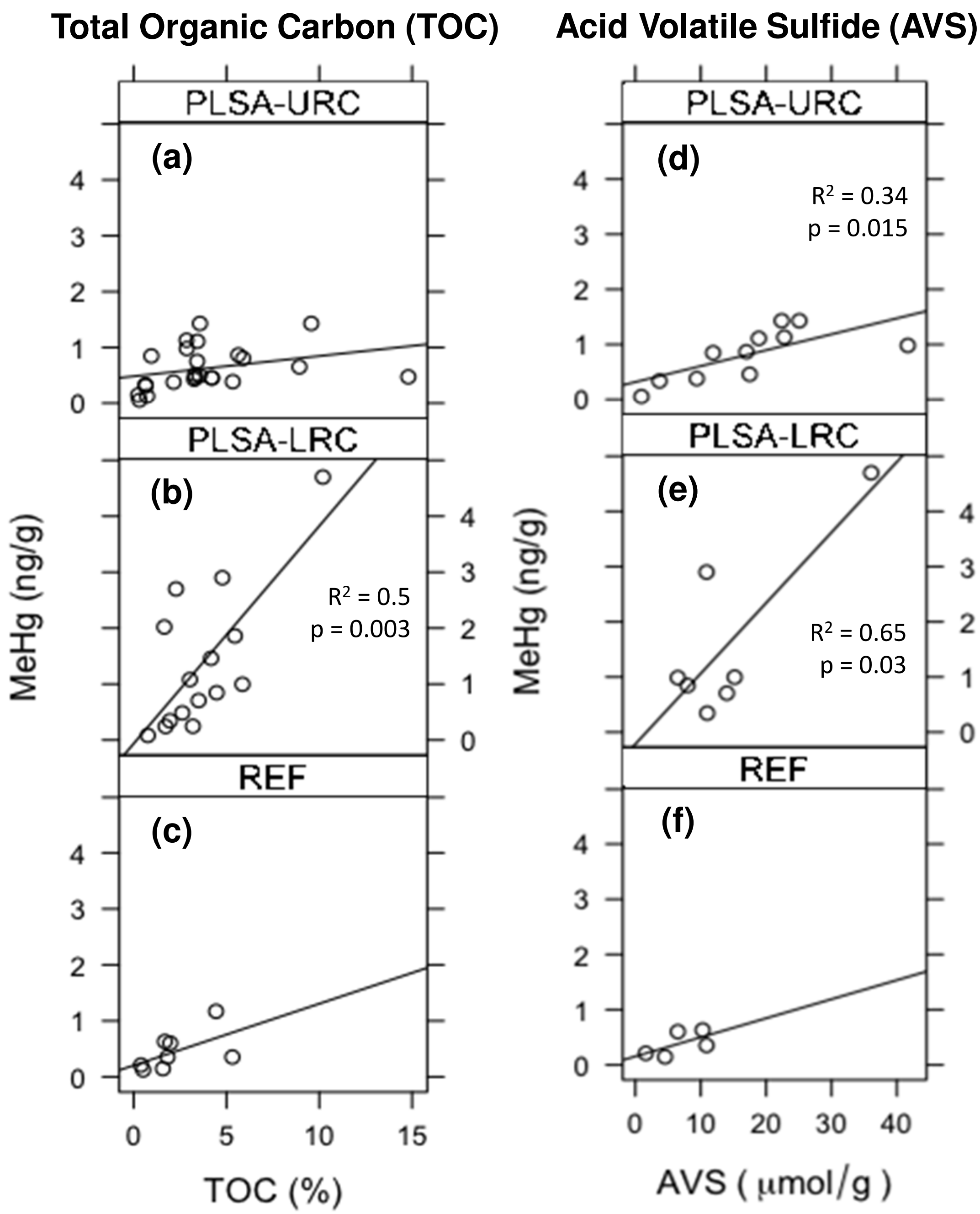
Figure 6-4
Average Total Mercury and Methylmercury Concentrations in Sediment and Pore Water by Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

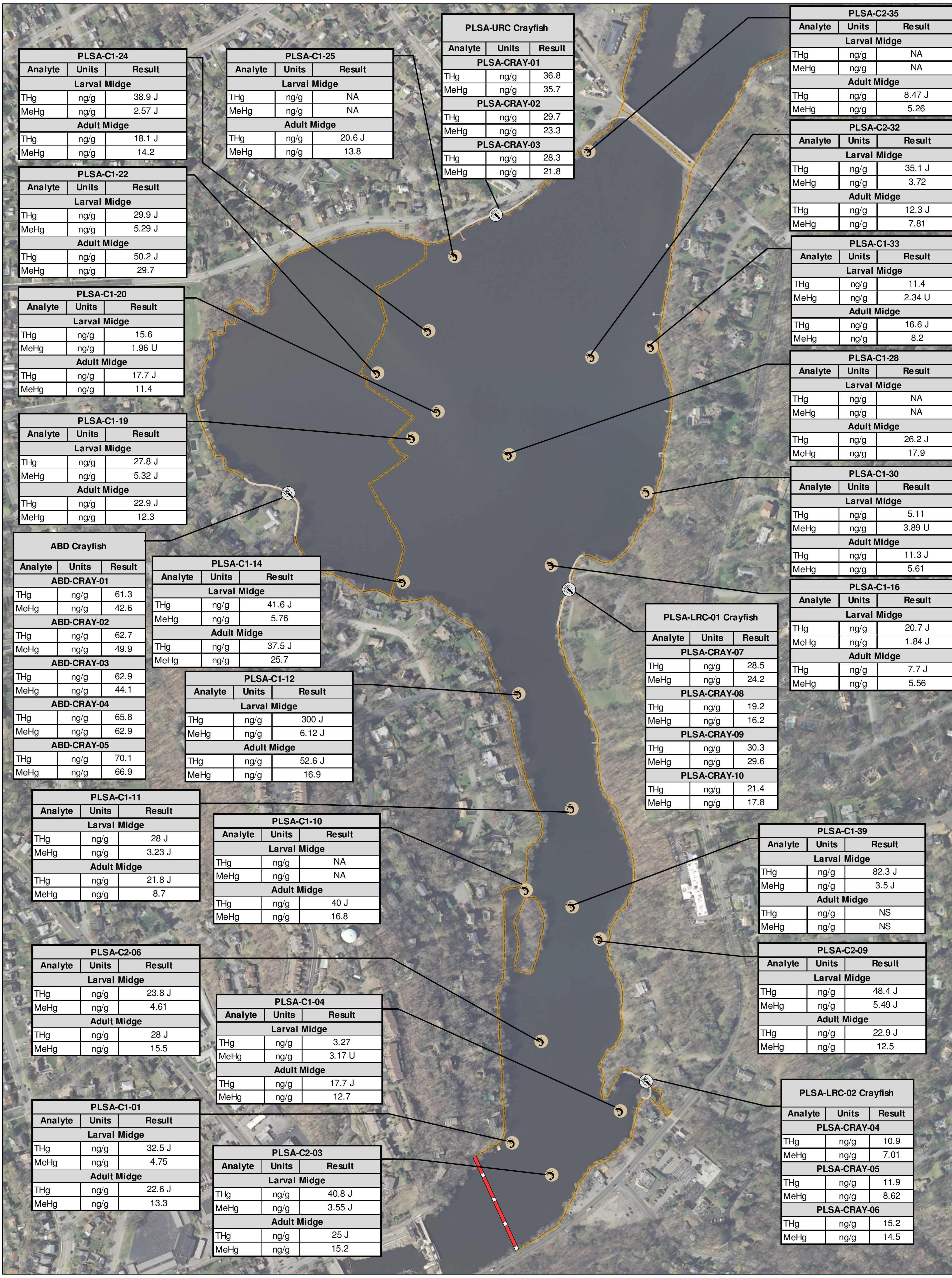


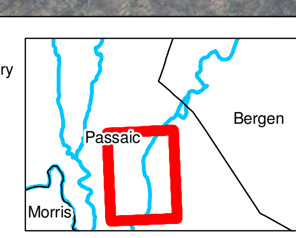
Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in sediment and pore water samples collected at Pompton Lake Study Area (PLSA) and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on one-tailed comparisons using a parametric t-test or non-parametric Mann-Whitney test to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences (α= 0.05) between areas are represented by different letters; identical letters indicate no statistical differences between areas.

Figure 6-5
Relations Between Sediment MeHg, Total Organic Carbon, and Acid Volatile Sulfide Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the association of methylmercury with total organic carbon (TOC) and acid volatile sulfide (AVS) in sediment samples collected at Pompton Lake Study Area (PLSA-URC and PLSA-LRC), and reference area (REF) sample locations. Data are represented as individual sample values. Coefficent of determination (R^2) and probability (p) values are presented for significant regressions ($p < 0.05$).





PLSA-C1-24

Analyte	Units	Result
Larval Midge		
THg	ng/g	38.9 J
MeHg	ng/g	2.57 J
Adult Midge		
THg	ng/g	18.1 J
MeHg	ng/g	14.2

PLSA-C1-25

Analyte	Units	Result
Larval Midge		
THg	ng/g	NA
MeHg	ng/g	NA
Adult Midge		
THg	ng/g	20.6 J
MeHg	ng/g	13.8

PLSA-URC Crayfish

Analyte	Units	Result
PLSA-CRAY-01		
THg	ng/g	36.8
MeHg	ng/g	35.7
PLSA-CRAY-02		
THg	ng/g	29.7
MeHg	ng/g	23.3
PLSA-CRAY-03		
THg	ng/g	28.3
MeHg	ng/g	21.8

PLSA-C2-35

Analyte	Units	Result
Larval Midge		
THg	ng/g	NA
MeHg	ng/g	NA
Adult Midge		
THg	ng/g	8.47 J
MeHg	ng/g	5.26

PLSA-C1-22

Analyte	Units	Result
Larval Midge		
THg	ng/g	29.9 J
MeHg	ng/g	5.29 J
Adult Midge		
THg	ng/g	50.2 J
MeHg	ng/g	29.7

PLSA-C2-32

Analyte	Units	Result
Larval Midge		
THg	ng/g	35.1 J
MeHg	ng/g	3.72
Adult Midge		
THg	ng/g	12.3 J
MeHg	ng/g	7.81

PLSA-C1-33

Analyte	Units	Result
Larval Midge		
THg	ng/g	11.4
MeHg	ng/g	2.34 U
Adult Midge		
THg	ng/g	16.6 J
MeHg	ng/g	8.2

PLSA-C1-20

Analyte	Units	Result
Larval Midge		
THg	ng/g	15.6
MeHg	ng/g	1.96 U
Adult Midge		
THg	ng/g	17.7 J
MeHg	ng/g	11.4

PLSA-C1-28

Analyte	Units	Result
Larval Midge		
THg	ng/g	NA
MeHg	ng/g	NA
Adult Midge		
THg	ng/g	26.2 J
MeHg	ng/g	17.9

PLSA-C1-19

Analyte	Units	Result
Larval Midge		
THg	ng/g	27.8 J
MeHg	ng/g	5.32 J
Adult Midge		
THg	ng/g	22.9 J
MeHg	ng/g	12.3

PLSA-C1-30

Analyte	Units	Result
Larval Midge		
THg	ng/g	5.11
MeHg	ng/g	3.89 U
Adult Midge		
THg	ng/g	11.3 J
MeHg	ng/g	5.61

ABD Crayfish

Analyte	Units	Result
ABD-CRAY-01		
THg	ng/g	61.3
MeHg	ng/g	42.6
ABD-CRAY-02		
THg	ng/g	62.7
MeHg	ng/g	49.9
ABD-CRAY-03		
THg	ng/g	62.9
MeHg	ng/g	44.1
ABD-CRAY-04		
THg	ng/g	65.8
MeHg	ng/g	62.9
ABD-CRAY-05		
THg	ng/g	70.1
MeHg	ng/g	66.9

PLSA-C1-14

Analyte	Units	Result
Larval Midge		
THg	ng/g	41.6 J
MeHg	ng/g	5.76
Adult Midge		
THg	ng/g	37.5 J
MeHg	ng/g	25.7

PLSA-C1-16

Analyte	Units	Result
Larval Midge		
THg	ng/g	20.7 J
MeHg	ng/g	1.84 J
Adult Midge		
THg	ng/g	7.7 J
MeHg	ng/g	5.56

PLSA-LRC-01 Crayfish

Analyte	Units	Result
PLSA-CRAY-07		
THg	ng/g	28.5
MeHg	ng/g	24.2
PLSA-CRAY-08		
THg	ng/g	19.2
MeHg	ng/g	16.2
PLSA-CRAY-09		
THg	ng/g	30.3
MeHg	ng/g	29.6
PLSA-CRAY-10		
THg	ng/g	21.4
MeHg	ng/g	17.8

PLSA-C1-12

Analyte	Units	Result
Larval Midge		
THg	ng/g	300 J
MeHg	ng/g	6.12 J
Adult Midge		
THg	ng/g	52.6 J
MeHg	ng/g	16.9

PLSA-C1-11

Analyte	Units	Result
Larval Midge		
THg	ng/g	28 J
MeHg	ng/g	3.23 J
Adult Midge		
THg	ng/g	21.8 J
MeHg	ng/g	8.7

PLSA-C1-10

Analyte	Units	Result
Larval Midge		
THg	ng/g	NA
MeHg	ng/g	NA
Adult Midge		
THg	ng/g	40 J
MeHg	ng/g	16.8

PLSA-C1-39

Analyte	Units	Result
Larval Midge		
THg	ng/g	82.3 J
MeHg	ng/g	3.5 J
Adult Midge		
THg	ng/g	NS
MeHg	ng/g	NS

PLSA-C2-06

Analyte	Units	Result
Larval Midge		
THg	ng/g	23.8 J
MeHg	ng/g	4.61
Adult Midge		
THg	ng/g	28 J
MeHg	ng/g	15.5

PLSA-C2-09

Analyte	Units	Result
Larval Midge		
THg	ng/g	48.4 J
MeHg	ng/g	5.49 J
Adult Midge		
THg	ng/g	22.9 J
MeHg	ng/g	12.5

PLSA-C1-04

Analyte	Units	Result
Larval Midge		
THg	ng/g	3.27
MeHg	ng/g	3.17 U
Adult Midge		
THg	ng/g	17.7 J
MeHg	ng/g	12.7

PLSA-LRC-02 Crayfish

Analyte	Units	Result
PLSA-CRAY-04		
THg	ng/g	10.9
MeHg	ng/g	7.01
PLSA-CRAY-05		
THg	ng/g	11.9
MeHg	ng/g	8.62
PLSA-CRAY-06		
THg	ng/g	15.2
MeHg	ng/g	14.5

PLSA-C1-01

Analyte	Units	Result
Larval Midge		
THg	ng/g	32.5 J
MeHg	ng/g	4.75
Adult Midge		
THg	ng/g	22.6 J
MeHg	ng/g	13.3

PLSA-C2-03

Analyte	Units	Result
Larval Midge		
THg	ng/g	40.8 J
MeHg	ng/g	3.55 J
Adult Midge		
THg	ng/g	25 J
MeHg	ng/g	15.2

Legend

- Midge Sampling Location
- Crayfish Sampling Location
- Dam Safety Stop
- Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

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Figure 6-6a
Chironomid & Crayfish Analytical Results- Pompton Lake Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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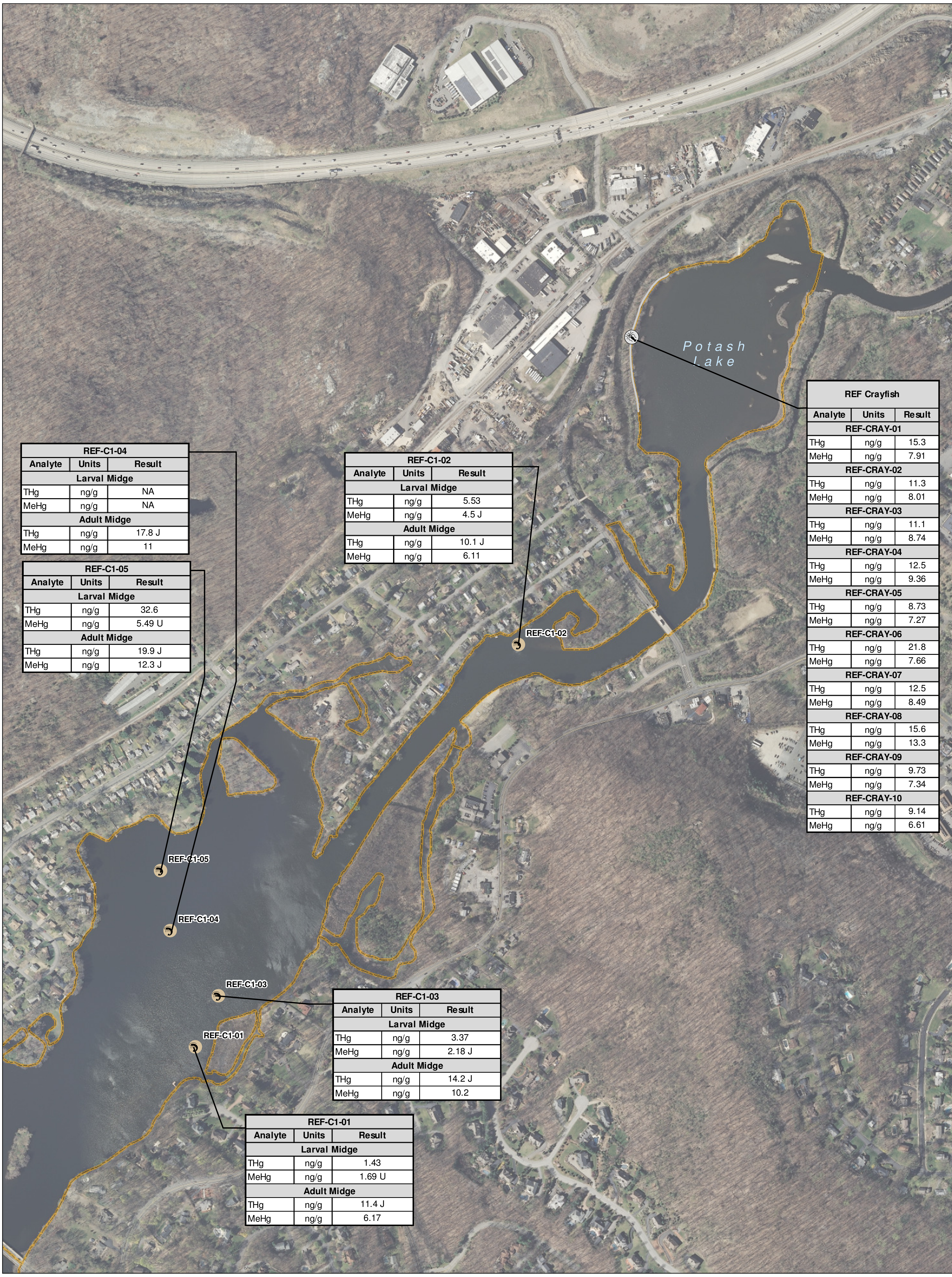

REF-C1-04

Analyte	Units	Result
Larval Midge		
THg	ng/g	NA
MeHg	ng/g	NA
Adult Midge		
THg	ng/g	17.8 J
MeHg	ng/g	11

REF-C1-05

Analyte	Units	Result
Larval Midge		
THg	ng/g	32.6
MeHg	ng/g	5.49 U
Adult Midge		
THg	ng/g	19.9 J
MeHg	ng/g	12.3 J

REF-C1-02

Analyte	Units	Result
Larval Midge		
THg	ng/g	5.53
MeHg	ng/g	4.5 J
Adult Midge		
THg	ng/g	10.1 J
MeHg	ng/g	6.11

REF Crayfish

Analyte	Units	Result
REF-CRAY-01		
THg	ng/g	15.3
MeHg	ng/g	7.91
REF-CRAY-02		
THg	ng/g	11.3
MeHg	ng/g	8.01
REF-CRAY-03		
THg	ng/g	11.1
MeHg	ng/g	8.74
REF-CRAY-04		
THg	ng/g	12.5
MeHg	ng/g	9.36
REF-CRAY-05		
THg	ng/g	8.73
MeHg	ng/g	7.27
REF-CRAY-06		
THg	ng/g	21.8
MeHg	ng/g	7.66
REF-CRAY-07		
THg	ng/g	12.5
MeHg	ng/g	8.49
REF-CRAY-08		
THg	ng/g	15.6
MeHg	ng/g	13.3
REF-CRAY-09		
THg	ng/g	9.73
MeHg	ng/g	7.34
REF-CRAY-10		
THg	ng/g	9.14
MeHg	ng/g	6.61

REF-C1-03

Analyte	Units	Result
Larval Midge		
THg	ng/g	3.37
MeHg	ng/g	2.18 J
Adult Midge		
THg	ng/g	14.2 J
MeHg	ng/g	10.2

REF-C1-01

Analyte	Units	Result
Larval Midge		
THg	ng/g	1.43
MeHg	ng/g	1.69 U
Adult Midge		
THg	ng/g	11.4 J
MeHg	ng/g	6.17

Legend

- Midge Sampling Location
- Crayfish Sampling Location
- Study Area

NA - Not Analyzed Due to Insufficient Sample Mass

N

0 125 250 500 750 1,000 Feet

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Reference:
NJDEP 2012 Aerial Imagery

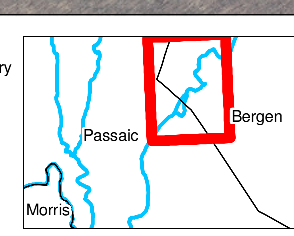

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Figure 6-6b
Chironomid & Crayfish Analytical Results- Reference Area
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S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 6-6b Chironomid & Crayfish Analytical Results - Reference Area.mxd

Figure 6-7
Average Total Mercury and Methylmercury Concentrations in Larval and Emergent Adult Insect Tissue by Study Area
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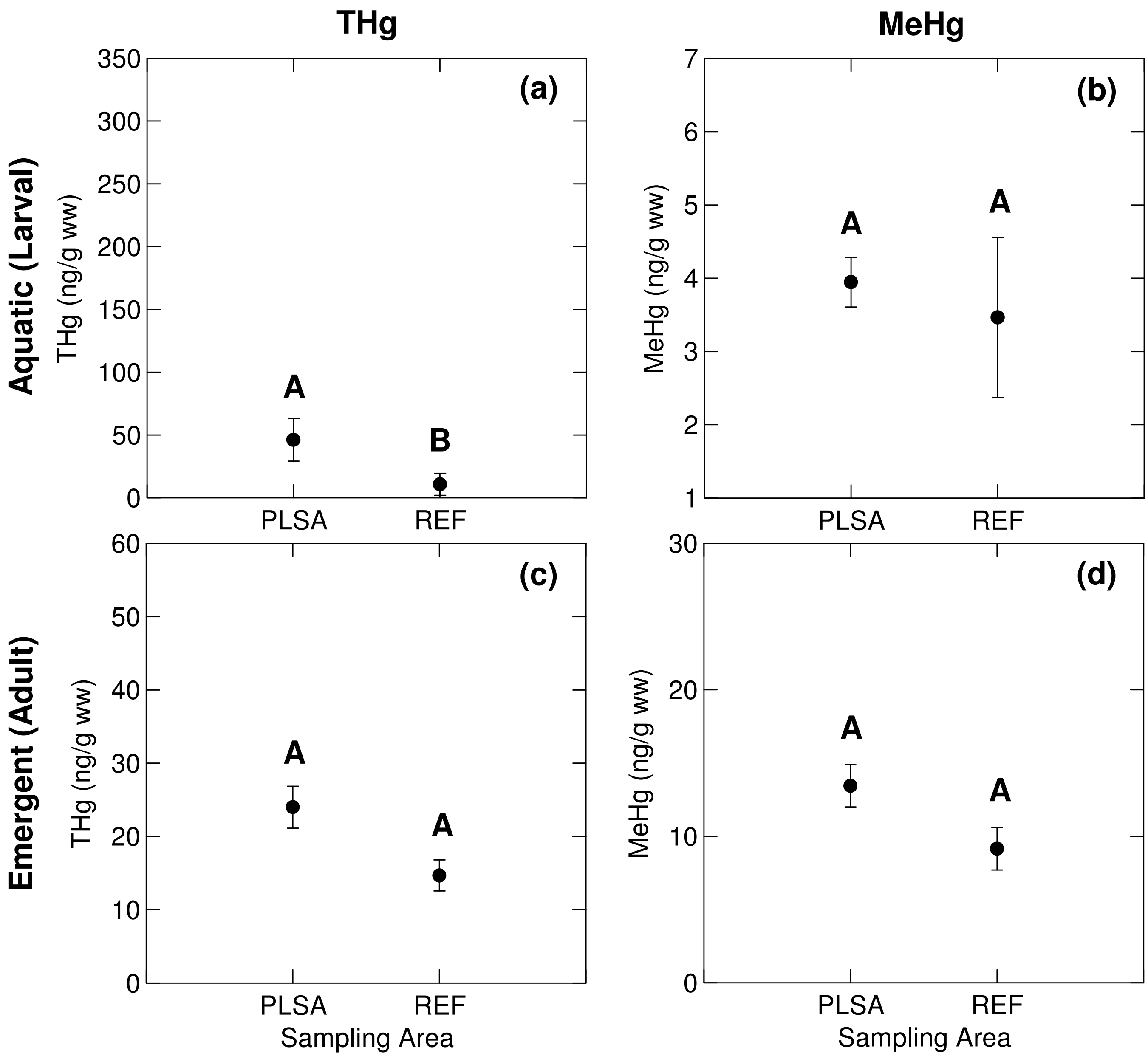
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in aquatic (larval) and emergent (adult) chironomid samples collected at Pompton Lake Study Area (PLSA) and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on one-tailed comparisons using a parametric t-test to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences (α= 0.05) between areas are represented by different letters; identical letters indicate no statistical differences between areas.

Figure 6-8
Average Total Mercury and Methylmercury Concentrations in Crayfish Tissue by Study Area
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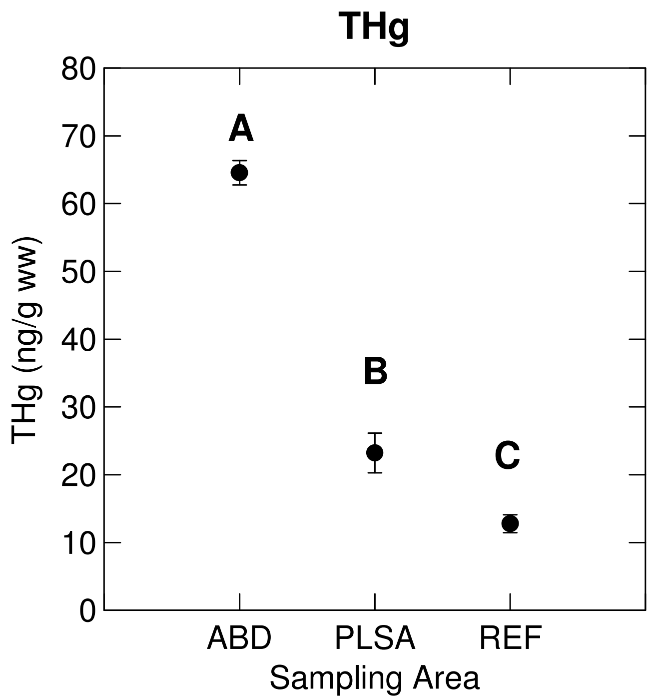
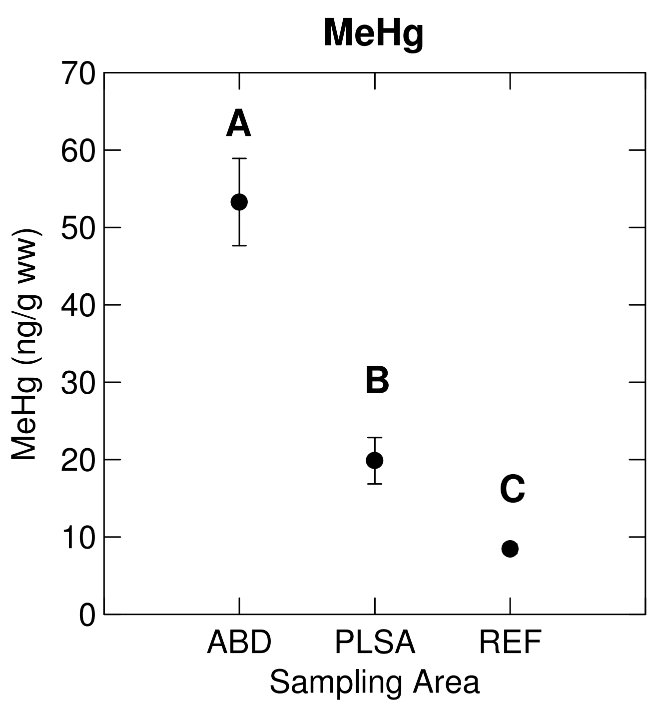
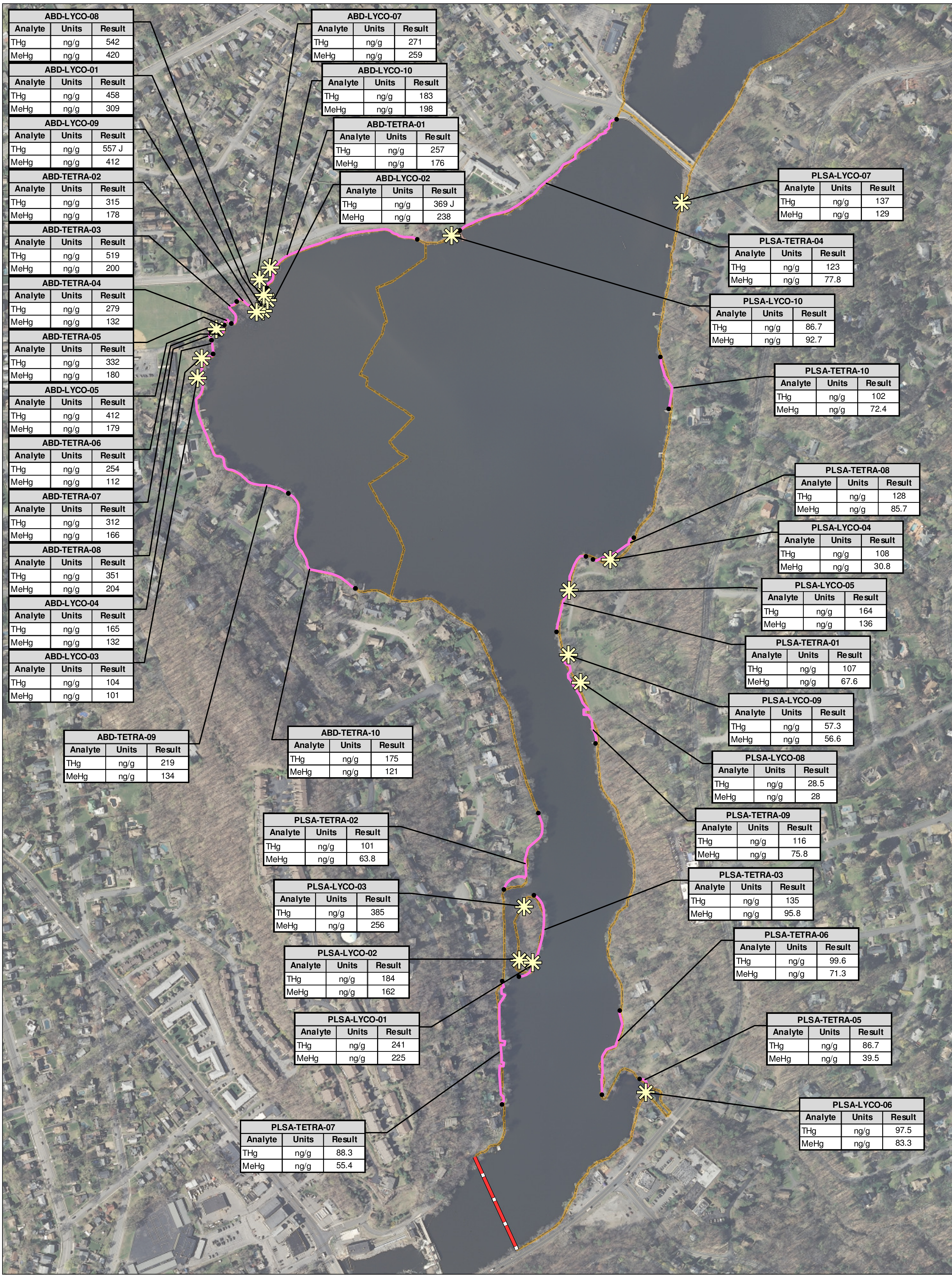




Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in individual whole body crayfish samples collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on parametric analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) post hoc analysis; to maximize statistical power one-tailed t-tests were conducted to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences between areas ($\alpha = 0.05$) are represented by different letters; identical letters indicate no statistical differences between areas.



ABD-LYCO-08

Analyte	Units	Result
THg	ng/g	542
MeHg	ng/g	420

ABD-LYCO-01

Analyte	Units	Result
THg	ng/g	458
MeHg	ng/g	309

ABD-LYCO-09

Analyte	Units	Result
THg	ng/g	557 J
MeHg	ng/g	412

ABD-TETRA-02

Analyte	Units	Result
THg	ng/g	315
MeHg	ng/g	178

ABD-TETRA-03

Analyte	Units	Result
THg	ng/g	519
MeHg	ng/g	200

ABD-TETRA-04

Analyte	Units	Result
THg	ng/g	279
MeHg	ng/g	132

ABD-TETRA-05

Analyte	Units	Result
THg	ng/g	332
MeHg	ng/g	180

ABD-LYCO-05

Analyte	Units	Result
THg	ng/g	412
MeHg	ng/g	179

ABD-TETRA-06

Analyte	Units	Result
THg	ng/g	254
MeHg	ng/g	112

ABD-TETRA-07

Analyte	Units	Result
THg	ng/g	312
MeHg	ng/g	166

ABD-TETRA-08

Analyte	Units	Result
THg	ng/g	351
MeHg	ng/g	204

ABD-LYCO-04

Analyte	Units	Result
THg	ng/g	165
MeHg	ng/g	132

ABD-LYCO-03

Analyte	Units	Result
THg	ng/g	104
MeHg	ng/g	101

ABD-LYCO-07

Analyte	Units	Result
THg	ng/g	271
MeHg	ng/g	259

ABD-LYCO-10

Analyte	Units	Result
THg	ng/g	183
MeHg	ng/g	198

ABD-TETRA-01

Analyte	Units	Result
THg	ng/g	257
MeHg	ng/g	176

ABD-LYCO-02

Analyte	Units	Result
THg	ng/g	369 J
MeHg	ng/g	238

PLSA-LYCO-07

Analyte	Units	Result
THg	ng/g	137
MeHg	ng/g	129

PLSA-TETRA-04

Analyte	Units	Result
THg	ng/g	123
MeHg	ng/g	77.8

PLSA-LYCO-10

Analyte	Units	Result
THg	ng/g	86.7
MeHg	ng/g	92.7

PLSA-TETRA-10

Analyte	Units	Result
THg	ng/g	102
MeHg	ng/g	72.4

PLSA-TETRA-08

Analyte	Units	Result
THg	ng/g	128
MeHg	ng/g	85.7

PLSA-LYCO-04

Analyte	Units	Result
THg	ng/g	108
MeHg	ng/g	30.8

PLSA-LYCO-05

Analyte	Units	Result
THg	ng/g	164
MeHg	ng/g	136

PLSA-TETRA-01

Analyte	Units	Result
THg	ng/g	107
MeHg	ng/g	67.6

PLSA-LYCO-09

Analyte	Units	Result
THg	ng/g	57.3
MeHg	ng/g	56.6

PLSA-LYCO-08

Analyte	Units	Result
THg	ng/g	28.5
MeHg	ng/g	28

PLSA-TETRA-09

Analyte	Units	Result
THg	ng/g	116
MeHg	ng/g	75.8

PLSA-TETRA-03

Analyte	Units	Result
THg	ng/g	135
MeHg	ng/g	95.8

PLSA-TETRA-06

Analyte	Units	Result
THg	ng/g	99.6
MeHg	ng/g	71.3

PLSA-TETRA-05

Analyte	Units	Result
THg	ng/g	86.7
MeHg	ng/g	39.5

PLSA-LYCO-06

Analyte	Units	Result
THg	ng/g	97.5
MeHg	ng/g	83.3

ABD-TETRA-09

Analyte	Units	Result
THg	ng/g	219
MeHg	ng/g	134

ABD-TETRA-10

Analyte	Units	Result
THg	ng/g	175
MeHg	ng/g	121

PLSA-TETRA-02

Analyte	Units	Result
THg	ng/g	101
MeHg	ng/g	63.8

PLSA-LYCO-03

Analyte	Units	Result
THg	ng/g	385
MeHg	ng/g	256

PLSA-LYCO-02

Analyte	Units	Result
THg	ng/g	184
MeHg	ng/g	162

PLSA-LYCO-01

Analyte	Units	Result
THg	ng/g	241
MeHg	ng/g	225

PLSA-TETRA-07

Analyte	Units	Result
THg	ng/g	88.3
MeHg	ng/g	55.4

Legend

- Lycosid Spider Trap Location
- Tetragnathid Spider Sampling Extent
- Dam Safety Stop
- Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.

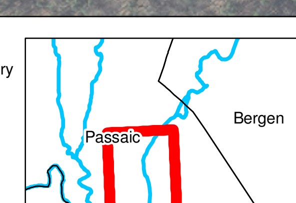


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Figure 6-9a
Spider Tissue Analytical Results- Pompton Lake Study Area
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Pompton Lakes, New Jersey

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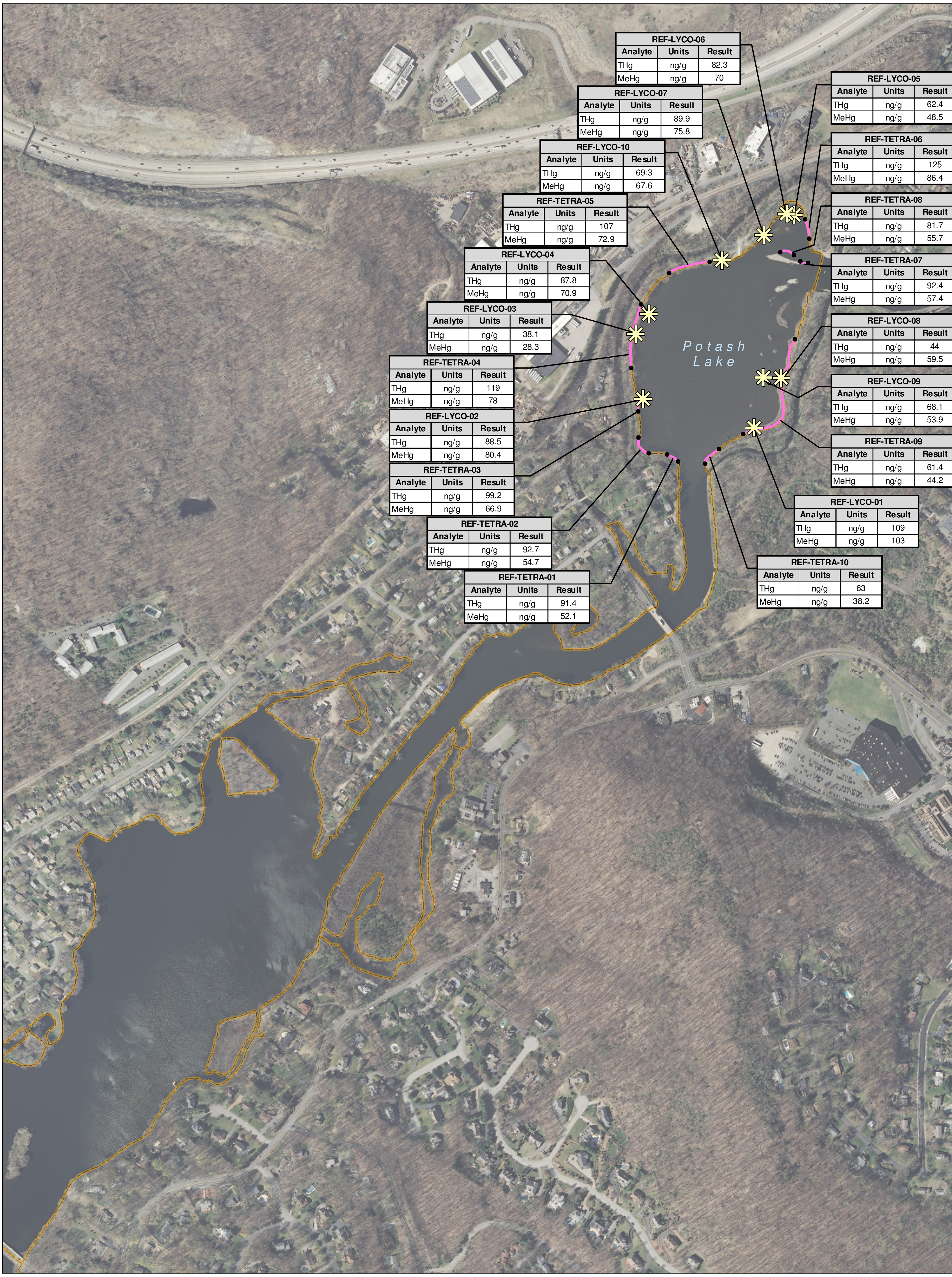

Legend

- Lycosid Spider Trap Location
- Tetragnathid Spider Sampling Extent
- Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery

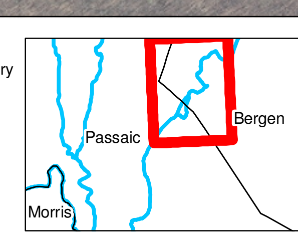

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Figure 6-9b
Spider Tissue Analytical Results - Reference Area
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Figure 6-10
Average Total Mercury and Methylmercury Concentrations in Spider Tissue by Study Area
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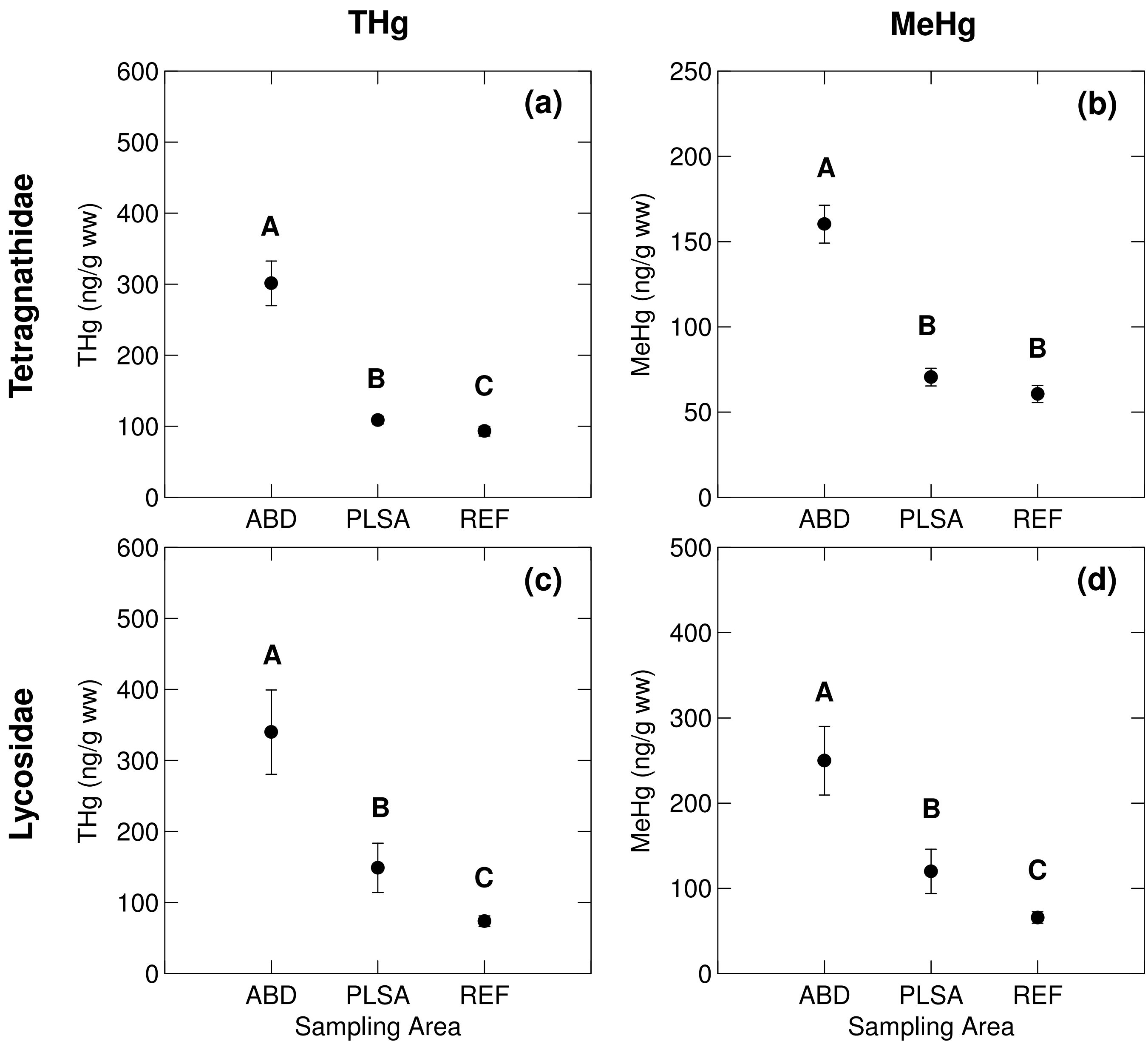
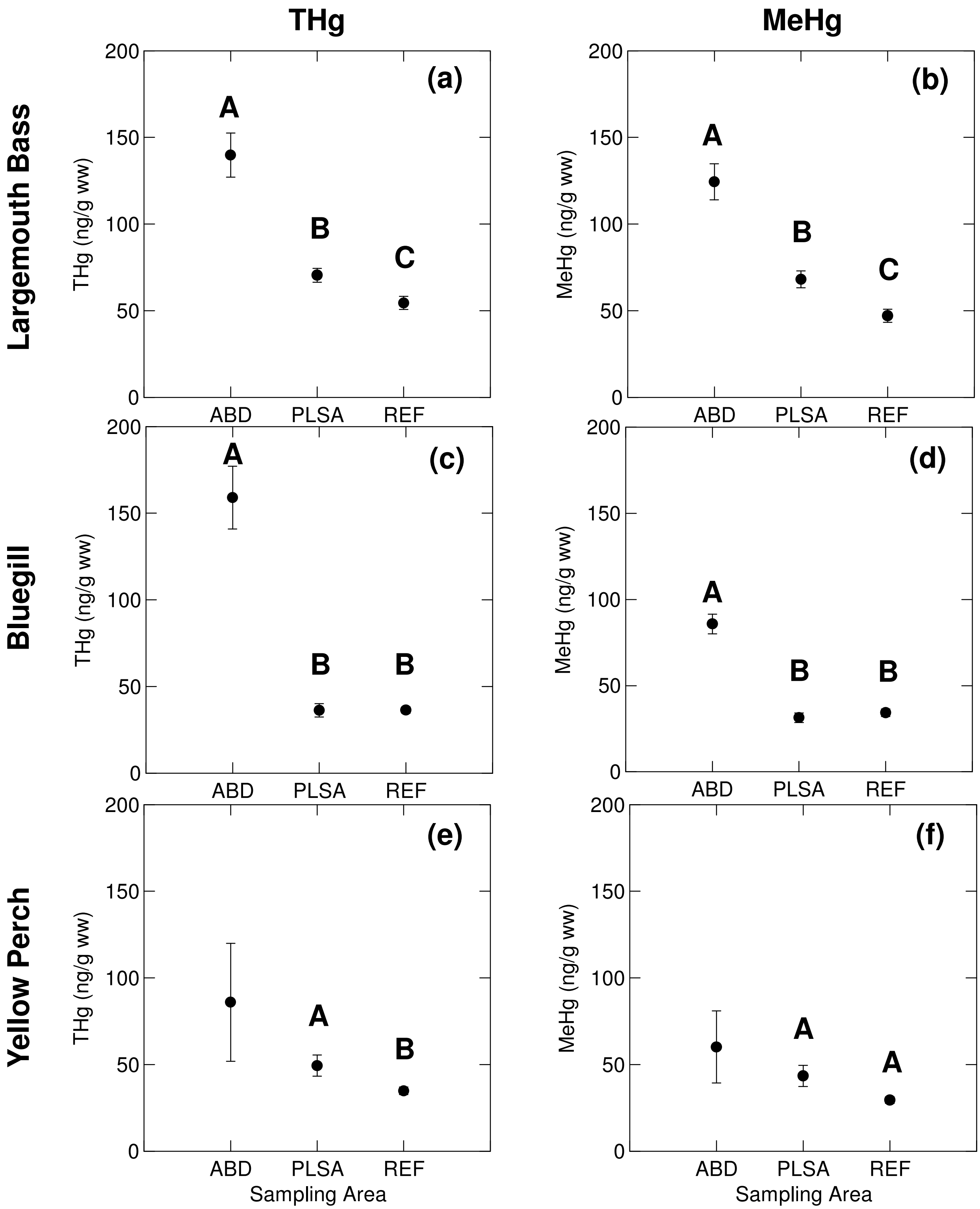
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in composite Tetragnathid and Lycosid samples collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on parametric analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) post hoc analysis; to maximize statistical power one-tailed t-tests were conducted to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences between areas (α= 0.05) are represented by different letters; identical letters indicate no statistical differences between areas.

Figure 6-11
Average Total Mercury and Methylmercury Concentrations in Young-of-Year (YOY) Fish by Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in whole body composite young-of year fish samples collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on parametric analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) post hoc analysis; to maximize statistical power one-tailed t-tests were conducted to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences between areas (α= 0.05) are represented by different letters; identical letters indicate no statistical differences between areas. Statistical comparisons of yellow perch tissue residues were not conducted for the ABD due to low sample size (n = 2).

Figure 6-12
Comparison of Young-of-Year (YOY) Fish Tissue Concentrations by Study Area and Sampling Event
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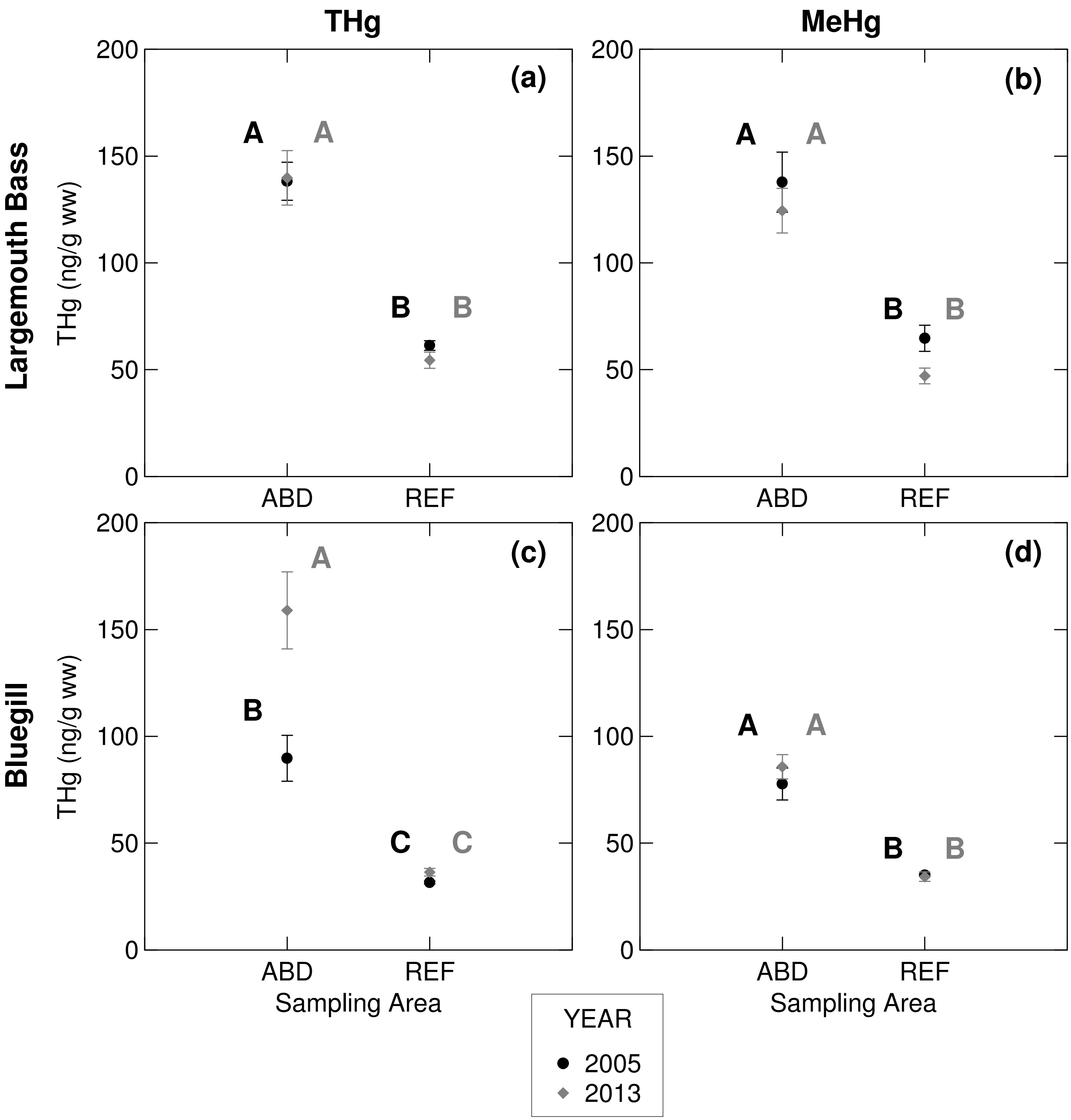
Pompton Lakes, New Jersey



Notes: Data shown are the concentrations of total mercury and methylmercury in whole body YOY fish tissue samples collected at Acid Brook Delta (ABD), and Reference Area (REF) sample locations in 2005 and 2013. Data are represented as the mean ± standard error (SE). Two-way ANOVA w/ Tukey Honestly Significant Difference (HSD) post hoc analyses were used to test for significant differences (α= 0.05) among sampling areas and years. Statistically significant differences between areas (α= 0.05) are represented by different groups; identical letters indicate no statistical differences between groups.

Figure 6-13
Average Total Mercury and Methylmercury Concentrations in Adult Largemouth Bass by Study Area
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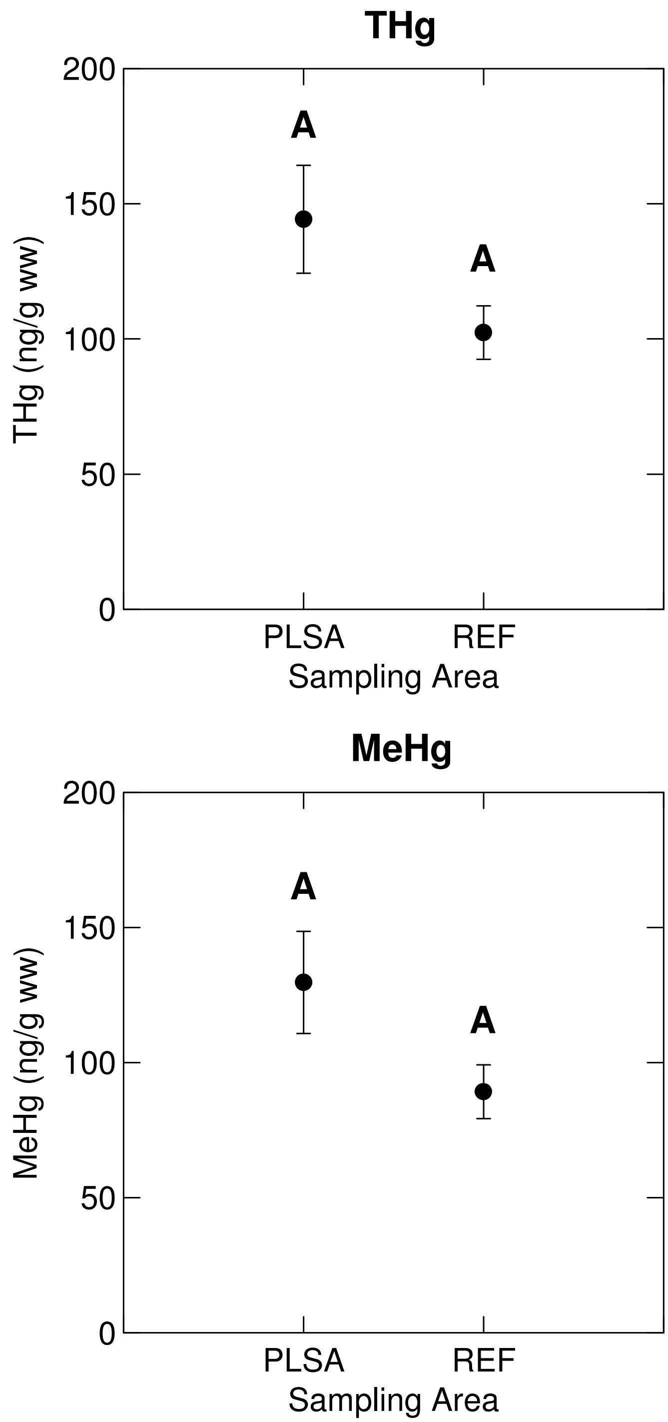
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in adult largemouth bass samples collected at Pompton Lake Study Area (PLSA) and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on one-tailed comparisons using a non-parametric Mann-Whitney test to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences ($\alpha = 0.05$) between areas are represented by different letters; identical letters indicate no statistical differences between areas.

Figure 6-14
Average Total Mercury and Methylmercury Concentrations in Other Adult Fish by Study Area
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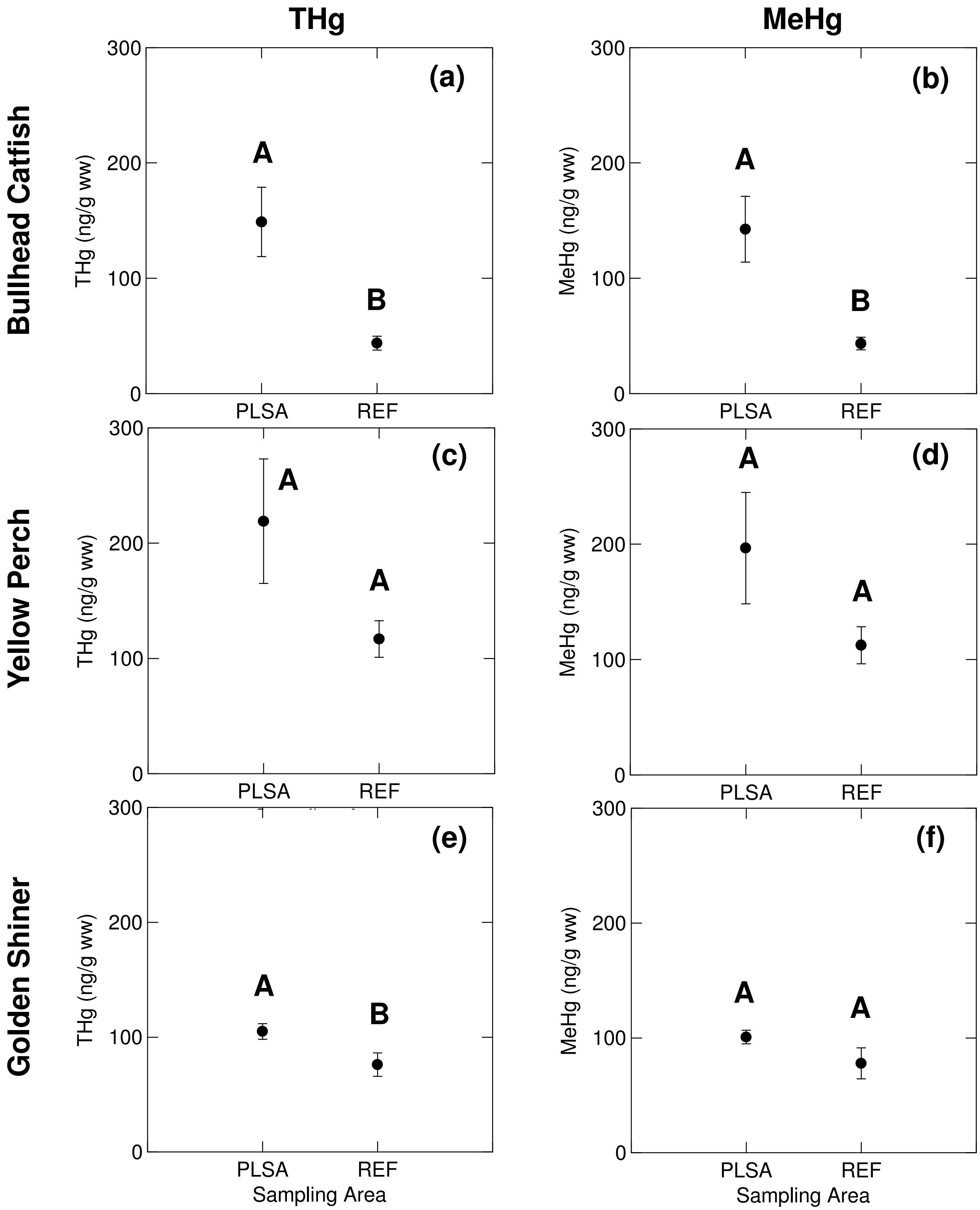
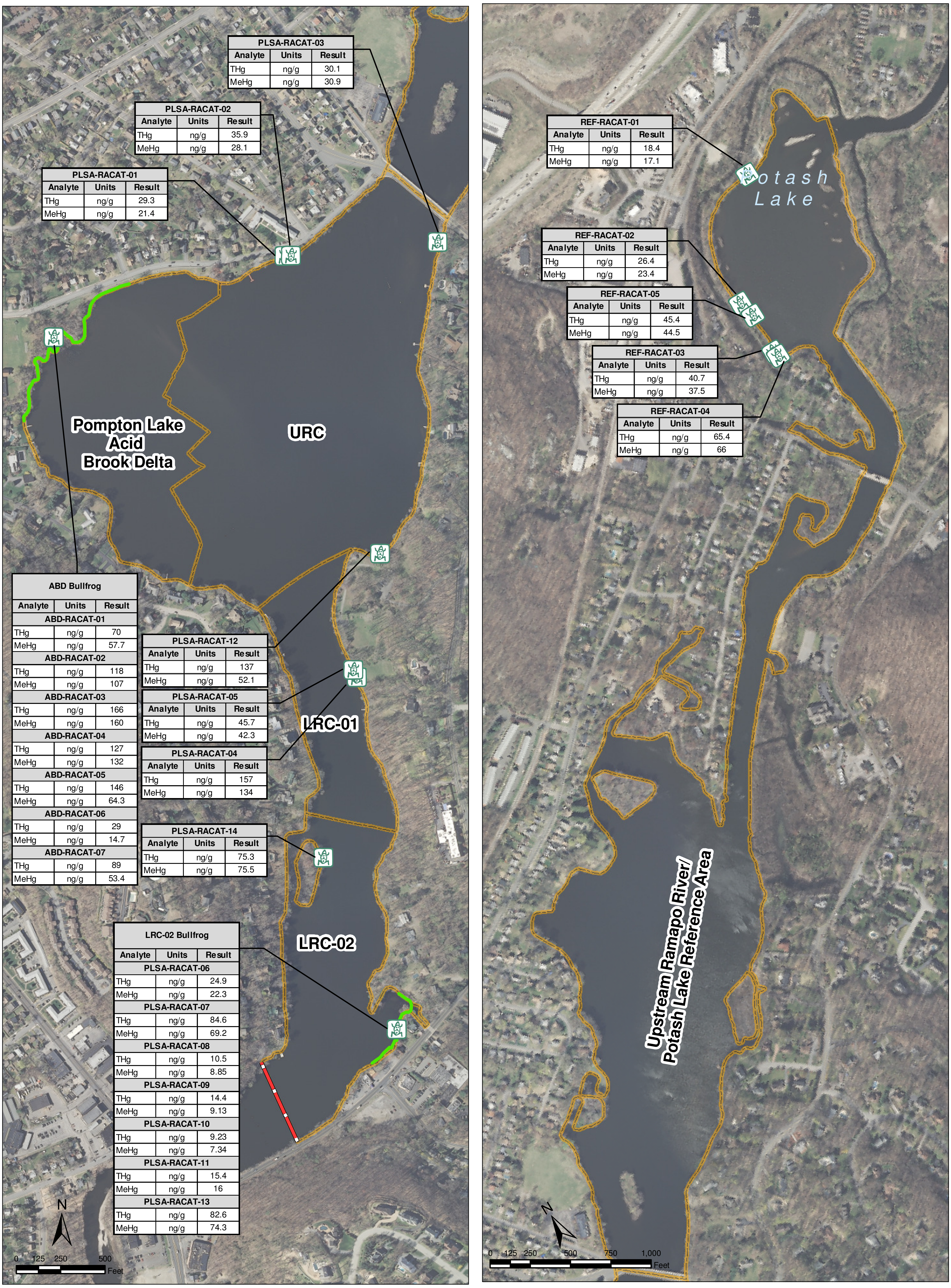
Pompton Lakes, New Jersey



Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in individual whole body adult fish tissue samples collected at Pompton Lake Study Area (PLSA) and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on one-tailed comparisons using a parametric t-test to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences (α= 0.05) between areas are represented by different letters; identical letters indicate no statistical differences between areas. Yellow bullhead (*Ameiurus natalis*) and brown bullhead (*Ameiurus nebulosus*) were pooled as "Bullhead Catfish" for data analysis.



PLSA-RACAT-03

Analyte	Units	Result
THg	ng/g	30.1
MeHg	ng/g	30.9

PLSA-RACAT-02

Analyte	Units	Result
THg	ng/g	35.9
MeHg	ng/g	28.1

PLSA-RACAT-01

Analyte	Units	Result
THg	ng/g	29.3
MeHg	ng/g	21.4

ABD Bullfrog

Analyte	Units	Result
ABD-RACAT-01		
THg	ng/g	70
MeHg	ng/g	57.7
ABD-RACAT-02		
THg	ng/g	118
MeHg	ng/g	107
ABD-RACAT-03		
THg	ng/g	166
MeHg	ng/g	160
ABD-RACAT-04		
THg	ng/g	127
MeHg	ng/g	132
ABD-RACAT-05		
THg	ng/g	146
MeHg	ng/g	64.3
ABD-RACAT-06		
THg	ng/g	29
MeHg	ng/g	14.7
ABD-RACAT-07		
THg	ng/g	89
MeHg	ng/g	53.4

PLSA-RACAT-12

Analyte	Units	Result
THg	ng/g	137
MeHg	ng/g	52.1

PLSA-RACAT-05

Analyte	Units	Result
THg	ng/g	45.7
MeHg	ng/g	42.3

PLSA-RACAT-04

Analyte	Units	Result
THg	ng/g	157
MeHg	ng/g	134

PLSA-RACAT-14

Analyte	Units	Result
THg	ng/g	75.3
MeHg	ng/g	75.5

LRC-02 Bullfrog

Analyte	Units	Result
PLSA-RACAT-06		
THg	ng/g	24.9
MeHg	ng/g	22.3
PLSA-RACAT-07		
THg	ng/g	84.6
MeHg	ng/g	69.2
PLSA-RACAT-08		
THg	ng/g	10.5
MeHg	ng/g	8.85
PLSA-RACAT-09		
THg	ng/g	14.4
MeHg	ng/g	9.13
PLSA-RACAT-10		
THg	ng/g	9.23
MeHg	ng/g	7.34
PLSA-RACAT-11		
THg	ng/g	15.4
MeHg	ng/g	16
PLSA-RACAT-13		
THg	ng/g	82.6
MeHg	ng/g	74.3

REF-RACAT-01

Analyte	Units	Result
THg	ng/g	18.4
MeHg	ng/g	17.1

REF-RACAT-02

Analyte	Units	Result
THg	ng/g	26.4
MeHg	ng/g	23.4

REF-RACAT-05

Analyte	Units	Result
THg	ng/g	45.4
MeHg	ng/g	44.5

REF-RACAT-03

Analyte	Units	Result
THg	ng/g	40.7
MeHg	ng/g	37.5

REF-RACAT-04

Analyte	Units	Result
THg	ng/g	65.4
MeHg	ng/g	66

Legend

- American Bullfrog Location
- American Bullfrog Sampling Extent
- Dam Safety Stop
- Study Area

Reference:
NJDEP 2012 Aerial Imagery

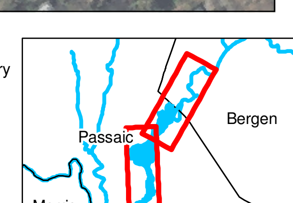


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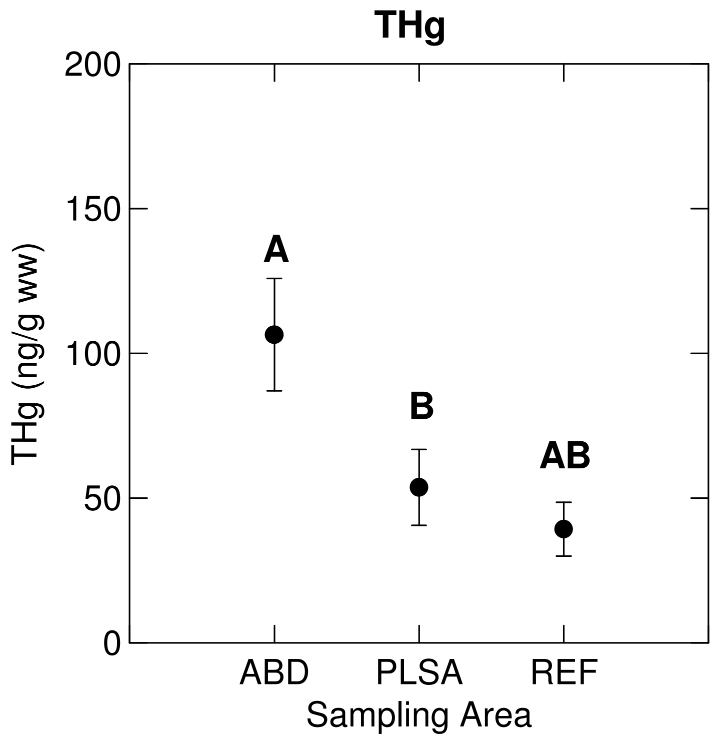
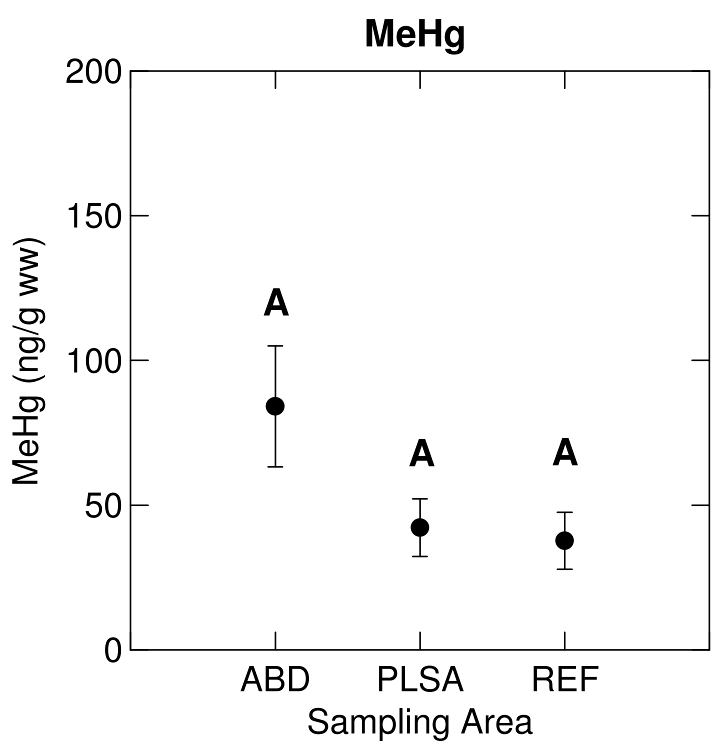
Figure 6-15
American Bullfrog Analytical Results
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure 6-15 Amphibian Tissue Analytical Results.mxd

Figure 6-16
Average Total Mercury and Methylmercury Concentrations in American Bullfrog by Study Area
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey





Notes: Data shown are the mean ± standard error (SE) concentrations of THg and MeHg in individual whole body American bullfrog samples collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and reference area (REF) sample locations. As indicated in Table 6-1, statistical comparisons were conducted based on parametric analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) post hoc analysis; to maximize statistical power one-tailed t-tests were conducted to evaluate whether concentrations in the PLSA were greater than REF. Statistically significant differences between areas ($\alpha = 0.05$) are represented by different letters; identical letters indicate no statistical differences between areas.

Appendices

Appendix A

Sediment Quality Triad Report

Appendix A: Sediment Quality Triad Investigation Report
2013 Pompton Lake Ecological Investigation
DuPont Pompton Lakes Works

Date: March 2014

Project No.: 18986472.00007

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Appendices

Acronym List

Acronym	Explanation
ABD	Acid Brook Delta
AFDW	Ash Free Dry Weight
ANSP	Academy of Natural Sciences - Philadelphia
ASTM	American Society for Testing and Materials
AVS	Acid Volatile Sulfides
CCME	Canadian Council of Ministers of the Environment
CMI WP	Corrective Measures Implementation Work Plan
CV-AFS	Cold-Vapor Atomic Fluorescence
ECSM	Ecological Conceptual Site Model
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ESC	Ecological Screening Criteria
GPS	Global Positioning System
H	Shannon-Weaver Diversity Index
HBI	Hilsenhoff Biotic Index (HBI)
ISQG	Canadian Interim Sediment Quality Guidelines
LEL	Lowest Effects Level
LMII	Lake Macroinvertebrate Integrity Index
LOE	Line-of-Evidence
LOEC	Lowest Observable Effects Concentration
LRC	Lower Ramapo River Channel
LTL	Lower Tolerance Limit
MeHg	Methylmercury
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCO	Non-Chironomid/Oligochaete
NJDEP	New Jersey Department of Environmental Protection
NJSWQS	New Jersey Surface Water Quality Standards
NMDS	Non-Metric Multidimensional Scaling
NOEC	No Observable Effects Concentration
NRWQC	National Recommended Water Quality Criterion
ORP	Oxygen Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbons
PEC	Probable Effects Concentration
PEC-Q	Probable Effects Concentration Quotient
PEL	Probable Effects Level
PLSA	Pompton Lake Study Area
PW-TU	Pore Water Toxic Units
QA/QC	Quality Assurance/Quality Control
REV	Reference Envelope Value
RPD	Relative Percent Difference
RPM	Revolutions Per Minute
SEL	Severe Effects Level
SEL-Q	Severe Effects Level Quotient
SEM	Simultaneously Extractable Metals
SETAC	Society of Environmental Toxicology and Chemistry
SOW	Scope of Work
SQB	Sediment Quality Benchmark

Acronym	Explanation
SQB-Q	Sediment Quality Benchmark Quotients
SQT	Sediment Quality Triad
SVOC	Semi-Volatile Organic Compound
TAC	Test Acceptability Criteria
TAL	Target Analyte List
TCL	Target Compound List
TEC	Threshold Effects Concentration
THg	Total Mercury
TOC	Total Organic Carbon
tPAH	Total Polycyclic aromatic hydrocarbons
URC	Upper Ramapo River Channel
USFWS	United States Fish and Wildlife Service
WOE	Weight-of-Evidence

1.0 Introduction

A sediment quality triad (SQT) investigation was conducted to evaluate potential adverse effects to benthic macroinvertebrate communities exposed to mercury in sediments from areas of Pompton Lake outside of the Acid Brook Delta (ABD) remedial action area, as defined in the *Corrective Measures Implementation Work Plan* (CMI WP; ARCADIS et al., 2011). The sediment evaluations were part of ecological investigations conducted in 2013 to confirm or further refine the ecological conceptual site model (ECSM) for potential direct contact and bioaccumulation exposure pathways in Pompton Lake [Exponent, 2003; DuPont Corporate Remediation Group (CRG), 2006]. The findings of the 2013 Ecological Investigation will be used to support remedial-decision making for mercury in sediments outside of the ABD remedial action area.

The SQT approach evaluates sediment quality by integrating spatially- and temporally-matched sediment chemistry, biological, and toxicological information (Long and Chapman 1985; Chapman et al., 1987). Benthic macroinvertebrate community analysis and sediment toxicity testing provide site-specific information regarding potential ecological effects of direct contact exposure of mercury to benthic invertebrates in sediment within the study area. These additional lines of evidence (LOEs) supplement traditional bulk sediment and pore water chemistry data to provide a more relevant, site-specific assessment of risks. The multiple LOEs measured in the SQT investigation are integrated into a weight-of-evidence (WOE) evaluation of potential sediment toxicity.

The SQT investigation was conducted in September 2013 in general accordance with scope of work (SOW) #7 *Sediment Quality Triad Investigation and Sediment/Pore Water Characterization* submitted to the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), and New Jersey Department of Environmental Protection (NJDEP) on August 14, 2013. In a letter dated November 5, 2013, EPA, USFWS, and NJDEP provided comments on SOW #7 and other SOWs submitted as part of the 2013 Ecological Investigation. Additional sampling stations were added to the investigation following the submittal of the SOW to further enhance the sampling design based on the preliminary results of sediment sampling for total mercury (THg) conducted in August and September 2013 [ARCADIS, 2013; URS Corporation (URS), 2013b].

This report presents the objectives, methods, and findings of the SQT investigation conducted during the 2013 Ecological Investigation. The findings presented in this report will be used to support the assessment of ecological risk to benthic macroinvertebrate communities outside of the ABD remedial action area, as presented in the *2013 Pompton Lake Ecological Investigation Report* (Ecological Investigation Report).

2.0 Study Objectives

The overall objective of the SQT studies conducted in Pompton Lake in areas outside of the CMI WP removal limit was to incorporate site-specific ecological effects information to identify the concentrations of THg and methylmercury (MeHg) in sediments and pore water that may be associated with adverse effects to benthic macroinvertebrate receptors. Specific study objectives for the SQT investigation were to evaluate potential mercury-associated toxicity across a gradient of THg concentrations in sediment in representative habitats within study and reference area based on the following:

- *In situ* evaluations of potential differences in benthic macroinvertebrate community structure
- *Ex situ* evaluations of sediment toxicity to freshwater invertebrate test organisms in long-term sediment toxicity tests
- Comparisons of measured THg and MeHg concentrations in sediment and pore water to literature-derived benchmarks for sediment and aqueous exposures, respectively

In addition to SQT studies, mercury concentrations in sediment and pore water were characterized at additional stations within the study area. The objective of the additional sediment and pore water characterization was to provide data to develop site-specific exposure point concentrations (EPCs) for benthic macroinvertebrates over a broader spatial extent within the study area. EPCs for sediment and pore water were evaluated in the context of the findings of the SQT studies to assess the potential for mercury-associated effects on benthic macroinvertebrate communities. The results of these exposure analyses are presented in Section 6.1.2 of the Ecological Investigation Report; the additional characterization data are not discussed explicitly in this report.

3.0 Sampling Design and Approach

The following sections provide specific details regarding the study design and sampling approach for the SQT studies conducted in Pompton Lake in September 2013.

3.1 Sampling Design

The SQT investigation evaluated potential impacts to benthic macroinvertebrate communities within Pompton Lake relative to upstream reference areas. The spatial extent of the Pompton Lake study area and reference areas are defined as follows:

- Pompton Lake Study Area (PLSA): Areas within Pompton Lake outside of the 2011 CMI WP removal area limit extending upstream to the Lakeside Avenue Bridge and downstream to a safety buffer area upstream of the Pompton Lake Dam (see Figure A-1). For the purposes of data presentation, this study area was further divided into sub-study areas for the investigation:
  - PLSA – Upper Ramapo River Channel (URC): Pompton Lake study area east of the 2011 CMI WP removal area limit from the Lakeside Avenue Bridge downstream to where the Ramapo River channel narrows below the ABD.
  - PLSA – Lower Ramapo River Channel (LRC): Pompton Lake study area outside of the ABD where the Ramapo River channel narrows below the ABD to the safety buffer area upstream of the Pompton Lake Dam.
- Upstream Ramapo River/Potash Lake Reference Area: Upstream reference area on the Ramapo River extending from the Lakeside Avenue Bridge approximately 1.5 miles upstream to Potash Lake (see Figure A-1).

Twenty-two stations were sampled for evaluation in the 2013 SQT studies within the PLSA (n=17) and reference area (n=5). The following sections present the rationale for the selection of SQT stations in each area.

3.1.1 Selection of SQT Stations within the Pompton Lake Study Area

The number and distribution of SQT stations were selected to reflect a gradient of surficial sediment THg concentrations and to provide adequate spatial coverage within representative habitat types in the PLSA. A distribution of sampling stations across a range of THg concentrations is necessary to elucidate potential dose-response relationships between sediment mercury concentrations and ecological effects where they may exist. Ideally, predictable dose-response relationships must be demonstrated with empirical field data to identify a range of potential ecological effects thresholds that may be considered in remedial decision making.

Existing sediment data were used to select SQT sampling stations within representative substrate/habitat types present in the PLSA. THg data collected as part of previous investigations were used as the basis for selecting stations to represent a gradient of sediment mercury concentrations (CRG, 2006; CRG, 2008). THg concentrations reported for the surface interval (0 – 0.5 feet), which is operationally defined as the bioactive zone for benthic macroinvertebrate receptors (EPA, 2001), were used the primary basis for selecting stations to represent the exposure gradient for mercury. However, THg concentrations from shallow subsurface sampling intervals (>0.5 to <2.0 feet) were also considered in identifying stations with elevated THg concentrations below the bioactive zone relative to surface concentrations. Sampling stations were selected based on substrate/habitat types identified during the May 2013 side-scan sonar mapping of the lake bottom (ARCADIS, 2013). Figures A-2a and A-2b illustrate the locations of SQT stations (Category I stations) within the PLSA URC and PLSA LRC, respectively; Table A-1 presents a summary of physical attributes observed at SQT stations.

In addition to sediment THg concentrations and habitat/substrate type, spatial coverage was also considered in the selection of SQT stations. SQT stations were positioned to provide representative coverage of the PLSA, with spatial bias to the area adjacent to the 2011 CMI Work Plan removal limit (see Figure A-2a). The greatest concentrations and the greatest variability in sediment THg concentrations outside of the ABD were measured in previous investigations in this area. Based on historical sediment THg concentrations, six SQT stations were selected from this area to represent the upper range of the expected THg concentration gradient and to spatially represent exposure adjacent to the 2011 CMI Work Plan removal limit.

Additional sediment data obtained in August and September 2013 were used to evaluate the adequacy of the sampling design and to add supplemental stations, as necessary, to satisfy the objective of testing the expected gradient of sediment THg concentrations. Extensive sediment characterization sampling was conducted in August 2013 to confirm existing data and further characterize sediment THg concentrations within the PLSA (ARCADIS, 2013). In addition, the sampling and analyses of the six SQT stations located adjacent to the 2011 CMI Work Plan removal limit were expedited in early September 2013 to evaluate whether the upper range of the intended THg concentration gradient was adequately captured. These additional sediment data were evaluated in the context of the study objectives and the following stations were added to enhance the sampling design:

- PLSA-C1-40: An additional station was located within the ABD to capture the upper range of the THg concentration gradient within the PLSA. Expedited analyses of the six SQT stations located adjacent to the 2011 CMI Work Plan removal limit indicated a maximum THg concentration of 12.4 µg THg/g (PLSA-C1-22) within the PLSA, which was lower than the intended maximum concentration targeted in the initial sampling design. The THg concentration of 23.5 µg THg/g measured at the additional station (PLSA-C1-40) represents the maximum concentration evaluated in the SQT study; this maximum concentrations is within the desired upper concentration range of 20 to 30 µg THg/g indicated by EPA in the November 5, 2013 comment letter on SOW #7 (EPA, 2013).
- PLSA-C1-39: An additional SQT station was added to the lower Ramapo River channel portion of Pompton Lake based on the results of additional sediment characterization sampling conducted in August 2013 (see Figure A-2b; ARCADIS, 2013). The THg concentration measured in the surficial sampling interval (0 to 0.5 feet) at this station during the August 2013 sampling event was 19.6 µg/g, which was greater than concentrations evaluated for this area during the design of the SQT investigation. An additional SQT station was added to

evaluate potential mercury-associated effects on benthic macroinvertebrate communities at this location.

3.1.2 Selection of SQT Stations within the Reference Area

Five stations were sampled upstream of the Lakeside Avenue Bridge to provide reference data for comparisons with SQT results from stations within the PLSA (see Figure A-2c). As stated in SOW #7, reference stations were selected consistent with the following criteria:

- Contaminant concentrations consistent with regional background, with no known or potential sources of contamination from the site
- Substrate characteristics (grain size distribution, organic content, etc.) qualitatively similar to SQT stations within the PLSA
- A range of water depths or habitat zones at reference stations comparable to the range of water depths or habitats at SQT stations within the PLSA

3.2 Sampling Approach and Methodology

A systematic sampling approach was implemented to collect data to support the multiple LOEs evaluated in the SQT investigation. The following sediment samples were collected from the surface sediment interval (0 to 0.5 feet) at each SQT station:

- Discrete grab samples (n = 5)[1] for benthic macroinvertebrate community analysis
- Discrete grab sample for *ex situ* extraction of pore water
- Composite grab samples to obtain at least 8 liters of sediment for toxicity testing and 1 liter of sediment for bulk sediment analysis

At each SQT station, aliquots of sediment were collected from an undisturbed grab sample for analyses of acid volatile sulfides and simultaneously extractable metals (AVS-SEM), MeHg, and THg; aliquots for these analyses were sampled from undisturbed grab samples to minimize changes in sediment reduction-oxidation (redox) conditions that may result from sample manipulation and homogenization. In addition, undisturbed bulk sediment was submitted to the analytical laboratory for *ex situ* extraction of pore water. Additional grab samples were collected and composited for submittal to the sediment toxicity testing laboratory; aliquots of the homogenized composite for sediment toxicity testing were submitted to the laboratory for analyses of the other analytical parameters. Discrete grab samples were collected and processed for benthic community analyses.

The approximate center of each SQT sampling station was recorded using a Trimble GeoXH global positioning system (GPS) unit with sub-meter accuracy. Additionally, near-bottom surface water quality parameters [i.e., temperature, dissolved oxygen, pH, conductivity, and oxygen reduction potential (ORP)] were measured at each sampling

[1] SOW #7 specified the collection of three replicate samples for benthic community analyses; however, two additional replicate samples were also collected and archived for potential future analysis if the intra-station variability of the initial three replicates precluded meaningful interpretation of the community results.

station. Additional details regarding the collection of sediment and pore water to support the three LOEs are provided in the following sections.

3.2.1 Bulk Sediment Analyses

Bulk sediment samples were collected at SQT stations to provide representative analytical data for comparison to sediment quality benchmarks (SQBs) and to establish EPCs for comparisons with the results of the benthic community and sediment toxicity studies.

Samples for bulk sediment analyses were collected from the composite sample collected for sediment toxicity testing using a standard Ponar grab sampler. Aliquots from the first undisturbed Ponar grab included in the composite sample were collected for analyses of AVS-SEM (EPA Method 821-R-91-100), MeHg (BRL-0011[2]), and THg (EPA Method 1631) to minimize changes in sediment redox conditions that may result from sample manipulation and homogenization. Aliquots for these analyses were collected from the top of the closed Ponar sampler with a small diameter dedicated butyrate core liner inserted at the midpoint of the sampler. Aliquots removed from the undisturbed sample were transferred to laboratory-supplied bottleware and filled to zero headspace. THg and MeHg samples were submitted for analysis to Brooks Rand Labs, LLC (Brooks Rand Labs in Seattle, Washington). The remaining sediment grab samples were composited and homogenized to obtain sufficient sample volume for sediment toxicity testing and analyses of the following additional analytical parameters by Eurofins Lancaster Laboratories, Inc. in Lancaster, Pennsylvania:

- Modified target analyte list (TAL) metals by EPA Method 6010B
- Target compound list (TCL) pesticides by EPA Method 8081
- TCL herbicides by EPA Method 5151
- TCL Semi-volatile organic compounds (SVOCs) by EPA Method 8270C
- TOC by EPA Method 9060
- Sediment grain size distribution by the American Society for Testing and Materials (ASTM) Method D422

Although the SQT investigation was designed specifically to evaluate mercury-associated effects, the evaluation of other potential chemical stressors that may adversely affect benthic macroinvertebrates was necessary for the interpreting the results of sediment toxicity testing and benthic community analyses.

In addition to field samples, additional sediment volume was submitted to the laboratory for quality assurance/quality control (QA/QC) analyses. QA/QC samples for sediment include duplicate analyses and matrix spike/matrix spike duplicate (MS/MSD) analyses of additional sample volumes submitted to the laboratories. Duplicate samples and

[2] MeHg was analyzed in solids according to Brooks Rand Labs Method BR-0011, which is a modification of EPA Method 1630 for the analysis of MeHg in solids. This method is based on cold-vapor atomic fluorescence spectrometry (CV-AFS) technology and is widely accepted and used for the analyses of MeHg in solid samples (e.g., Bloom, 1992).

MS/MSD samples were collected at a rate of five percent of the total samples collected in the study.

3.2.2 Pore Water Analyses

The evaluation of sediment pore water represents an important line of evidence in assessing potential toxic effects of mercury to benthic macroinvertebrates because pore water measurements provide direct information regarding the fraction of sediment-associated mercury that is likely to be most bioavailable (EPA, 2002). Pore water samples were collected at each SQT station to provide representative pore water EPCs to evaluate the findings of sediment toxicity testing and benthic community analyses. Pore water samples were extracted via centrifugation from non-homogenized bulk sediment samples submitted to Brooks Rand Labs. As stated in SOW #7, *ex situ* extraction of pore water via centrifugation was the preferred method for the collection of pore water samples in the study based on the following study constraints:

- Collection methods needed to be consistent for all stations sampled in the study so that appropriate comparisons could be made between samples (EPA, 2001).
- Water depths of SQT stations (maximum water depth greater than 15 feet) and water quality conditions precluded the use of standard *in situ* methods of pore water collection using peeper and suction methods (EPA, 2001).
- Field pore water collection methods needed to be consistent with laboratory pore water collection methods used on surrogate sediment samples in the sediment toxicity testing program (see Section 3.2.3).

Ex situ extraction of pore water via centrifugation is a standard method and is the generally preferred laboratory method for the collection of pore water [EPA, 2001; Society of Environmental Toxicology and Chemistry (SETAC), 2001; Mason et al., 1998; Besser et al., 2009; Marvin-DiPasquale et al., 2009].

Bulk sediment samples for pore water extraction were collected from an undisturbed grab sample with a dedicated butyrate core liner and transferred into three laboratory-provided 250 mL wide mouth centrifuge tubes filled to zero headspace. Filled centrifuge tubes were submitted to Brooks Rand Labs for pore water extraction via centrifugation at 3,000 revolutions per minute (RPM) for 20 minutes. Following centrifugation, the tubes were opened in a nitrogen environment to minimize alterations in redox conditions. Separated pore water was decanted and then filtered with an acid-cleaned 0.45 µm disposable filter unit. Filtered samples were prepped for THg and MeHg analyses according to EPA Method 1631 and EPA Method 1630, respectively. The centrifugation protocol remained consistent for all samples in the study to ensure consistency in methods and comparability of data.

3.2.3 Sediment Toxicity Testing

Sediment samples for toxicity testing were composited from standard Ponar grab samples to obtain at least eight to 11 liters of sediment required for toxicity testing protocols. Composite samples were homogenized and placed in opaque containers and filled to zero headspace. Composite samples were held on wet ice at approximately 4°C and transported to EnviroSystems, Inc. (EnviroSystems; Hampton, New Hampshire) as soon as practicable, typically via next day courier service.

Sediment toxicity testing was conducted based on programs and protocols developed in EPA *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates* (EPA, 2000) and the ASTM Test *Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates* (ASTM, 2012). The following chronic sediment toxicity tests were performed using sediments from SQT stations:

- 28-day *Hyalella azteca* test for survival and growth (EPA Method 100.4; EPA, 2000)
- 20-day *Chironomus dilutus* test for survival and growth (EPA Method 100.5; EPA, 2000)

The toxicity testing laboratory performed the designated tests on SQT and laboratory control sediments in accordance with test protocols established in EPA (2000), ASTM (2012), and the American Public Health Association (APHA; 2012). A laboratory control treatment was established using formulated sediments prepared in accordance with EPA (2000) and ASTM (2012). Overlying water quality was monitored daily for temperature, dissolved oxygen, pH, and specific conductance in a surrogate test chamber for each treatment. Alkalinity, ammonia, and hardness were measured in the surrogate test chamber at the start of the test and weekly thereafter. Total organic carbon (TOC) of the overlying water was measured in the surrogate chamber at the start and end of the test. Additional details regarding test set up and monitoring are provided in Appendix A-1.

At the request of EPA, additional surrogate test chambers were established with sediment from five SQT stations and sampled for pore water analyses seven days following the start of the test. Surrogate chambers were set up for pore water analyses using sediment from SQT stations at the upper range of THg concentrations expected in sediments based on historical data:

- PLSA-C1-10
- PLSA-C1-14
- PLSA-C1-19
- PLSA-C1-22
- PLSA-C1-25

On Day 7 of the toxicity test, sediment from the surrogate chambers was transferred to three 250 mL laboratory-supplied centrifuge tubes, filled with zero headspace and submitted to Brooks Rand Labs via next day courier service for pore water extraction. One 250 mL centrifuge tube was filled with sediment from the *H. azteca* surrogate chambers, one centrifuge tube was filled with sediment from the *C. dilutus* surrogate chambers, and the third centrifuge tube was filled with an equal volume of sediment from each test. Following pore water extraction, separated pore water from each tube was composited into one sample for THg and MeHg analyses by EPA Method 1631 and EPA Method 1630, respectively, as previously described in Section 3.2.2.

3.2.4 Benthic Macroinvertebrate Community Analyses

The incorporation of benthic macroinvertebrate community data into the SQT investigation provides an empirical dataset for *in situ* evaluations of potential mercury-associated impacts. Benthic macroinvertebrates are ideal bioindicators because they: 1) are abundant across a broad array of sediment types, 2) are relatively sedentary, completing most or all of their life cycle in the same microhabitat, 3) respond to the cumulative effects of various stressors having differing magnitudes and periods of exposure, and 4) integrate both the effects of stressors and the population compensatory mechanisms evolved over time to survive in a highly variable and stressful environment.

Three replicate samples for benthic macroinvertebrate community analyses were collected at each SQT station from discrete standard Ponar grab samples; two additional replicate benthic community samples were processed and archived for potential future analysis. Each replicate sample was passed through a 500-µm mesh sieve to remove fine-grained sediments; large vegetation and woody debris were rinsed over the sieve and discarded. The inside of the standard Ponar sampler was thoroughly rinsed over the sieve to remove any remaining organisms. Material retained on the sieve was transferred to a sampling container and preserved with 70 percent ethanol. Following the transfer of the sample material to the sample container, the sieve was inspected to remove any residual organisms, which were added to the sample container.

Preserved samples were submitted to EcoAnalysts, Inc. (Moscow, Idaho) for taxonomic analysis. In the laboratory, benthic community samples were subsampled using a random 200-organism sub-count in accordance with Barbour et al. (1999). Quality control on sorting procedures was checked by re-sorting 20 percent of each sample to ensure 90 percent sorting efficiency. Organisms included in the sub-count were identified to the lowest taxonomic level practical, typically genus or species. The accuracy of taxonomic identification was evaluated by the re-identification of 10 percent of the samples by an experienced taxonomist to ensure 90 percent similarity. The results of QA/QC procedures for sorting efficiency and taxonomic analyses are provided with the final data deliverable provided as Appendix A-2.

4.0 Data Evaluation Approach

The following sections present the approach for evaluating data for each LOE studied in the SQT investigation. A framework is also presented for integrating the findings of the SQT investigation into a WOE of potential sediment toxicity in the PLSA.

4.1 Bulk Sediment and Pore Water Chemistry Evaluation

The following sections describe the approach for evaluating benthic macroinvertebrate exposure to bulk sediment and pore water at SQT stations.

4.1.1 Bulk Sediment

The results of sediment mercury analyses were compared to generic SQBs to evaluate potential for mercury-associated effects based on bulk sediment chemistry. As discussed in detail in Section 5.1.1 of the Ecological Investigation Report, generic SQBs are typically derived from large co-occurrence databases of sediment chemistry and toxicity data from a wide range of freshwater environments. The resulting SQBs have limited relevance to site-specific exposures and may not reflect a reliable cause and effect relation between exposure to an individual constituent, like mercury, and an ecological effect observed in test organisms exposed to a mixture of constituents in a sediment toxicity test. Recognizing these limitations, THg concentrations were compared to the severe effects level (SEL) of 2.0 µg THg/g developed by Persaud et al. (1992) and adopted by the NJDEP as an upper bound ecological screening criterion (ESC) for mercury in freshwater sediment. The SEL has been used in previous investigations of potential mercury toxicity to benthic organisms in Pompton Lake [Exponent and Academy of Natural Sciences – Philadelphia (ANSP), 2003]. An SQB was not identified from the available literature sources of ecological screening values to evaluate potential exposure to MeHg in sediments.

The results of bulk sediment analyses of non-mercury constituents were compared to SQBs to evaluate the potential for adverse effects to benthic macroinvertebrate communities resulting from exposure to other sediment-associated constituents. Sediment quality benchmarks were obtained from the following literature-based sources:

- Threshold effects concentrations (TECs) and probable effects concentrations (PECs) developed by MacDonald et al. (2000)
- NJDEP ESCs for Freshwater Sediment: Compilation of ecological screening criteria from various sources for use in ecological assessments
- EPA Region 5 Ecological Screening Benchmarks (EPA, 2003)
- Canadian Interim Sediment Quality Guidelines (ISQG) and Probable Effects Level (PEL) as developed by the Canadian Council of Ministers of the Environment (CCME; 2013)

To bracket potential benthic macroinvertebrate exposure to non-mercury constituents in sediment, two-tiers of benchmarks were identified, as available:

- SQB_{Low}: Screening-level benchmark concentrations below which adverse effects are not likely to occur [e.g., lowest effects level (LEL) or TEC].
- SQB_{High}: Upper bound benchmark concentrations that have been associated with adverse effects to benthic macroinvertebrates (e.g., SEL or PEC).

4.1.2 Pore Water

Mercury concentrations measured in pore water were compared to ecological benchmarks derived from water quality criteria and aqueous toxicity studies presented in the literature for benthic macroinvertebrates. Aqueous studies presenting concentration-response relationships for survival and growth endpoints based on benthic macroinvertebrate test organisms were prioritized for the evaluation of potential THg effects associated with exposure to pore water (Chibunda, 2009; Azevedo-Pereira and Soares, 2010; Valenti et al., 2005). Toxicological data on the effects of aqueous exposures of MeHg on benthic macroinvertebrate test organisms are not extensive; however, water quality screening benchmarks for MeHg have been derived for the general protection of aquatic life [Canadian Council of Ministers of the Environment (CCME), 2003; Suter, 1996; Suter and Tsao, 1996]; water quality screening benchmarks were conservatively used to evaluate aqueous exposure to MeHg. As discussed in greater detail in Section 5.1.1 of the *2013 Pompton Lake Ecological Investigation Report*, the following benchmarks were identified to evaluate potential ecological effects associated with THg and MeHg concentrations in pore water.

Mercury Form	**Pore Water Benchmark**		**Basis**
	NOEC (ng/L)	**LOEC (ng/L)**	
THg	4,000	7,000	Bounded no observable effects concentration (NOEC) and lowest observable effects concentration (LOEC) derived based on the relative growth of benthic macroinvertebrates evaluated in Chibunda (2009); Azevedo-Pereira and Soares, (2010); Valenti et al. (2005).
MeHg	4	40	NOEC represents the CCME *Water Quality Guideline for the Protection of Aquatic Life* derived based on a LOEC of 40 ng/L for daphnid reproduction divided by a safety factor of 10 (CCME, 2003).

4.2 Sediment Toxicity Evaluation

The evaluation of sediment toxicity was based on the following chronic test endpoints measured at the end of the exposure period for each respective test:

- 28-day *H. azteca*: 28-day survival (percent), growth (mg dry weight per surviving individual), and biomass (mg dry weight per exposed individual)

- 20-day *C. dilutus*: 20-day survival (percent), growth [ash free dry weight (AFDW) per surviving individual], and biomass (mg AFDW per exposed individual)

Quantitative comparisons between sediment toxicity endpoints were conducted based on pairwise statistical comparisons and the reference envelope approach to evaluate the potential significance of any observed differences in survival, growth, or biomass of test organisms between PLSA and reference SQT stations.

4.2.1 Reference Envelope Approach

The reference envelope approach was used to evaluate potential differences in toxicity endpoints in the context of the potential variability associated with reference conditions and/or testing procedures. The reference envelope approach has been applied in sediment toxicity testing programs as a means to distinguish between non-contaminant-related sources of variability in reference area toxicity test results and contaminant-related toxicity associated with exposure to impacted sediments (Hunt et al., 2001; MacDonald et al., 2009; Ingersoll et al., 2009a; Ingersoll et al., 2009b).

The reference envelope approach establishes a reference envelope value (REV), which represents a lower limit of endpoint values that may be attributed to non-contaminant-related sources of variability in sediment toxicity tests from reference areas. For each endpoint, the REV is compared to the mean endpoint value measured in toxicity tests from an individual PLSA station to evaluate incremental toxicity relative to reference area sediments. If the mean endpoint value calculated for a given PLSA station is lower than the REV, the result is considered to be indicative of a potentially negative (i.e., toxic) response for that endpoint.

The performance of toxicity tests conducted using reference area sediments satisfies chemical and biological criteria that have been established for the application of the reference envelope approach:

- Minimal contaminant concentrations in reference sediments: Mean PEC quotients expressed at 1% sediment organic carbon (PEC-$Q_{1\%\ TOC}$)[3] were less than 0.2 for all five SQT reference stations; this benchmark has been previously used to identify sediments with minimal contamination (Ingersoll et al., 2009a).
- Percent survival exceeding 75 percent of control survival: Mean survival for *H. azteca* and *C. dilutus* exceeded 75 percent of control survival in tests conducted on sediment from all five SQT reference stations; this benchmark has been used as a criterion for the reference envelope approach to ensure that non-contaminant or unmeasured contaminant stressors were not adversely affecting test performance in reference sediments (EPA, 2004; MacDonald et al., 2009; Ingersoll et al., 2009b).

Satisfaction of these criteria indicates that the sediment toxicity endpoints from reference area SQT stations are suitable for the application of the reference envelope approach to categorize potential sediment toxicity at PLSA stations.

[3] The mean PEC-$Q_{1\%TOC}$ was calculated as the mean of the ratios of measured concentrations to available PECs expressed at 1% TOC (MacDonald et al., 2000).

In the evaluation of potential toxic responses in PLSA sediments, REVs were established at the lower limit of the response measured in tests of reference area sediments. REVs have been established in sediment toxicity testing programs as the lower 5^{th} percentile (MacDonald et al., 2009; Ingersoll et al., 2009a) or the lower tolerance limit (LTL) of the 5^{th} percentile of mean endpoint values from reference stations (Hunt et al., 2001). In studies where the number of reference stations is limited (e.g., less than 10 stations), the minimum mean endpoint value of reference stations has been established as the REV to represent the lower limit of the reference response range (Ingersoll et al., 2009b). Given that five reference SQT stations were evaluated in the current study, the minimum mean endpoint value measured from these five reference stations was established as the REV for each toxicity endpoint.

Established REVs were used as the basis for evaluating whether a response for a given endpoint in PLSA toxicity tests was toxic relative to the reference response. If the mean endpoint value measured at a PLSA station exceeded the REV, it was concluded that the test response was within the reference envelope and not different than the variability observed in tests from reference stations. If the mean PLSA endpoint value was lower than the REV, the PLSA endpoint values were compared statistically with the endpoint values from the reference station used to establish the REV. If there was no statistical difference between the PLSA endpoint values and the REV station endpoint values, it was concluded that the result was not different than the variability in reference tests. If the PLSA endpoint values were statistically lower than the REV station endpoint values, it was concluded that the response was significantly lower than the lower limit of the reference response range; these station-endpoint responses were considered to be toxic relative to reference conditions.

Statistical procedures for pairwise stations comparisons were conducted by EnviroSystems using the procedures described in Appendix A-1. Statistical tests were based on parametric (e.g., t-test) or non-parametric tests (e.g., Mann-Whitney U test), depending on the underlying distribution of the data and the homogeneity of variance. Statistical differences between endpoints were identified based on a one-tailed hypothesis test evaluating whether the endpoint value was significantly lower at the PLSA station compared to the reference station used to establish the REV. Differences were considered statistically significant based on an alpha (α) = 0.05.

4.2.2 Comparisons to Exposure Media

Sediment toxicity endpoint values were compared to sediment and pore water exposure conditions and select habitat parameters to identify potential associations between test response and environmental variables. Comparisons were made using the non-parametric Spearman-Rank Correlation analysis in SYSTAT 11; non-parametric correlation analyses were selected because multiple exposure and endpoint parameters did not approximate a normal distribution and could not be transformed to approximate a normal distribution. Statistical differences for rank correlations were established at $\alpha = 0.05$; no adjustment was made for experiment-wise error (e.g., Bonferroni method) to enable a conservative evaluation of potential associations between the toxicity tests and environmental variables.

4.3 Benthic Community Evaluation

Benthic macroinvertebrate data were analyzed using multivariate and multi-metric procedures to evaluate relative differences between communities at PLSA and reference area SQT stations. Multi-metric evaluations of benthic macroinvertebrate data were consistent with frameworks established in EPA guidance documents (EPA, 1998; Barbour et al. 1999).

4.3.1 Multivariate Approach

Multivariate statistical techniques were used as an initial exploratory community analysis to evaluate potential differences between benthic macroinvertebrate structure observed at PLSA and reference SQT stations. Non-metric multidimensional scaling (NMDS) was used as an ordination technique to identify potential differences in multi-dimensional species-abundance data based on underlying patterns in the data (McCune and Grace, 2002). Greater differences in the structure of benthic communities between stations result in greater separation on the NMDS ordination plot; stations with similar community structure are ordinated in closer proximity (McCune and Grace, 2002). NMDS analyses were conducted in PC-ORD v. 5.10 using relative species-abundance data calculated from pooled replicates from the benthic community samples collected as part of the SQT investigation (McCune and Mefford, 2006).

4.3.2 Multi-Metric Approach

Specific community metrics evaluated to characterize the benthic macroinvertebrate communities included the following:

- Total abundance: Number of individuals per sample; total abundance values may increase or decrease with increasing environmental disturbance.
- Taxa richness: Number of unique taxa observed per sample; taxa richness values generally decrease with increasing environmental disturbance.
- Non-Chironomid/Oligochaete (NCO) taxa richness: Number of unique taxa observed per sample that are not members of the Family Chironomidae or the Subclass Oligochaeta; NCO taxa richness values generally decrease with increasing environmental disturbance.
- Shannon-Weaver Diversity index (H): A measure of diversity in a community that accounts for the abundance and evenness of the taxon present; values of H are expected to decrease with increasing environmental disturbance.
- Percent dominant taxon: Percent abundance of the most abundant taxon in the sample; percent dominant taxon metric values typically increase with increasing disturbance.

In addition to individual metrics, potential impacts to benthic communities within the PLSA were evaluated based on a modification of a biotic index developed to identify impaired lakes and reservoirs in central and northern New Jersey. The Lake Macroinvertebrate Integrity Index (LMII) was developed to identify benthic impairment in 58 central and northern New Jersey lakes and reservoirs (Blocksom et al., 2002). The LMII was developed primarily as a biotic index for benthic community condition in sublittoral zones of lakes; however, the LMII was applied in the SQT as a relative measure of benthic community integrity at PLSA and reference stations across lake habitat zones. The LMII was based on five community metrics [number of dipteran taxa, percent chironomid individuals, percent oligochaetes/leeches, percent collector-gather taxa, and the Hilsenhoff Biotic Index (HBI)] that were determined to have the greatest discriminatory power out of 33 candidate metrics to distinguish between reference and impaired lakes and reservoirs. The LMII was modified by excluding the HBI metric due to a limited and varied number of taxa within the dataset for which tolerance values were available; this metric was removed to avoid biasing the index for samples with a high relative abundance of taxa lacking tolerance values. It is assumed that the percent oligchaetes/leeches metric provides a measure of the relative abundance of tolerant taxa likely to be present in the PLSA and reference areas. As a result, a Modified LMII ($LMII_{mod}$) was calculated using the following four metrics:

- Number of Dipteran taxa: Number of taxa within the Order Diptera; the number of Dipteran taxa is expected to decrease with increasing disturbance.
- Percent chironomid individuals: Percent abundance of individuals that are members of the Family Chironomidae; the percent abundance of chironomid individuals typically decreases with increasing disturbance in lakes and reservoirs.
- Percent oligochaetes/leeches: The percent abundance of individuals that are members of the Subclasses Oligochaeta and Hirudinea; the percent abundance of oligochaetes and leeches are expected to increase with increasing disturbance.
- Percent collector-gather taxa: Percent of taxa classified within the collector-gather trophic category; the number of collector-gather taxa is expected to decrease with increasing disturbance.

Each metric score was represented as a proportion of the measured value to the best expected value for central and northern New Jersey lakes and reservoirs established by Blocksom et al. (2002). For percent oligochaetes/leeches, the only metric expected to increase with increasing disturbance, the metric score was calculated from the complement of the percent abundance of oligochaete/leech individuals (e.g., 100 percent – percent oligochaetes/leeches) so that a greater metric score was indicative of better biological condition (Blocksom et al., 2002). Consistent with Blocksom et al. (2002), the metric scores in the modified approach were truncated between 0 and 1. The scores of the four metrics were summed to calculate the $LMII_{mod}$ for each individual replicate; the mean of individual replicates was calculated to represent the $LMII_{mod}$ for each SQT station.

Potential impairments to benthic condition at PLSA stations were evaluated relative to reference benthic condition based on the $LMII_{mod}$ using the reference envelope approach discussed above for sediment toxicity testing (see Section 4.2.1). Consistent with the approach for toxicity testing, an REV is established using the $LMII_{mod}$ to represent a lower limit of benthic community condition that may be attributed to non-contaminant-related sources of variability in from reference areas. The REV is compared to the mean $LMII_{mod}$ value calculated for each PLSA station to evaluate potential community impairment in the PLSA relative to reference areas. For PLSA stations with $LMII_{mod}$ values below the REV, pairwise statistical comparisons between $LMII_{mod}$ values calculated at PLSA and reference stations to determine statistical differences. Pairwise statistical comparisons between metrics were conducted using two-sample, non-parametric comparisons (Mann-Whitney U test) based on a one-tailed hypothesis test evaluating whether the median of $LMII_{mod}$ values was significantly lower at the PLSA station compared to the station used to establish the REV. Differences were considered statistically significant based on $\alpha = 0.05$.

4.3.3 Comparison to Exposure Media

Differences in benthic community attributes identified between stations in the NMDS ordination analysis and multi-metric analysis were compared to concentration gradients in exposure media and habitat parameters to assess potential contaminant-associated effects to benthic macroinvertebrate community structure. Comparisons were also made between benthic community metrics to evaluate the correlation between metric values. Consistent with the approach used for toxicity testing, benthic community metric values were compared to exposure concentrations and select habitat parameters using Spearman-Rank Correlation analysis in SYSTAT 11 due to the non-normal distribution of multiple attributes. Statistical differences for rank correlations were established at $\alpha = 0.05$; no adjustment was made for experiment-wise error (e.g., Bonferroni method) to enable a conservative evaluation of potential associations between community attributes and environmental variables.

4.4 SQT Weight-of-Evidence Evaluation Approach

The multiple LOEs in the SQT investigation were integrated into a weight-of-evidence evaluation of potential sediment toxicity within the PLSA. The LOEs vary in terms of relevance to the site-specific toxicity of sediments; therefore, the relative weight of each LOE was established *a priori* in SOW #7 (URS, 2013a). LOEs were weighted in the following order, listed in order of descending relative weight:

- Benthic macroinvertebrate community analyses
- Sediment toxicity testing
- Comparison of bulk sediment chemistry and pore water analyses to ecological benchmark concentrations

Benthic community analyses provide the most relevant information regarding site-specific toxicity (Chapman, 2007; Chapman and Anderson, 2005; McPherson et al., 2008). Community studies are *in situ* evaluations of indigenous benthic invertebrates that have integrated the effects of stressors and have evolved over time to survive in a highly variable and stressful environment. Sediment toxicity testing is less relevant to site-specific toxicity because it represents an *ex situ* evaluation of sediment toxicity that creates artificial exposure conditions (e.g., disruption of redox conditions) through the collection, transport, and manipulation of sediments. Furthermore, sediment toxicity testing is conducted using naïve, laboratory-reared organisms that have not evolved the population compensatory mechanisms to survive in a highly variable and stressful environment. The lowest relative weight is assigned to evaluations of bulk sediment chemistry because generic SQBs do not take into account site-specific factors that may mitigate the toxicity and bioavailability of constituents in sediments (McPherson et al., 2008; Chapman and Anderson, 2005). The inclusion of pore water data into the SQT approach provides a more relevant exposure concentration to evaluate the potential bioavailability and toxicity of mercury; however, this LOE is also limited by comparisons to generalized ecological effects benchmarks from literature studies that may not reflect site-specific conditions.

Consistent with the weighting of the LOEs described above, SQT data from the PLSA were evaluated based on the general framework for interpreting SQT data proposed by Bay and Weisberg (2010). The framework for integrating the three LOEs into a station-specific assessment of impacts is based on a three step process:

- Step 1: Develop response criteria for each LOE.
- Step 2: Classify the severity of effects and the potential for chemically-mediated effects based on the response criteria developed in Step 1.
- Step 3: Integrate the severity of effects classifications and the potential for chemically-mediated effects into a WOE classification of each PLSA station.

Further discussion of each step is provided in the sections below.

4.4.1 Step 1: Develop Response Criteria

Criteria were developed to assign the response for each LOE into one of four categories:

- No difference from reference conditions (i.e., minimal response);
- A minor response that might not be distinguishable from reference (i.e., low response);
- A response that is clearly distinguishable from reference (i.e., moderate response); and
- A severe response indicative of extreme conditions (i.e., high response).

The justification for response criteria is provided for each LOE in the following sections.

Sediment and Pore Water Chemistry

Benthic macroinvertebrate exposures to chemicals in sediment and pore water were evaluated relative to ecological benchmark concentrations established in Sections 4.1.1 and 4.1.2, respectively. Sediment exposures were categorized based on sediment quality benchmark quotients (SQB-Q) calculated based on the ratio of measured concentrations to upper bound SQBs (e.g., SELs and PECs). For mercury, an SEL quotient (SEL-Q) was calculated based on the SEL of 2 μg THg/g. For other constituents, the SQB-Qs were calculated based on PEC values (MacDonald et al., 2000). PEC-Qs for metals and pesticides were calculated as the mean of PEC-Qs calculated for individual metals (arsenic, cadmium, chromium, copper, lead, nickel, and zinc) and pesticides [sum dichlorodiphenyltrichloroethane (DDTs) and alpha chlordane] that were detected in at least one sample and had available PECs. An overall SQB-Q ($SQB\text{-}Q_{overall}$) was calculated for each station as the mean SEL-Q and PEC-Q values for each constituent group (MacDonald et al., 2009). Sediment chemistry response categories were established consistent with categories used to evaluate the predictive ability of PEC-Qs; this evaluation identified a mean PEC-Q of 0.5 as a useful threshold to classify sediments as toxic or non-toxic (MacDonald et al. (2000). Exposure criteria for sediment based on SQB-$Q_{overall}$ values include the following:

- Minimal exposure: SQB-$Q_{overall}$ < 0.5
- Low exposure: SQB-$Q_{overall}$ 0.5 to 1.0
- Moderate exposure: SQB-$Q_{overall}$ 1.0 to 1.5
- High exposure: > 1.5

Exposures to THg and MeHg in pore water were expressed as pore water toxic units (PW-TU), calculated based on the proportion of the pore water concentration measured in field samples relative to NOEC benchmarks provided in Section 4.1.2. Pore water toxic units were summed for THg and MeHg to provide an overall pore water value for each station (PW-TU_{sum}). Response criteria for pore water exposure were expressed based on PW-TU_{sum} based on NOEC and LOEC thresholds as follows:

- Minimal exposure: PW-TU_{sum} < 1 representing concentrations below the NOEC.
- Low exposure: PW-TU_{sum} 1.0 to 1.75 representing concentrations between the NOEC and LOEC[4].
- Moderate exposure: PW-TU_{sum} 1.75 to 2.5.
- High exposure: PW-TU_{sum} > 2.5.

Individual sediment and pore water exposure categories were averaged to provide an overall chemistry exposure category. Separate exposure categories for sediment and pore water were assigned an ordinal value of 1, 2, 3, or 4 for minimal, low, moderate, and high exposure categories, respectively. The ordinal values were averaged to assign overall exposure categories; average values were conservatively rounded up to assign an overall exposure category For example, the average of a moderate sediment exposure category (3) and low pore water exposure category (2) would be rounded up to a moderate overall exposure category (average of 2.5 rounded to 3).

Sediment Toxicity Testing

Response categories for sediment toxicity testing were based on deviations from the REV values established for each endpoint (see Section 4.2.1). Comparisons to the REV value were expressed as the relative percent difference (RPD)[5] between the PLSA endpoint value and the REV. Species-endpoint combinations with RPD values exceeding zero indicate that the PLSA endpoint was within the reference envelope and therefore, not considered to be toxic relative to variability associated with the reference response. Species-endpoint combinations were also considered non-toxic if the pairwise statistical comparison of the endpoint values did not indicate that the PLSA station was statistically lower than the endpoint values for the reference station used to establish the REV. Furthermore, survival endpoints for PLSA stations that exceeded test acceptability criteria (TAC) were not identified as toxic for survival based on the assumption that

[4] Based on the LOEC:NOEC ratio of 1.75, which is more conservative than the MeHg LOEC:NOEC of 10 (see Section 4.1.2)
[5] Relative percent difference (RPD) from REV: RPD = [(Endpoint/REV)-1]*100; RPD > 0 indicates that PLSA endpoint value is within the reference envelope.

substantive adverse effects would not be associated with sediment endpoints that meet the acceptability criteria for experimental control samples.

Categories of relative toxicity were identified for species-endpoint combinations that were considered to be toxic based on the above criteria. Survival endpoints had a lower threshold in assigning toxicity categories because adverse effects observed in survival endpoints will likely result in greater effects on population stability (McPherson et al. 2008). PLSA stations with survival RPD values from 0 and -10 and significantly lower survival endpoints relative to the reference station used to establish the REV were categorized as low toxicity; the 10 percent survival reduction threshold from reference samples has been used as the basis to identify low risk thresholds in other sediment toxicity testing programs (MacDonald et al., 2009). Significant survival endpoints with RPD values from -10 to -20 were categorized as moderate toxicity, and survival RPDs less than -20 were considered to represent high toxicity.

Toxicity thresholds for growth and biomass were higher relative to survival toxicity thresholds based on the premise that growth responses are less likely to affect population stability (McPherson et al., 2008). A statistically significant reduction in growth and biomass endpoints from the REV represented by RPD values between 0 and -20 were categorized as low toxicity. A 20 percent or greater reduction in growth and biomass endpoints relative to reference has been associated with impaired benthic structure in some sediment evaluations (MacDonald et al. 2004). Effects levels exceeding 20 percent have been associated with population-level effects; however, it may not be possible to differentiate effects of less than 20 percent due to natural variability (Suter et al., 2000). In other studies, a 20 percent or greater difference in a treatment response compared to an appropriate reference or control was considered to be substantial in evaluating responses in toxicity sediment tests (Thursby et al., 1997; Field et al., 2002). Moderate and high toxicity categories were established from the 20 percent reduction threshold, with RPD values of -20 to -40 representing moderate toxicity and RPD values less than -40 representing high toxicity for growth and biomass endpoints.

Benthic Macroinvertebrate Community Disturbance

Disturbances in benthic macroinvertebrate communities in the PLSA were evaluated relative to reference benthic communities using the reference envelope approach based on the $LMII_{mod}$ biotic index (see Section 4.3.2). The RPD between $LMII_{mod}$ values for PLSA and the REV stations was calculated for each station. PLSA stations with RPD values greater than zero were considered to be representative of benthic community integrity within the reference envelope; therefore, benthic disturbance at these PLSA stations were considered to be consistent with reference conditions. Disturbance associated with RPD values less than zero was categorized based on a 20 percent deviation from the lower limit of the reference condition represented by the REV. The 20 percent reduction in the $LMII_{mod}$ was generally based on the premise that ecological effects that are less than 20 percent of an appropriate reference are difficult to differentiate from natural variability (Suter et al., 2000).

As a result, disturbance criteria for benthic macroinvertebrates were established based on RPD values for $LMII_{mod}$ as follows:

- Reference: RPD > 0
- Low disturbance: RPD 0 to -20
- Moderate disturbance: RPD -20 to -40
- High disturbance: RPD < -40

4.4.2 Step 2: Classify the Severity of Effects and Potential for Chemically-Mediated Effects

Based on the responses assigned in Step 1, individual LOEs were integrated to evaluate two key questions: 1) Is the disturbance of benthic macroinvertebrate communities evident at PLSA stations; and 2) Are concentrations of constituents, particularly THg and MeHg, in exposure media sufficiently elevated to explain the observed disturbance? As illustrated in Tables A-2a to A-2c, response categories assigned to each LOE in Step 1 are used as follows:

- Classify the severity of effects (see Table A-2a): sediment toxicity testing and benthic community analysis LOEs are combined to classify the severity of effects as unaffected, low effect, moderate effect, or high effect.
- Indicate the potential for chemically-mediated effects (see Table A-2b): sediment chemistry and sediment toxicity testing LOEs are used to classify the potential that observed biological effects may be chemically-mediated as minimal potential, low potential, moderate potential, or high potential.

4.4.3 Step 3: Integrate Severity of Effects Classifications and Potential for Chemically-Mediated Effects into Weight-of-Evidence Classifications

The final step in the weight-of-evidence evaluation is the incorporation of the severity of effects classifications and the potential for chemically-mediated effects into a final weight-of-evidence classification for each PLSA station (see Table A-2c). The framework presented above provides the basis for assigning PLSA stations into one of six impact categories based on the SQT LOEs (Bay and Weisberg, 2010):

- Unimpacted: Constituents in exposure media are not causing significant adverse impacts to aquatic life inhabiting sediments at PLSA stations.
- Likely unimpacted: Constituents in exposure media are not expected to cause adverse impacts to aquatic life, but some disagreement among the LOEs reduces certainty in classifying the PLSA site as unimpacted.
- Possibly impacted: Constituents in exposure media at the PLSA station may be causing adverse impacts to aquatic life, but these impacts are either small or uncertain because of disagreement between among the LOEs.
- Likely impacted: Evidence for a contaminant-related impact to aquatic life at the PLSA station is persuasive, even if there is some of disagreement among LOE.

- Clearly impacted: Constituents in exposure media at the PLSA station are causing clear and severe adverse impacts to aquatic life.
- Inconclusive: Disagreements among the LOE suggest that either the data are suspect or that additional information is needed before a classification can be made.

The framework described above provides a systematic approach for interpreting the LOEs and evaluating potential impacts to benthic macroinvertebrate communities in the PLSA. The following sections present the results of the SQT investigation and the WOE evaluation of potential chemically-mediated sediment toxicity in the PLSA.

5.0 Results and Discussion

The following sections present the results of the SQT investigation based on the data evaluation approach presented in the preceding section.

5.1 Bulk Sediment and Pore Water Chemistry

The following sections present the results of bulk sediment and pore water chemistry analyses that were used to evaluate and interpret the benthic macroinvertebrate community analysis and sediment toxicity testing results.

5.1.1 Bulk Sediment Analyses

The results of bulk sediment analyses of THg and MeHg at SQT stations are summarized in Table A-3; a summary of the results of analyses of other constituents is presented in Table A-4. Complete sediment analytical results for SQT samples are provided in Table D-2 of Appendix D of the Ecological Investigation Report.

THg and MeHg

As presented in Table A-3, concentrations of THg at SQT stations within the PLSA ranged from 0.04 (PLSA-C1-28) to 23.5 µg THg/g at PLSA-C1-40, the station within the ABD that was added to capture the upper bound of the THg exposure gradient in sediment. Arithmetic mean (± standard error) [6] and the upper confidence limit of the mean concentration (UCL_{mean}) of THg at SQT stations within the PLSA were 4.32 ± 1.40 and 7.88 µg THg/g, respectively. At reference SQT stations, THg concentrations ranged from 0.02 to 0.25 µg THg/g. MeHg concentrations in bulk sediment samples from PLSA stations ranged from 0.05 to 4.7 ng MeHg/g; mean and UCL_{mean} concentrations of MeHg were 1.15 ± 0.27 and 1.79 ng MeHg/g, respectively. MeHg concentrations in reference SQT stations ranged from 0.15 to 0.63 ng MeHg/g (see Table A-3).

The evaluation of sediment mercury concentrations measured in the PLSA relative to applicable SQBs indicates that concentrations of THg generally exceed the SEL. As presented in Table A-3, THg concentrations in sediment samples from seven of 17 SQT stations within the PLSA were below the SEL; mean and UCL_{mean} concentrations in samples from the PLSA also exceeded the SEL. THg concentrations at the five reference stations were below the SEL (see Table A-3). As previously stated, an SQB was not identified to evaluate the results of MeHg analyses of sediments from SQT stations.

Other Constituents in Sediment

Non-mercury constituents were also measured in sediment samples at SQT stations to identify other constituents that may adversely affect benthic macroinvertebrate communities or test organisms in sediment toxicity tests. Summary statistics of non-mercury constituents detected in at least one sediment sample within the PLSA are provided in Table A-4; complete analytical results for non-mercury constituents at PLSA and reference stations are provided in Table D-2 of Appendix D of the Ecological

[6] Unless otherwise noted, mean values are reported as the arithmetic mean value ± the standard error of the arithmetic mean.

Investigation Report. As summarized in Table A-4, 16 metals, 17 pesticides/herbicides[7], three SVOCs, and 16 polycyclic aromatic hydrocarbons (PAHs) were detected in at least one sample from PLSA stations.

An evaluation of exposure to non-mercury metals indicates that concentrations are not likely elevated within the PLSA at concentrations likely to result in adverse effects to benthic macroinvertebrates. Maximum concentrations of metals were below the SQB_{high} for all metals except copper, lead, and manganese. Concentrations of copper and lead were greatest at PLSA-C1-40, located inside the ABD removal limit (see Table A-4 and Figure A-2a). The greatest concentration of SEM metals, including copper, lead, mercury, nickel, silver, and zinc, was also measured at station PLSA-C1-40. An evaluation of the bioavailability of these metals in PLSA sediment samples indicates that there is sufficient AVS and TOC to bind SEM metals into insoluble metal-sulfide complexes, which limits the bioavailability and toxicity of these metals to benthic organisms. The difference between the sum of the molar concentrations of SEM and AVS normalized by the fraction of organic carbon (SEM-AVS/f_{oc}) was below the 130 μmol/g_{oc} threshold for invertebrate survival proposed by EPA (2005) for all SQT stations in the PLSA.

With the potential exception of total PAHs (tPAHs), organic constituents in sediment were not measured at concentrations indicative of adverse effects. Concentrations of pesticides and herbicides were below the SQB_{high} in sediment samples from PLSA stations (see Table A-4). Concentrations were between the SQB_{low} and SQB_{high} for nine of the 13 detected pesticides/herbicides with available sediment benchmarks; however, maximum detected concentrations did not exceed the SQB_{high} in any PLSA sample. Two stations (PLSA-C1-33 and PLSA-C1-01) contained tPAH concentrations exceeding the SQB_{high}; maximum concentrations of individual PAHs and tPAHs were measured at PLSA-C1-33. These stations were located away from the ABD, with PLSA-C1-33 located on the opposite shoreline of the ABD (see Figure A-2a) and PLSA-C1-01 located in the Lower Ramapo River channel portion of the study area upstream of the Pompton Lake dam (see Figure A-2b).

The evaluation of exposure to non-mercury constituents in sediment within the PLSA indicates a limited potential for adverse effects associated with other metal and organic constituents. The greatest potential for adverse effects associated with non-mercury constituents is associated with exposure to PAHs at stations PLSA-C1-33 and PLSA-C1-01, located away from the ABD.

5.1.2 Pore Water Analyses

The results of pore water analyses of THg and MeHg are presented in Table A-5. THg concentrations in pore water measured in sediments from PLSA SQT stations ranged from 0.41 to 8.26 ng THg/L; mean and UCL_{mean} concentrations of THg in pore water were 1.41 ± 0.47 and 3.48 ng THg/L, respectively. THg concentrations in pore water samples from reference SQT stations ranged from 0.2 to 0.53 ng THg/L. MeHg concentrations in pore water samples from PLSA stations ranged from 0.02 to 0.23 ng

[7] Total DDTs were presented in Table A-3 as the sum of the concentrations of individual DDx compounds measured in sediment.

MeHg/L; mean and UCL_{mean} concentrations were 0.10 ± 0.02 and 0.13 ng MeHg/L, respectively. Pore water MeHg concentrations measured at reference SQT stations were comparable to results from PLSA stations, with concentrations ranging from 0.03 to 0.16 ng MeHg/L (see Table A-5).

The comparisons of pore water results from the PLSA to ecological benchmarks indicate limited potential for adverse effects. Maximum concentrations of THg and MeHg measured in pore water samples from the 17 SQT stations within the PLSA were substantially lower than ecological effects benchmarks for benthic macroinvertebrates (see Table A-5). Furthermore, the maximum pore water concentration of 8.26 ng THg/L was two orders of magnitude lower than the chronic freshwater EPA National Recommended Water Quality Criterion (NRWQC) and chronic freshwater New Jersey Surface Water Quality Standard (NJSWQS) of 770 ng THg/L (dissolved). The results indicate that exposures to pore water at SQT stations within the PLSA are not likely to result in adverse effects to benthic macroinvertebrates.

5.2 Sediment Toxicity Testing

This section presents the results of 28-day *H. azteca* and 20-day *C. dilutus* sediment toxicity testing conducted as described in Section 3.2.3. Sediment toxicity tests satisfied TAC specified for each test; laboratory reports detailing the performance of the toxicity tests are provided in Appendix A-1.

5.2.1 Evaluation of Mercury Exposure Conditions

The evaluation of mercury exposure conditions in the test chambers indicates that the toxicity tests likely overestimate benthic macroinvertebrate exposure to mercury when compared to *in situ* exposure conditions. As previously stated in Section 3.2.4, pore water samples were collected from surrogate test chambers established for five PLSA stations on Day 7 of the toxicity test. THg and MeHg measured in pore water from surrogate test chambers were evaluated relative to concentrations measured in pore water samples extracted from field sediment samples collected during the SQT investigation. As illustrated in Figure A-3, THg and MeHg concentrations measured in pore water from samples collected on Day 7 of the toxicity test were substantially greater than concentrations measured in field samples for the same stations. THg concentrations were 20 to 75 fold greater in Day 7 pore water samples relative to pore water samples analyzed from field samples from the same station; MeHg concentrations in Day 7 pore water samples were two to 5.4 times greater compared pore water concentrations measured in field samples. Greater mercury concentrations in Day 7 pore water samples may be attributed to increased partitioning of mercury from sediment to pore water resulting from the manipulation of sediments for test setup. These comparisons indicate that exposures to mercury and potentially other sediment constituents (e.g., divalent metals) were greater in the *ex situ* toxicity test relative to *in situ* exposure concentrations measured in field samples. Therefore, the results of the toxicity tests presented below represent a highly conservative evaluation of potential effects to benthic macroinvertebrates.

5.2.2 28-Day *Hyalella azteca* Exposure

The results of the 28-day sediment toxicity tests for *H. azteca* indicate negligible lethal and limited sublethal responses resulting from exposure to PLSA sediments. As presented in Table A-6, mean survival at all PLSA stations exceeded the survival TAC of 80 percent, with mean survival ranging from 82.5 ±4.53 to 97.5 ±1.64 percent; *H. azteca* survival at reference stations ranged from 82.5 ±5.26 to 95 ±2.67 percent. Mean growth measured as dry weight at PLSA stations ranged from 0.382 ±0.04 to 0.687 ±0.07 mg/surviving individual; growth in reference stations ranged from 0.504 ±0.06 to 0.817 ±0.10 mg/surviving individual. Consistent with growth endpoints, mean biomass measured as dry weight at PLSA stations ranged from 0.351 ±0.05 to 0.644 ±0.08 mg/exposed individual; mean biomass at reference stations ranged from 0.469 ±0.04 to 0.683 ±0.1 mg/exposed individual (see Table A-6).

No PLSA stations were identified as toxic for *H. azteca* survival because survival endpoints at all stations were within the reference envelope established based on reference station REF-C1-03 (see Section 4.3.2). Percent survival at PLSA stations was equal to or exceeded the REV of 82.5 percent (see Table A-6).

Growth and biomass endpoints at some PLSA stations were lower than the reference conditions established by the reference envelope approach. Mean growth endpoints at six PLSA stations were below the REV of 0.504 mg/surviving individual established based growth at REF-C1-05; however, pairwise comparisons indicated that growth endpoints were not statistically lower at any of the six PLSA stations relative to REF-C1-05 (see Table A-6). Biomass endpoints at seven PLSA stations were below the reference envelope established by station REF-C1-05; however, biomass endpoints were significantly (marginally) lower than REF-C1-05 in only three of the seven stations (see Table A-6). These results indicate a relatively minor sublethal response relative to reference conditions, particularly given that exposure concentrations for mercury and potentially other redox-sensitive stressors were greater in the toxicity tests than what was measured in field sediment samples.

The results of the *H. azteca* toxicity tests are inconsistent with adverse effects associated with mercury exposure. As illustrated in Figures A-4 through A-7, *H. azteca* survival was not significantly lower in toxicity tests across the exposure gradient of THg and MeHg in sediment and pore water, respectively. The observed reductions in growth and biomass endpoints at some PLSA stations relative to the REV were not consistent across the exposure gradients for THg and MeHg in sediment and pore water, i.e., no dose-response pattern (see Figures A-4 through A-7). Spearman-Rank Correlation analyses indicate no significant correlations between sediment and pore water MeHg concentrations and growth and biomass endpoints; however, weak, but significant negative correlations were observed between sediment and pore water THg concentrations and growth and biomass endpoints (see Table A-7). Based on the relative toxicity of MeHg to THg, it is expected that mercury-associated effects would reflect stronger correlations between MeHg concentrations in exposure media and endpoint values. Furthermore, the three stations with significantly lower biomass endpoints relative to the REV reference station contained sediment THg concentrations ranging from 0.04 to 23.5 µg THg/g, which encompasses the range of sediment THg concentrations tested in the study. These findings indicate that lower growth and biomass endpoint values measured at these PLSA stations were not consistent with a negative response to increasing mercury exposure concentrations, i.e., no dose-response pattern.

The observed minimal reduction in *H. azteca* growth and biomass may be attributed to other exposure conditions in the toxicity test. The lowest growth and biomass endpoints were measured at station PLSA-C1-40, which also had the greatest concentration of SEM metals and the greatest concentrations of total recoverable copper, lead, and zinc. Although these metals are expected to be bound under *in situ* exposure conditions by metal-sulfides and TOC, as indicated by SEM-AVS/f_{oc} < 130 µmol/g_{oc} in field samples (see Table A-4), it is possible that these divalent metals were liberated from sulfide-complexes during the manipulation and handling of sediments for the toxicity test set up. As discussed in Section 5.2.1, THg and MeHg concentrations were substantially greater in Day 7 pore water samples relative to pore water samples extracted from bulk sediments collected from the field, indicating that the manipulation of sediments may have altered sediment conditions and increased *ex situ* exposure conditions.

These findings indicate that the relatively minimal observed response in growth and biomass endpoints for *H. azteca* is not consistent with exposure conditions for mercury. Given the inconsistencies with the growth and biomass response across the THg concentration gradient and the lack of correlation with more bioavailable and toxic MeHg in sediment and pore water, it is uncertain whether the minimal reduction in growth and biomass observed in these samples may have been attributed to greater *ex situ* exposure conditions of other stressors or potentially unmeasured stressors in the test chambers.

5.2.3 20-Day *Chironomus dilutus* Exposure

The results of the 20-day sediment toxicity tests for *C. dilutus* were generally consistent with the results presented above for *H. azteca*. *C. dilutus* exposures to PLSA sediments resulted in negligible lethal and minimal sublethal responses. As summarized in Table A-6, mean survival at PLSA stations exceeded the survival TAC of 70 percent, with the exception of PLSA-C1-39 which had a comparable mean survival 68.8 percent (PLSA-C1-39). Lower mean survival at PLSA-C1-39 was skewed by two of the eight replicates in the test; percent survival in these two replicates were zero and 20 percent, while the percent survival in the other six replicates from this station ranged from 70 to 100 percent and averaged 88 percent (see Appendix A-1). Mean survival in tests on sediment from other PLSA stations ranged from 75.0 ± 8.86 to 93.8 ± 1.83 percent; *C. dilutus* survival at reference stations ranged from 77.5 ± 4.91 to 91.3 ± 2.95 percent.

Mean growth at PLSA stations ranged from 1.522 ± 0.06 to 2.058 ± 0.33 mg AFDW/surviving individual; growth in reference stations ranged from 1.603 ± 0.12 to 2.124 ± 0.17 mg AFDW/surviving individual. Mean biomass at PLSA stations ranged from 1.021 ±0.13 to 1.508 ±0.09 mg AFDW/exposed individual; mean biomass at individual reference stations ranged from 0.96 ±0.13 to 1.57 ±0.11 mg/exposed individual (see Table A-6).

Based on the reference envelope approach, no PLSA stations were identified as toxic to *C. dilutus* because lethal and sublethal endpoints were within the statistical significance of the reference station used to establish the REV (see Table A-6). Percent survival at PLSA stations exceeded the REV of 77.5 percent established from reference stations at all stations with the exception of PLSA-C1-39, PLSA-C1-20, and PLSA-C1-16; however, pairwise statistical comparisons indicate that survival at these stations was not significantly lower than survival at REF-C1-05, which was the basis for the REV (see Table A-6). Furthermore, mean survival at PLSA-C1-20 (76.3 percent) and PLSA-C1-16 (75.0 percent) exceeded the TAC of 70 percent. As stated above, the lowest survival endpoint at station PLSA-C1-39 was skewed by two of eight replicates with very low survival; the mean survival in of the other six replicates at PLSA-C1-39 was 88 percent, exceeding the TAC and REV.

Minimal differences observed in growth at some PLSA stations were not substantially lower than the reference conditions established by the reference envelope approach. Mean growth endpoints exceeded the REV at PLSA stations, with the exception of PLSA-C1-24 and PLSA-C1-40; however, growth was not significantly lower at these stations relative to growth at REF-C1-04, which established the REV. Mean biomass endpoints exceeded the REV at each PLSA station (see Table A-6). No stations within the PLSA were identified as toxic to *C. dilutus*, given that endpoint values were within the statistical range of the reference envelope and exposure concentrations for mercury were greater in the *ex situ* toxicity tests.

Similar to the results of the *H. azteca* toxicity tests, the results of the 20-day *C. dilutus* test are not consistent with mercury exposure. As illustrated in Figures A-4 through A-7, *C. dilutus* survival was not significantly lower in toxicity tests across the exposure gradient of THg and MeHg in sediment and pore water from PLSA stations, respectively. The reduction in *C. dilutus* growth was minimal across the exposure gradients for THg and MeHg in sediment and pore water (see Figures A-4 through A-7). Spearman-Rank Correlation analyses indicate only a marginally significant negative correlation between sediment THg concentrations and growth; THg concentrations in pore water and MeHg concentrations in sediment or pore water were not negatively correlated with *C. dilutus* growth (see Table A-7). As stated above for *H. azteca*, significant correlations between MeHg in sediment and pore water would be expected if mercury exposure was inhibiting growth. Similar to *H. azteca*, stations with endpoint values lower than the REV for growth were observed across a gradient of mercury exposure, with sediment THg concentrations associated with lower growth ranging from 3.37 to 23.5 µg THg/g. In addition, no significant negative correlations were identified between THg and MeHg exposure concentrations in sediment and pore water and *C. dilutus* biomass. These findings indicate that growth and biomass endpoints are not consistent with a negative response to increasing mercury exposure. Similar to the *H. azteca* results, it is uncertain whether the minimal reduction in growth observed in *C. dilutus* tests may have been attributed to other exposure conditions or unmeasured stressors in the test chambers.

5.3 Benthic Community Analyses

The following sections present the results of benthic macroinvertebrate analyses to evaluate relative differences between communities sampled at PLSA and reference area SQT stations. Abundance data for taxa observed in benthic community samples (individuals per sample) from PLSA and reference area stations are summarized in Table A-8; supporting information for taxonomic analyses are provided in Appendix A-2.

5.3.1 Benthic Community Description

A total of 126 unique benthic macroinvertebrate taxa were identified in samples collected from the 22 SQT stations sampled within the PLSA (n=17) and reference area (n=5). Of the 126 taxa identified, 117 taxa were present in samples from PLSA SQT stations, and 82 taxa were present in samples from reference area SQT stations. *Amnicola sp*., a small freshwater snail (Family: Amnicolidae) was the most commonly observed taxon in PLSA SQT samples (76 percent) and reference area samples (67 percent). The majority of taxa observed at PLSA and reference stations were members of four major taxonomic groups: Diptera, Oligochaeta, Mollusca, and Crustacea. The percent abundances of taxa representing these groups at each station were comparable between areas, ranging from 76 to 98 percent in PLSA samples and from 86 to 95 percent in samples from reference areas (see Table A-9).

5.3.2 Multivariate Analysis

Multivariate statistical analyses were used as an initial exploratory analysis to evaluate potential differences between benthic macroinvertebrate structure observed at PLSA and reference SQT stations. As previously stated, NMDS was used to identify patterns in the underlying structure of the relative abundance data. Greater differences in the structure of benthic communities between stations result in greater separation on the NMDS ordination plot; stations with similar community structure are ordinated in closer proximity on the plot (McCune and Grace, 2002).

As presented in Figure A-8, the NMDS ordination plot indicates general separation of benthic communities at SQT stations based on habitat attributes. Most of the variance in the benthic community data were captured on Axis 1 (79 percent), which indicated separation of stations based on lake habitat zone. Stations with positive scores on Axis 1 were generally associated with deeper water, profundal habitats characterized by the absence of macrophytes and a high relative abundance of the phantom midge *Chaoborus*. SQT stations with positive scores on Axis 1 (PLSA-C1-12, PLSA-C1-11, REF-C1-04, REF-C1-05, PLSA-C1-01, and PLSA-C1-39) were generally associated with the former river channel; water depths at these stations were 9 feet or greater and contained trace amounts or no macrophytes (see Table A-1). In general, these stations contained few taxa with limited abundance. The relative abundance of *Chaoborus*, a genus typical of the profundal zone of lakes, was high at these stations relative to samples from other SQT stations that contained few or no individuals of this genus.

Stations with negative scores on Axis 1 were generally associated with shallower water depths (< 5 feet) and the presence of moderate to abundant macrophyte cover (see Table A-1). Benthic macroinvertebrate communities at these stations had greater numbers of taxa and higher abundance compared to stations with positive scores on Axis 1 (see Table A-9). Stations with negative scores on Axis 1 were further separated on Axis 2, which captured substantially lower variance in the benthic macroinvertebrate community data (14 percent) relative to Axis 1. Separation of stations on Axis 2 was primarily associated with greater relative abundance of the isopod *Caecidotea* at stations with negative scores, particularly at PLSA-C1-30 and PLSA-C1-14.

The ordination of SQT stations based on the NMDS analysis of species-abundance data was not associated with mercury or other constituent concentrations in exposure media. NMDS axis scores were evaluated relative to THg and MeHg concentrations in sediment and pore water using Spearman's Rank Correlation analysis to identify potential associations between the ordination of SQT stations and exposure concentrations. The resulting correlation matrix indicates that NMDS axis scores are not significantly correlated ($p > 0.05$) with exposure concentrations for THg or MeHg in sediment or pore water or other constituents in sediment (see Table A-7). As illustrated in Figure A-9, there is no consistent relation between concentrations of THg or MeHg in sediment or pore water and NMDS scores on Axis 1, which captured 79 percent of the total variance in the benthic community data (see Table A-7). A similar lack of correlation with mercury exposure concentrations was also observed in comparisons with Axis 2 scores. In addition, the ordination of reference SQT stations generally spanned the range of NMDS scores for PLSA stations on Axis 1. Separation of reference stations in the ordination plot was primarily between deeper water stations with trace or no macrophytes (REF-C1-04 and REF-C1-05) and reference stations in shallower water depths with moderate to abundant macrophytes (REF-C1-01, REF-C1-02, and REF-C1-03). NMDS scores on Axis 1 were positively correlated with water depth (rho (ρ) = 0.728; $p < 0.05$) and negatively correlated with the abundance of rooted macrophytes, as classified based on qualitative field observations[8] ($\rho = -0.654$; $p < 0.05$). These comparisons indicate that differences in benthic macroinvertebrate community structure are explained primarily by macro-habitat attributes and not mercury or other constituent concentrations in exposure media within the PLSA.

5.3.3 Multi-Metric Analysis

The evaluation of benthic macroinvertebrate community metrics indicates comparable ranges in metric values between PLSA and reference stations. Metric values for total abundance per sample, taxa richness, NCO taxa richness, percent abundance of the dominant taxon, diversity, and $LMII_{mod}$ measured at PLSA stations were not statistically lower (α= 0.05) than corresponding metric values measured at reference stations (see Figure A-10). A summary of metric values is provided in Table A-9.

Spearman's Rank Correlation analyses of benthic community metric values indicate strong correlations between community metric values. Taxa richness, NCO taxa richness, diversity, and $LMII_{mod}$ were positively correlated, with correlation coefficients between metrics ranging from 0.738 to 0.972 ($p < 0.05$; see Table A-7). As expected, percent abundance of the dominant taxon values were negatively correlated with richness and diversity metrics and the $LMII_{mod}$ (see Table A-7). Richness and diversity metrics and the $LMII_{mod}$ were also correlated with total abundance; however, the correlation coefficients between these metrics were lower than coefficients measured between richness and diversity metrics (ρ = 0.548 – 0.73; $p < 0.05$).

Benthic community metric values varied with water depth at SQT stations. Richness, diversity, abundance, and $LMII_{mod}$ metric values were negatively correlated with water

[8] The presence of macrophytes was classified based on qualitative field observations during SQT sampling as: 0) no macrophytes observed; 1) trace abundance; 2) moderate abundance; and 3) abundant. Values of macrophyte abundance classifications were used as ordinal data in the correlation analyses.

depth, while percent dominant taxon values were positively correlated with water depth (see Table A-7). Comparisons to other habitat variables, including percent fine-grained sediments and TOC, did not indicate significant correlations with benthic community metrics (see Table A-7). As illustrated in Figure A-11, richness and diversity metrics, as represented by total taxa richness, decreased with increasing water depth at PLSA (R^2=0.60; $p < 0.05$) and reference (R^2=0.94; $p < 0.05$) stations. Invertebrate abundance per station was also inversely related to water depth (see Figure A-11) although this relation explained less variability in abundance per stations at PLSA stations (R^2=0.29; $p < 0.05$) when compared to reference stations (R^2=0.90; $p < 0.05$). Decreases in benthic community metrics for richness, diversity, abundance, and the $LMII_{mod}$ with increasing water depth were observed consistently across the range of water depths for stations sampled within the PLSA and reference areas. This indicates that the relationship was observed in areas with elevated constituent concentration in exposure media, as well as reference areas without elevated constituent concentrations. These findings reflect general agreement with the results of the NMDS analyses presented in the preceding section.

Decreasing richness, diversity, and abundance metrics with increasing water depths are typical of benthic communities in lake systems (Wetzel, 2001; Moore, 1981; Wiederholm 1984). Lake benthic communities are generally characterized by greater richness and diversity in the littoral zone, defined as the shallow zone where light penetration supports the growth of rooted macrophytes. By contrast, benthic communities are generally characterized by lower richness and diversity in the profundal zone where light does not penetrate to support the growth of rooted macrophytes. The sublittoral zone, the transition between the littoral and profundal zones, usually has a benthic community that is less diverse than the littoral zone but more diverse than the profundal zone (Moore, 1981; Wiederholm 1984). This gradient of decreasing benthic macroinvertebrate richness and diversity with increasing water depth may be stronger in highly eutrophic lakes due to the general loss of diversity caused by nutrient enrichment (Wetzel, 2001). The observed decreases in benthic macroinvertebrate richness, diversity, and abundance and increased percent abundance of the dominant taxon are consistent with the typical distribution of benthic macroinvertebrates in lake systems, particularly in eutrophic lake systems like Pompton Lake.

Correlation analyses indicate that exposures to mercury or other constituents in sediment are not associated with metric values indicative of impairment. The correlation matrix indicates that richness, diversity, abundance, dominance, and biotic index values are not significantly correlated with concentrations of THg or MeHg measured in sediments or pore water or other constituents measured in sediment (see Table A-7). As illustrated in Figure A-12, there is no consistent relation between values of richness, diversity, and $LMII_{mod}$, as represented by $LMII_{mod}$, and THg or MeHg concentrations measured in sediment or pore water. Mean values of richness and abundance calculated for reference SQT stations generally span a similar range of values measured at PLSA stations (see Table A-9). The lack of correlation between community metrics and mercury concentrations in sediment and pore water indicates that exposure to THg and MeHg in sediments and pore water is not adversely affecting the biotic integrity of benthic communities within the PLSA, including richness, diversity, abundance, and dominance.

Overall comparisons of the relative integrity of benthic macroinvertebrate communities between PLSA stations and the reference envelope were based on the $LMII_{mod}$. As indicated by the results of the correlation analyses presented above, $LMII_{mod}$ values are also representative of individual richness, abundance, and diversity measures based on positive correlations with these metrics; $LMII_{mod}$ was also inversely correlated with the percent abundance of the dominant taxon (see Table A-7). These associations and the relevance of the index for use in central and northern New Jersey lakes and reservoir make it an appropriate measure of the relative integrity between benthic communities in the reference and PLSA.

In selecting the REV to represent the lower limit of the reference envelope for benthic macroinvertebrate community structure, the observed relationship between $LMII_{mod}$ (and associated metrics) and lake habitat zones were considered. PLSA and reference stations were categorized into two habitat groups based on the results of the exploratory NMDS analyses and multi-metric correlation analyses. As indicated in Table A-9, SQT stations were separated into profundal and littoral habitat zones based on water depth and the presence of macrophytes. Reference stations were associated with both profundal and littoral habitat zones; therefore, the minimum mean $LMII_{mod}$ value of the reference stations within each habitat zone was selected as the REV to represent the lower limit of the reference envelope for that habitat. Based on these classifications, reference station REF-C1-04 was selected as the basis for the REV for profundal stations and REF-C1-01 was selected as the basis for the REV for littoral stations (see Table A-9).

Comparisons between the selected REVs indicate that benthic communities within the PLSA are generally within the reference envelope for each habitat zone. For the littoral zone, calculated values of $LMII_{mod}$ exceeded the REV for all PLSA stations except PLSA-C1-25. Station PLSA-C1-25 had a relatively low $LMII_{mod}$ value due to a low number of Dipteran taxa, chironomid individuals, and a high relative abundance of oligochaetes. However, other benthic community metrics at this station, including richness, abundance, and diversity metrics were within the upper portion of the range observed in reference areas (see Table A-9 and Figure A-10). In profundal habitats within the PLSA, $LMII_{mod}$ values for all stations were within the reference envelope established by REF-C1-01 in the deeper portion of the reference area. These findings indicate that when categorized by habitat zone, the relative integrity of benthic macroinvertebrate communities at PLSA stations is consistent with the integrity of reference area communities.

Collectively, the multivariate and multi-metric analyses of benthic macroinvertebrate community data collected from SQT stations do not indicate impairment at PLSA stations relative to reference stations. Differences observed between benthic macroinvertebrate community attributes were consistent with differences in macro-habitat attributes (e.g., water depth, macrophytes) that are typical in freshwater lake systems, particularly eutrophic systems like Pompton Lake. These findings do not indicate alterations or impairments of benthic macroinvertebrate community structure within the PLSA relative to reference conditions that is consistent with exposure to mercury or other constituents.

6.0 SQT Weight-of-Evidence Evaluation

The findings presented in the preceding section were used in a WOE evaluation to identify SQT stations with potential benthic macroinvertebrate community impacts explained by mercury concentrations in sediment or pore water. The multiple LOEs in the SQT investigation were integrated into the framework for proposed by Bay and Weisberg (2010) as described in Section 4.4. The overall results of the WOE evaluation indicate that impacts to benthic organisms resulting from exposure to mercury in sediment and pore water within the PLSA are not likely. The following sections present the results of the WOE evaluation.

6.1 Step 1: Assign Response Categories

The initial step of the evaluation was to assign one of four response categories to each line-of-evidence: minimal, low, moderate, and high. Table A-10 summarizes the data used to assign response categories for each LOE based on the criteria developed in Section 4.4.1; a discussion of the various response categories is provided below.

6.1.1 Sediment and Pore Water Chemistry

The response categories for chemical exposure were classified based on the combined evaluation of pore water and bulk sediment chemistry data. As summarized in Table A-10, pore water exposure classifications for all PLSA stations were identified as minimal based on field samples. Concentrations of THg and MeHg were substantially lower than NOEC benchmarks for benthic macroinvertebrates. $PW\text{-}TU_{sum}$ values, which represent the summed ratios of measured THg and MeHg concentrations to respective NOEC benchmark concentrations were less than one for each PLSA station. As a result, exposure to mercury in pore water was considered to represent minimal exposure to benthic macroinvertebrates.

Sediment exposure categories varied by station based primarily on concentrations of THg (see Table A-10). As summarized in Section 5.1.1, concentrations of non-mercury constituents were generally below SQB_{high} values, with the exception of tPAH concentrations at PLSA-C1-33 and PLSA-C1-01. As a result, $SQB\text{-}Q_{overall}$ values were greatly influenced by the $SEL\text{-}Q_{THg}$. Based on $SQB\text{-}Q_{overall}$ values, sediment exposure categories reflected the gradient of sediment THg concentrations that was the basis for SQT sampling design (see Table A-10).

Overall exposure classifications for sediment and pore water were based on the average of the exposure categories. As a result of the minimal exposure to mercury in pore water, overall sediment and pore water classifications ranged from moderate (PLSA-C1-40 and PLSA-C1-22) at the stations with the two highest sediment THg concentrations to minimal at five stations with $SEL\text{-}Q_{THg}$ values generally less than one. The remaining 10 PLSA stations were classified as low exposure (see Table A-10).

6.1.2 Sediment Toxicity Testing

Response categories for sediment toxicity were based on the results of the 28-day *H. azteca* and 20-day *C. dilutus* toxicity tests. Classification of sediment toxicity based on these results is likely highly conservative based on test exposure conditions that overestimated *in situ* pore water exposure of THg and MeHg (and potentially other constituents; see Section 5.2.1).

Sediment toxicity classifications were based primarily on relatively minimal biomass responses observed in the 28-day *H. azteca* exposure (see Table A-10). Mean biomass values for three stations (PLSA-C1-12, PLSA-C1-28, and PLSA-C1-40) were below the REV for biomass; these endpoints were also significantly lower than the mean biomass measured in the reference station (REF-C1-05) used as the basis for the REV. As a result, these stations were considered to have a growth response outside of the reference envelope. Based on toxicity categories established using the RPD between mean biomass measured at PLSA stations and the REV, sediment toxicity at PLSA-C1-12 and PLSA-C1-40 was classified as moderate based on RPDs between -20 and -40 and low at PLSA-C1-28 based on an RPD between 0 and -20. All other endpoints for all other stations evaluate in the 28-day *H. azteca* and 20-day *C. dilutus* exposures were classified as non-toxic based on the criteria established in Section 4.4.1 (see Table A-10).

6.1.3 Benthic Macroinvertebrate Community Disturbance

Based on comparisons between the REVs values for $LMII_{mod}$ established for profundal and littoral habitat zones, only station PLSA-C1-25 was identified as not being within the reference envelope for $LMII_{mod}$ values. The disturbance of the benthic community at PLSA-C1-25 was classified as moderate using criteria established in Section 4.4.1. All other stations were within the reference envelope based on the REVs established for each habitat zone. As a result, the benthic community disturbance at all other stations was classified as reference (see Table A-10).

6.2 Step 2: Classify the Severity of Effects and the Potential for Chemically-Mediated Effects

The response categories assigned to each LOE in the preceding section were used to classify the severity of potential biological effects and the potential for those effects to be chemically-mediated (i.e., explained by mercury concentrations in sediment and pore water). Tables A-2a and A-2b illustrate the combination of response categories used to classify the severity of biological effects and the potential for chemically-mediated effects (Bay and Weisberg, 2010). Classifications of PLSA stations based on these categories is summarized in Table A-11 and discussed below.

6.2.1 Severity of Effects

The severity of effects to benthic macroinvertebrates exposed to sediment at PLSA stations was classified based on the sediment toxicity and benthic disturbance response categories assigned for each station in the preceding section (see Table A-10).
Table A-11 summarizes the severity of effects categories for each station based on the combinations of sediment toxicity and benthic disturbance response categories. With the exception of PLSA-C1-25, all stations were classified as unaffected based on the combination of reference benthic disturbance response categories and non-toxic to moderate toxicity response categories (see Table A-2a). Although PLSA-C1-25 was classified as non-toxic in the sediment toxicity category the severity of effects at this

station was classified as a moderate effect based on the moderate disturbance identified in the benthic disturbance category (see Section 6.1.3).

6.2.2 Potential for Chemically-Mediated Effects

The potential for effects to be chemically-mediated was classified for each PLSA station based on the combination of sediment toxicity and sediment and pore water exposure response categories assigned for each station (see Table A-10). As summarized in Table A-11, the potential for effects to be chemically-mediated was categorized as minimal for 14 PLSA stations with non-toxic sediment toxicity categories and minimal to low exposure categories. Two stations (PLSA-C1-12 and PLSA-C1-40) were identified as having a moderate potential for chemically-mediated effects based on moderate toxicity categories and low to moderate exposure categories. PLSA-C1-22 was identified as having low potential for chemically-mediated effects based on non-toxic toxicity classification and moderate exposure (see Table A-11).

6.3 Step 3: Classify Station-Specific Impact

Using the classifications of the severity of biological effects and the potential for chemically-mediated effects identified in Step 2, potential overall impacts to benthic macroinvertebrates were classified for each PLSA station. As summarized in Table A-11, 14 PLSA stations were classified as unimpacted and three stations were classified as likely unimpacted. Further discussion of the overall impact classifications of PLSA stations is provided below.

6.3.1 Unimpacted

Fourteen of 17 PLSA stations were classified as unimpacted. These stations were classified as unaffected based on the severity of effects category and had minimal to low potential for chemically-mediated effects (see Table A-11). Based on the WOE evaluation, exposure to mercury or other constituents in sediment and pore water at these stations is not associated with adverse ecological effects relative to reference conditions.

6.3.2 Likely Unimpacted

Three stations were classified as likely unimpacted based on the severity of biological effects and the potential for chemically-mediated effects categories (see Table A-11). Further discussion of the classification of these stations is provided below.

- PLSA-C1-25: This station was classified as likely unimpacted due to a moderate benthic community disturbance, but a minimum potential for chemically-mediated effects. Given that exposure was considered to be low at this station and none of the six toxicity testing endpoints were below the REV (see Table A-10), it is likely that the relative difference in the $LMII_{mod}$ between this station and the reference envelope was associated with variables other than chemical exposure in sediment or pore water. In addition, other benthic community metrics at this station were within the upper portion of the range observed in reference areas (see Table A-9 and Figure A-10). It should also be noted that this station is located adjacent to the ABD removal limit in close proximity to a boat launch in the northern portion of the PLSA, which may result in physical disturbance to the area (see Figure A-2a). Based on these findings, any potential impacts to benthic macroinvertebrates at this station are not likely associated with exposure to mercury or other constituents.

- PLSA-C1-12: This station was classified as likely unimpacted due to a moderate toxicity classification based on a *H. azteca* endpoint that was marginally lower than the REV (see Table A-10). Pairwise comparisons between the biomass endpoints at PLSA-C1-12 and reference station REF-C1-05, which established the REV, were lower by a marginal statistical significant ($p = 0.041$); growth and biomass endpoints for *C. dilutus* were within the reference envelope for this station. Given that exposure conditions in the toxicity test were likely greater than the relatively low exposure conditions measured *in situ* at PLSA-C1-12 and that only a marginal effect on biomass was attributed to these tests, it is not likely that population-level impacts would be associated with exposure to sediments and pore water at PLSA-C1-12. Benthic community metrics at this station were within the reference envelope, indicating that community attributes at PLSA-C1-12 were similar to the community attributes of a reference area with similar habitat characteristics. As a result, it is not likely that exposure to mercury or other constituents is adversely impacting benthic macroinvertebrate receptors at PLSA-C1-12.
- PLSA-C1-40: This station received an overall classification as likely unimpacted based on its categorization as moderately toxic due to a reduced *H. azteca* biomass endpoint, moderate exposure potential, and benthic community attributes that were consistent with reference. This station is located within the ABD removal area and was added to the SQT sampling design to capture an upper bound THg concentration in sediment. In addition to having the greatest concentration of sediment THg in the SQT investigation, sediments from PLSA-C1-40 also contained the greatest concentrations of total recoverable metals, particularly divalent metals copper, lead, and zinc, as indicated by the greatest PEC-Q_{metals} (see Table A-10); station PLSA-C1-40 also had the greatest concentration of SEM metals in sediment (see Table A-4). As previously stated, exposure conditions in the toxicity tests likely overestimate exposure to mercury and possibly other redox-sensitive constituents, namely SEM constituents copper, lead, and zinc. Although this station had the greatest exposure concentrations in sediment, the only effect observed in toxicity testing was an approximately 25 percent reduction in biomass for *H. azteca* relative to the REV; there was no significant effect on *H. azteca* survival or any endpoints evaluated in the *C. dilutus* toxicity test for this station (see Table A-6). This minimal effect in the toxicity test is not apparent in the evaluation of benthic community metrics at this station, which indicate the highest $LMII_{mod}$ value measured in the PLSA and relatively high values of richness, abundance, and diversity metrics relative to reference (see Table A-9). Collectively, these findings indicate that exposures to mercury in sediment and pore water and other constituents in sediment at PLSA-C1-40 have little to no impact on benthic macroinvertebrate receptors under *in situ* exposure conditions.

6.4 Summary of SQT Weight-of-Evidence Evaluation

The results of the WOE evaluation of potential mercury-associated effects on benthic macroinvertebrate receptors indicate that sediments within the PLSA are unimpacted or likely unimpacted relative to reference areas. Benthic macroinvertebrate community attributes at PLSA stations were generally consistent with reference area benthic macroinvertebrate communities. The results of sediment toxicity testing conducted under conservative exposure conditions indicated only marginal effects in the biomass endpoint at a limited number of stations; these effects on biomass were not consistent between test organisms. Potential effects on benthic community structure or toxicity test endpoints were not consistent with exposure gradients for mercury in sediment or pore water. The integration of these lines of evidence into the SQT framework developed by Bay and Weisberg (2010) resulted in the classification of 14 of 17 PLSA stations as unimpacted and the remaining three stations as likely unimpacted.

The classifications of PLSA stations as unimpacted or likely unimpacted indicate that EPCs measured in THg and MeHg in sediment and pore water samples are representative of NOEC benchmarks values for benthic macroinvertebrate receptors. Table A-12 summarizes the maximum NOEC concentrations for THg and MeHg measured in sediment and pore water samples from PLSA stations. These NOEC benchmarks may be used as the basis to evaluate potential exposures to benthic macroinvertebrates in other sediment and pore water characterization sampling conducted during the 2013 Ecological Investigations. Concentrations below these NOEC benchmarks would not be expected to result in impaired benthic communities or substantial negative responses in sediment toxicity tests.

7.0 Conclusions

The results of the SQT investigation support the following conclusions regarding potential mercury-associated exposures to benthic macroinvertebrate communities within the PLSA:

- Benthic community attributes at PLSA stations were consistent with community attributes in reference areas; differences in benthic communities in PLSA and reference areas were primarily associated with station position within lake habitat zones.
- Mercury exposure in pore water measured in *ex situ* sediment toxicity tests was greater than exposure concentrations measured in samples collected directly from the field, resulting in a conservative evaluation of toxic effects relative to *in situ* exposure conditions.
- Longer-term sediment toxicity tests (28-day and 20-day) on *H. azteca* and *C. dilutus* did not result in adverse effects on invertebrate survival and relatively minor effects on sublethal endpoints (e.g., biomass).
- Observed differences in benthic community structure or minimal effects in toxicity tests were not consistent with exposure gradients for THg or MeHg in sediment or pore water.
- The findings of the WOE evaluation indicate that benthic macroinvertebrate receptors are unimpacted or likely unimpacted at PLSA stations with THg concentrations ranging up to 23.5 µg THg/g; this concentration and other maximum exposure concentrations in sediment and pore water will be used as NOECs in the evaluation of benthic macroinvertebrate exposure within the PLSA.

The conclusions of the SQT investigation were incorporated into the 2013 Ecological Investigation Report to support the assessment of ecological risk to benthic macroinvertebrate communities outside of the ABD remedial action area..

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Tables

Table A-1
Attributes of Sediment Quality Triad Sampling Stations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Station ID	Lake Habitat Zone	Bioactive Zone Description[a]	Habitat Layer[b]	Macrophytes Present[a]	Water Depth (ft)[a]	Sediment Parameters[a]			Near Bottom Water Quality Parameters[a]					
						ORP (mV)	TOC (%)	Fine Grained Sediment (% passing .064mm)	Temperature (°C)	DO (mg/L)	DO (%)	pH	Conductivity (mS/cm)	ORP (mV)
Pompton Lake Study Area														
PLSA-C1-01	Profundal	Dark grey clay silt w/ fine sands	Sand	Trace	9.0	-165.5	3.5	83.0	21.7	15.49	177	9.05	0.563	110.3
PLSA-C1-04	Littoral/Sublittoral	Dark grey/ black fluidized silt w/ trace sand	Silt	Abundant	3.8	-182.6	5.9	79.0	22.3	15.28	176.3	9.11	0.559	101.5
PLSA-C1-10	Littoral/Sublittoral	Dark brown/ grey fluidized silt	Silt[a]	Abundant	1.0	-90.9	10.5	78.0	23.3	6.64	88.3	7.72	0.603	41.1
PLSA-C1-11	Profundal	Brown/ grey clay/ sandy silt	Silt	None	15.0	-183.8	2.0	64.0	21.9	8.6	98.3	7.63	0.606	107.9
PLSA-C1-12	Profundal	Dark brown/ grey fluidized silt w/ gravel/ sand	Sand	None	15.0	-208.9	4.8	53.0	22.3	8.86	101.5	7.68	0.604	145.6
PLSA-C1-14	Littoral/Sublittoral	Dark brown/ black fluidized silt	Sand	Abundant	6.3	-193.6	2.9	78.5	24.2	11.03	131.2	8.78	0.68	29.7
PLSA-C1-16	Littoral/Sublittoral	Dark brown/ grey clay/ sandy silt	Silt	Moderate	8.1	149.7	2.2	77.5	23.7	9.01	84.7	8.08	0.582	135.2
PLSA-C1-19	Littoral/Sublittoral	Dark grey silt w/ trace fine sand	Vegetation	Moderate	3.2	-219.2	2.9	61.5	25.2	14.3	164	8.93	0.679	-50.3
PLSA-C1-20	Littoral/Sublittoral	Dark brown/ grey fine sandy silt	Vegetation	Moderate	4.2	-183.2	0.6	77.0	23.1	9.96	116.5	7.95	0.56	160.4
PLSA-C1-22	Littoral/Sublittoral	Brown/ grey clay/ sandy silt	Vegetation	Moderate	2.7	-198.2	3.4	88.0	24.5	13.98	170.3	8.39	1.076	65.9
PLSA-C1-24	Littoral/Sublittoral	Dark brown/ grey sandy/ clay silt	Vegetation	Trace	2.1	-191.0	0.9	81.0	23.0	0.33	2.9	8.52	0.555	21.9
PLSA-C1-25	Littoral/Sublittoral	Dark brown/ grey silt w/ trace sand	Vegetation	Moderate	2.3	-208.3	3.3	21.0	23.6	6.91	80.9	7.27	1.079	97.9
PLSA-C1-28	Littoral/Sublittoral	Grey/ brown silty fine sand	Vegetation	Trace	5.1	-140.3	0.3	7.0	18.8	11.16	166.8	7.73	0.53	147.9
PLSA-C1-30	Littoral/Sublittoral	Dark brown/ grey clay/ fluidized silt	Vegetation	Abundant	3.5	-129.4	9.6	79.0	19.2	12.39	134.4	7.91	0.556	119.7
PLSA-C1-33	Littoral/Sublittoral	Dark grey clay silt	Silt	Moderate	3.7	-155.7	5.6	80.0	20.7	11.44	7.77	7.53	0.546	58
PLSA-C1-39	Profundal	Dark brown/ grey clay/ silt	Sand	None	14	-103.8	4.5	87.5	17.9	7.09	74.8	8.67	0.531	122
PLSA-C1-40	Littoral/Sublittoral	Dark brown/ grey clay/ silt	Silt[a]	Trace	2.7	-111.6	3.6	86.0	17.0	11.3	115.3	9.23	0.529	124.1
Reference Area														
REF-C1-01	Littoral/Sublittoral	Dark brown fluidized silt w/ fine sand	Vegetation[a]	Abundant	1.2	-85.8	1.7	41.5	18.1	5.99	61.9	7.62	0.509	39.3
REF-C1-02	Littoral/Sublittoral	Brown sandy fluidized silt	Silt[a]	Moderate	4.1	-129.6	1.1	15.0	17.9	12.36	130.1	7.8	0.528	60.7
REF-C1-03	Littoral/Sublittoral	Tan/ grey silt/ sand	Sand[a]	Moderate	7.5	-168.9	0.4	4.0	18.2	9.89	100.4	7.63	0.503	101.5
REF-C1-04	Profundal	Dark grey/ black clay/ silt	Silt[a]	None	15	-158.8	2.0	60.0	18.3	9.72	101.9	7.64	0.499	51.7
REF-C1-05	Profundal	Dark brown/ grey clay/ silt	Silt[a]	None	12	-127.1	5.3	94.0	18.0	8.62	91.3	7.35	0.504	0.1

Notes:
a, Data collected during EI13 field investigations
b, Unless otherwise noted, habitat layer based on side scan sonar results (Arcadis, 2013)
ORP, Oxidation reduction potential
TOC, Total organic carbon
DO, Dissolved oxygen

Table A-2
Weight-of-Evidence Framework to Classify Potential Benthic Macroinvertebrate Community Impacts
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Table 2a: Severity of Effect Classifications

		Sediment Toxicity LOE Category			
		Non-Toxic	**Low Toxicity**	**Moderate Toxicity**	**High Toxicity**
Benthic Community Analysis	**Reference**	Unaffected	Unaffected	Unaffected	Low Effect
	Low Disturbance	Unaffected	Low Effect	Low Effect	Low Effect
	Moderate Disturbance	Moderate Effect	Moderate Effect	Moderate Effect	Moderate Effect
	High Disturbance	Moderate Effect	High Effect	High Effect	High Effect

Table 2b: Potential That Effects Are Chemically-Mediated

		Sediment Toxicity LOE Category			
		Non-Toxic	**Low Toxicity**	**Moderate Toxicity**	**High Toxicity**
Sediment and Pore Water Chemistry	**Minimal Exposure**	Minimal Potential	Minimal Potential	Low Potential	Moderate Potential
	Low Exposure	Minimal Potential	Low Potential	Moderate Potential	Moderate Potential
	Moderate Exposure	Low Potential	Moderate Potential	Moderate Potential	Moderate Potential
	High Exposure	Moderate Potential	Moderate Potential	High Potential	High Potential

Table 2c: Weight-of-Evidence Station Classifications

		Severity of Effect Classification			
		Unaffected	**Low Effect**	**Moderate Effect**	**High Effect**
Potential for Chemically-Mediated Effects	**Minimal Potential**	Unimpacted	Likely Unimpacted	Likely Unimpacted	Inconclusive
	Low Potential	Unimpacted	Likely Unimpacted	Possibly Impacted	Possibly Impacted
	Moderate Potential	Likely Unimpacted	Possibly Impacted or Inconclusive	Likely Impacted	Likely Impacted
	High Potential	Inconclusive	Likely Impacted	Clearly Impacted	Clearly Impacted

Notes:
LOE, Lines of Evidence

Table A-3
Summary of Sediment Analytical Results - SQT Investigation
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method	Ecological Screening Criteria (ESC)	Number of Stations Exceeding ESC
Pompton Lake Study Area										
Total Mercury	µg/g dw	17	17	0.04	23.5	4.32 (± 1.40)	7.88	95% Adjusted Gamma	2.0	10
Methylmercury	ng/g dw	17	17	0.05	4.7	1.15 (± 0.27)	1.79	95% Adjusted Gamma	NA	NA
Reference Area										
Total Mercury	µg/g dw	5	5	0.02	0.25	0.13 (± 0.05)	--	NC, small sample size	2.0	0
Methylmercury	ng/g dw	5	5	0.15	0.63	0.39 (± 0.01)	--	NC, small sample size	NA	NA

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NA, Not available. An ecological screening criterion was not identified for methylmercury exposure in freshwater sediment.
NC, UCL_{mean} was not calculated due to low sample size.

Table A-4
Screening Summary of Non-Mercury Constituents in Sediment
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Study Areas					Reference Areas		Sediment Quality Benchmark Low (SQB_{low})	Sediment Quality Benchmark High (SQB_{high})	Sediment Quality Benchmark Source	Number of Exceedances Low	Number of Exceedances High
			Number of Samples	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Location of Max Detect	Minimum Detected Concentration	Maximum Detected Concentration					
Metals (mg/kg)														
ALUMINUM	MG/KG	6010B	17	17	4330	25700	PLSA-C1-40	4580	21600	NV	NV	--	--	--
ANTIMONY	MG/KG	6010B	17	1	2.63	2.63	PLSA-C1-39	ND	ND	2	3	Low (5); High (4)	1	0
ARSENIC	MG/KG	6010B	17	13	1.69	9.63	PLSA-C1-39	1.57	5.11	9.79	33	Low (1); High (2)	0	0
BARIUM	MG/KG	6010B	17	17	25.5	203	PLSA-C1-04	25.8	160	NV	NV	--	--	--
BERYLLIUM	MG/KG	6010B	17	17	0.229	1.55	PLSA-C1-40	0.237	1.35	NV	NV	--	--	--
CADMIUM	MG/KG	6010B	17	17	0.319	2.43	PLSA-C1-40	0.256	1.16	0.99	4.98	Low (1); High (2)	14	0
CHROMIUM	MG/KG	6010B	17	17	11.6	94.1	PLSA-C1-12	8.3	40.4	43.4	111	Low (1); High (2)	8	0
COBALT	MG/KG	6010B	17	17	3.25	14.8	PLSA-C1-40	3.89	11.9	50	NV	Low (3)	0	--
COPPER	MG/KG	6010B	17	17	10.3	407	PLSA-C1-40	10.9	67	31.6	149	Low (1); High (2)	15	2
LEAD	MG/KG	6010B	17	17	8.92	263	PLSA-C1-40	6.11	71.3	35.8	128	Low (1); High (2)	14	3
MANGANESE	MG/KG	6010B	17	17	160	1740	PLSA-C1-04	167	1050	630	1100	Low (3) High (4)	13	4
NICKEL	MG/KG	6010B	17	17	6.51	34.7	PLSA-C1-39	6.41	24.1	22.7	48.6	Low (1); High (2)	9	0
SILVER	MG/KG	6010B	17	17	0.305	2.31	PLSA-C1-01	0.253	1.38	1	3.7	Low (3) High (4)	14	0
THALLIUM	MG/KG	6010B	17	5	0.549	2.96	PLSA-C1-11	ND	ND	NV	NV	--	--	--
VANADIUM	MG/KG	6010B	17	17	12.6	69.8	PLSA-C1-11	15.3	55.4	NV	NV	--	--	--
ZINC	MG/KG	6010B	17	17	40.4	439	PLSA-C1-40	33.5	258	121	459	Low (1); High (2)	14	0
Acid Volaitle Sulfide/Simultaneously Extractable Metals (AVS/SEM)														
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	17	16	3.7	41.7	PLSA-C1-19	1.6	10.9	--	--	--	--	--
CADMIUM	UMOL/G	6010B	17	17	0.00118	0.0142	PLSA-C1-40	0.256	1.16	--	--	--	--	--
COPPER	UMOL/G	6010B	17	17	0.0931	1.82	PLSA-C1-40	10.9	67	--	--	--	--	--
LEAD	UMOL/G	6010B	17	17	0.0291	0.737	PLSA-C1-40	6.11	71.3	--	--	--	--	--
MERCURY	UMOL/G	7471A	17	16	0.000014	0.0000719	PLSA-C1-10	0.000012	0.000012	--	--	--	--	--
NICKEL	UMOL/G	6010B	17	17	0.0313	0.19	PLSA-C1-30	6.41	24.1	--	--	--	--	--
SILVER	UMOL/G	6010B	17	8	0.00176	0.00433	PLSA-C1-30	0.253	1.38	--	--	--	--	--
ZINC	UMOL/G	6010B	17	17	0.385	3.92	PLSA-C1-40	33.5	258	--	--	--	--	--
Sum SEM	UMOL/G	--	16	16	2.56	6.61	PLSA-C1-40	0.90	4.59	--	--	--	--	--
SEM:AVS	UMOL/G	--	16	16	0.07	0.69	PLSA-C1-20	0.16	0.56	--	--	--	--	--
SEM-AVS/f_{oc}	UMOL/G_{oc}	--	16	16	-1352.38	-93.24	PLSA-C1-39	-281.93	-5.74	--	--	--	--	--
Pesticides (ug/kg)														
4,4'-DDD	UG/KG	8081A	17	5	2.6	19	PLSA-C1-22	ND	ND	4.88	28	Low (1); High (2)	2	0
4,4'-DDE	UG/KG	8081A	17	12	1.5	9.2	PLSA-C1-16	2.1	4.8	3.16	31.3	Low (1); High (2)	6	0
4,4'-DDT	UG/KG	8081A	17	12	1.1	6.7	PLSA-C1-25	2.6	3	4.16	62.9	Low (1); High (2)	3	0
Total DDTs	UG/KG	--	17	17	2.3	23.1	PLSA-C1-22	--	--	5.28	572	Low (1); High (2)	14	0
ALDRIN	UG/KG	8081A	17	6	1.6	8.9	PLSA-C1-12	ND	ND	2	80	Low (3) High (4)[a]	4	0
ALPHA CHLORDANE	UG/KG	8081A	17	10	0.56	7	PLSA-C1-04	0.98	5.8	NV	NV	--	--	--
ALPHA-BHC	UG/KG	8081A	17	6	1.2	14	PLSA-C1-12	1.1	1.1	6	100	Low (3) High (4)[a]	1	0
BETA-BHC	UG/KG	8081A	17	3	2.7	7.3	PLSA-C1-22	ND	ND	5	210	Low (3) High (4)[a]	1	0
DELTA-BHC	UG/KG	8081A	17	6	3.2	38	PLSA-C1-12	4.4	4.4	6,400	NV	Low (5)	0	--
ENDOSULFAN I	UG/KG	8081A	17	2	1.2	12	PLSA-C1-22	0.74	0.74	2.9	NV	Low (5)	1	--
ENDOSULFAN II	UG/KG	8081A	17	2	0.68	2.3	PLSA-C1-19	ND	ND	14	NV	Low (5)	0	--
ENDRIN ALDEHYDE	UG/KG	8081A	17	5	0.65	2.9	PLSA-C1-01	ND	ND	480	NV	Low (3)	0	--
HEPTACHLOR	UG/KG	8081A	17	9	1.9	23	PLSA-C1-12	1.7	3.6	0.6	10	Low (3) High (4)	9	0
LINDANE	UG/KG	8081A	17	1	3.3	3.3	PLSA-C1-24	ND	ND	2.37	4.99	Low (1) High (2)	1	0
Herbicides (ug/kg)														
2,4,5-T	UG/KG	8151A	17	1	0.85	0.85	PLSA-C1-24	ND	ND	NV	NV	--	--	--
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A	17	1	8800	8800	PLSA-C1-19	ND	ND	NV	NV	--	--	--
PENTACHLOROPHENOL	UG/KG	8151A	17	7	1.3	6.2	PLSA-C1-04	0.74	2.1	23000	NV	Low (3)	0	--
SILVEX	UG/KG	8151A	17	4	3.9	8.7	PLSA-C1-10	ND	ND	NV	NV	--	--	--
Semi-volatile Organic Compounds (SVOCs) (ug/kg)														
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C	17	1	19	19	PLSA-C1-24	ND	ND	670	NV	Low (5)	0	--
BENZO(B)FLUORANTHENE	UG/KG	8270C	17	17	73	3200	PLSA-C1-33	130	670	10400	NV	Low (3)	0	--
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C	17	1	310	310	PLSA-C1-25	ND	ND	180	NV	Low (5)	1	--
Polycyclic Aromatic Hydrocarbons (PAHs) ug/kg														
2-METHYLNAPHTHALENE	UG/KG	8270C	17	6	5	24	PLSA-C1-22	44	280	70	670	Low (3) High (4)	0	0
ACENAPHTHENE	UG/KG	8270C	17	10	4	87	PLSA-C1-39	54	54	16	500	Low (3) High (4)	6	0
ACENAPHTHYLENE	UG/KG	8270C	17	10	6	140	PLSA-C1-39	7	20	44	640	Low (3) High (4)	3	0
ANTHRACENE	UG/KG	8270C	17	12	10	620	PLSA-C1-33	16	220	57.2	845	Low (1); High (2)	5	0
BENZO(A)ANTHRACENE	UG/KG	8270C	17	17	35	1800	PLSA-C1-33	67	380	108	1050	Low (1); High (2)	15	2
BENZO(G,H,I)PERYLENE	UG/KG	8270C	17	17	36	2200	PLSA-C1-33	71	430	170	3200	Low (3) High (4)	14	0
BENZO(K)FLUORANTHENE	UG/KG	8270C	17	17	26	1800	PLSA-C1-33	54	330	240	13400	Low (3) High (4)	8	0
BENZO[A]PYRENE	UG/KG	8270C	17	17	48	2400	PLSA-C1-33	84	450	150	1450	Low (1); High (2)	14	1
CHRYSENE	UG/KG	8270C	17	17	48	2400	PLSA-C1-33	85	550	166	1290	Low (1); High (2)	14	3
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C	17	11	9	480	PLSA-C1-01	16	91	60	1300	Low (3) High (4)	4	0
FLUORANTHENE	UG/KG	8270C	17	17	80	3800	PLSA-C1-33	170	950	423	2230	Low (1); High (2)	14	3
FLUORENE	UG/KG	8270C	17	10	4	120	PLSA-C1-39	6	99	77.4	536	Low (1); High (2)	1	0
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C	17	17	32	1800	PLSA-C1-33	66	340	200	3200	Low (3) High (4)	11	0
NAPHTHALENE	UG/KG	8270C	17	10	4	59	PLSA-C1-39	80	80	176	561	Low (1); High (2)	0	0
PHENANTHRENE	UG/KG	8270C	17	17	40	1500	PLSA-C1-33	73	380	204	1170	Low (1); High (2)	14	2
PYRENE	UG/KG	8270C	17	17	76	3700	PLSA-C1-33	150	850	195	1520	Low (1); High (2)	15	5
TOTAL PAHs (ND = 0)	UG/KG	--	17	17	458	22020	PLSA-C1-33	865	4704	1610	22800	Low (1); High (2)	14	0
TOTAL PAHs (ND = 1/2 DL)	UG/KG	--	17	17	917.5	45600	PLSA-C1-33	1737.5	9570.5	1610	22800	Low (1); High (2)	16	2
Other Parameters														
TOTAL ORGANIC CARBON	%		17	17	0.31	10.5	PLSA-C1-10	0.395	5.32	--	--	--	--	--
FRACTION ORGANIC CARBON (f_{oc})			17	17	0.0031	0.105	PLSA-C1-10	30.6	74.5	--	--	--	--	--
PERCENT FINES (<0.064 MM)	% PASSING	D422	17	17	--	--	--	--	--	--	--	--	--	--

Notes:
NA - Not applicable
ND - Not detected
NV - Screening benchmark not available
UG/KG - microgram per kilogram
MGKG - milligram per kilogram
UMOL/G - micromole per gram
a, Expressed at 1 % sediment total organic carbon (TOC)

Benchmark Sources:
1. (TEC) MacDonald et al. 2000. Consensus -Based Sediment Quality Guidelines (SQGs) for Freshwater Ecosystems
2. (PEC) MacDonald et al. 2000. Consensus -Based Sediment Quality Guidelines (SQGs) for Freshwater Ecosystems
3. (LEL) New Jersey Department of Environmental Protection (NJDEP). 2009. Ecological Screening Criteria (ESC) Table. March. Available on-line at: http://www.nj.gov/dep/srp/guidance/ecoscreening/
4. (SEL) New Jersey Department of Environmental Protection (NJDEP). 2009. Ecological Screening Criteria (ESC) Table. March. Available on-line at: http://www.nj.gov/dep/srp/guidance/ecoscreening/
5. EPA. 2006a. *Ecological Risk Assessment Freshwater Sediment Screening Benchmarks*. URL: http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm.

Table A-5
Summary of Pore Water Analytical Results - SQT Investigation
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Analyte	Units	Number of Samples	Number of Detections	Minimum Detected Concentration	Maximum Detected Concentration	Mean (±SE) Concentration	Upper Confidence Limit of Mean Concentration (UCL_{mean})	UCL_{mean} Calculation Method	Ecological Screening Criteria (ESC)	Number of Stations Exceeding ESC
Pompton Lake Study Area										
Total Mercury	ng/L	17	17	0.41	8.26	1.41 (± 0.47)	3.48	95% Chebyshev (Mean, Sd)	4000	0
Methylmercury	ng/L	17	17	0.023	0.229	0.10 (± 0.02)	0.13	95% Student's t	4	0
Reference Area										
Total Mercury	ng/L	5	5	0.2	0.53	0.34 (± 0.06)	--	NC, small sample size	4000	0
Methylmercury	ng/L	5	5	0.029	0.164	0.08 (± 0.02)	--	NC, small sample size	4	0

Notes:
ProUCL version(5.0) used to calculate upper confidence limit of mean concentration (UCL_{mean})
SE, standard error of the mean concentration
NC, UCL_{mean} was not calculated due to low sample size.

Table A-6
Summary of 28-Day Hyalella azteca and 20-Day Chironomus dilutus Sediment Toxcity Testing
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Station	28-Day *Hyalella azteca* Toxicity Test									20-Day *Chironomus dilutus* Toxicity Test								
	Survival % REV = 82.5%			Growth REV = 0.504 mg/surviving indv			Biomass REV = 0.469 mg/exposed indv			Survival % REV = 77.5%			Growth REV = 1.603 mg/surviving indv			Biomass REV = 0.96 mg/exposed indv		
	Mean Survival (%)	±SE	*p*-value[a]	Mean Dry Weight (mg/surviving indv)	±SE	*p*-value[a]	Mean Dry Biomass (mg/exposed indv)	±SE	*p*-value[a]	Mean Survival (%)	±SE	*p*-value[a]	Mean AFDW (mg/surviving indv)	±SE	*p*-value[a]	Mean AFDW (mg/exposed indv)	±SE	*p*-value[a]
Pompton Lake Study Area																		
PLSA-C1-01	96.3	1.83	0.988	0.608	0.08	0.842	0.582	0.07	0.898	83.8	4.98	0.811	1.621	0.10	0.543	1.300	0.08	0.979
PLSA-C1-04	92.5	3.13	0.930	0.687	0.07	0.964	0.644	0.08	0.965	88.8	4.79	0.942	1.915	0.06	0.980	1.363	0.12	0.982
PLSA-C1-10	92.5	3.66	0.923	0.673	0.08	0.938	0.616	0.07	0.952	85.0	5.35	0.851	1.971	0.10	0.982	1.393	0.12	0.985
PLSA-C1-11	91.3	3.50	0.898	0.632	0.07	0.910	0.571	0.06	0.909	82.5	5.90	0.765	1.667	0.10	0.655	1.234	0.07	0.956
PLSA-C1-12	88.8	6.11	0.804	**0.419**	**0.05**	**0.139**	***0.363***	***0.04***	***0.041***	82.5	3.66	0.759	1.636	0.16	0.565	1.163	0.13	0.859
PLSA-C1-14	92.5	2.50	0.936	0.582	0.09	0.768	0.535	0.08	0.770	85.0	4.23	0.858	1.998	0.14	0.974	1.465	0.12	0.994
PLSA-C1-16	92.5	2.50	0.938	0.595	0.10	0.785	0.565	0.10	0.801	**75.0**	**8.86**	**0.476**	2.058	0.33	0.894	1.021	0.13	0.628
PLSA-C1-19	86.3	7.30	0.702	0.535	0.04	0.658	**0.458**	**0.05**	**0.434**	83.8	4.20	0.815	1.814	0.09	0.906	1.350	0.11	0.982
PLSA-C1-20	82.5	4.53	0.475	0.593	0.07	0.821	0.498	0.07	0.632	**76.3**	**12.09**	**0.768**	1.935	0.13	0.949	1.413	0.11	0.988
PLSA-C1-22	87.5	3.66	0.747	0.565	0.06	0.765	0.494	0.05	0.646	90.0	4.23	0.963	1.612	0.12	0.521	1.301	0.08	0.979
PLSA-C1-24	87.5	3.13	0.745	**0.474**	**0.05**	**0.352**	**0.414**	**0.05**	**0.190**	83.8	4.20	0.817	**1.584**	**0.09**	**0.451**	1.221	0.08	0.943
PLSA-C1-25	95.0	1.89	0.977	0.509	0.03	0.530	0.479	0.04	0.574	82.5	11.46	0.931	1.699	0.10	0.724	1.285	0.22	0.891
PLSA-C1-28	96.3	1.83	0.987	**0.441**	**0.05**	**0.221**	***0.427***	***0.05***	***0.047***	82.5	7.50	0.928	1.963	0.35	0.677	1.191	0.13	0.881
PLSA-C1-30	97.5	1.64	0.993	0.597	0.07	0.828	0.585	0.08	0.898	93.8	1.83	0.996	1.670	0.05	0.685	1.508	0.09	0.998
PLSA-C1-33	90.0	5.35	0.848	**0.437**	**0.06**	**0.097**	**0.380**	**0.05**	**0.083**	80.0	4.63	0.625	1.699	0.06	0.752	1.209	0.10	0.927
PLSA-C1-39	88.8	2.95	0.808	**0.486**	**0.07**	**0.323**	**0.426**	**0.06**	**0.276**	**68.8**	**13.15**	**0.294**	1.935	0.25	0.873	1.235	0.18	0.874
PLSA-C1-40	91.3	2.95	0.900	**0.382**	**0.04**	**0.062**	***0.351***	***0.05***	***0.037***	87.5	4.53	0.922	**1.522**	**0.06**	**0.288**	1.300	0.06	0.984
Reference Area																		
REF-C1-01	83.8	3.75	NA	0.806	0.12	NA	0.683	0.11	NA	88.8	2.95	NA	2.124	0.17	NA	1.490	0.10	NA
REF-C1-02	87.5	3.66	NA	0.687	0.05	NA	0.606	0.06	NA	87.5	3.66	NA	2.064	0.05	NA	1.570	0.11	NA
REF-C1-03	**82.5**	**5.26**	**NA**	0.817	0.10	NA	0.683	0.10	NA	91.3	2.95	NA	1.785	0.10	NA	1.327	0.14	NA
REF-C1-04	91.3	2.95	NA	0.635	0.07	NA	0.577	0.06	NA	83.8	3.75	NA	**1.603**	**0.12**	**NA**	**0.960**	**0.13**	**NA**
REF-C1-05	95.0	2.67	NA	**0.504**	**0.06**	**NA**	**0.469**	**0.04**	**NA**	**77.5**	**4.91**	**NA**	1.814	0.15	NA	1.083	0.10	NA
Pooled Reference Stations	88.0	1.76	NA	0.690	0.04	NA	0.604	0.04	NA	85.8	1.75	NA	1.878	0.06	NA	1.286	0.39	NA
Laboratory Control																		
Laboratory Control	97.5	1.64	NA	0.930	0.06	NA	0.902	0.05	NA	92.5	3.66	NA	2.201	0.13	NA	0.906	0.09	NA

Notes:
REV, Reference envelope value calculated as the minimum value of the endpoints measured in reference area SQT samples
a, Presents the probability value (p-value) for statistical comparisons between endpoints measured for the PLSA station and REV reference station.
Bold text indicates value exceeding the REV; bold and shaded cells indicate a statistical significance in the pairwise comparison between the PLSA station and the reference station used to establish the REV.
Reference envelope value

Table A-7
Spearman's Rank Correlation Matrix
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

		Exposure Media									Habitat Parameters				Sediment / Water Quality			Benthic Community Metrics								Toxicity Testing Endpoints					
		Pore Water (THg)	Pore Water (MeHg)	Sediment (THg)	Sediment (MeHg)	PEC-Q_{metals}	PEC-Q_{PAHs}	PEC-$Q_{pesticides}$	SEM-AVS/f_{oc}	Sum SEM	Percent Fines (0.064 mm passing)	Total Organic Carbon	Water Depth	Macrophyte Abundance	Sediment ORP (mV)	Surface Water ORP (mV)	Surface Water Dissolved Oxygen (%)	Total Abundance	Taxa Richness	Non-Chironomidae/Oligochaete Taxa Richness	Percent Dominant Taxa	Shannon-Weaver Diversity (H')	$LMII_{mod}$	NMDS Axis 1 Score	NMDS Axis 2 Score	Chironomus Survival	Chironomus Biomass	Chironomus Growth	Hyalella Survival	Hyalella Biomass	Hyalella Growth
Benthic Community Metrics	**Total Abundance**	0.187	-0.090	0.155	0.120	-0.045	-0.032	-0.227	-0.369	0.255	-0.160	0.029	-0.714	0.573	0.160	0.068	-0.158	1.000													
	Taxa Richness	0.035	0.068	-0.066	0.098	-0.159	0.037	-0.139	-0.214	0.070	-0.063	0.031	-0.634	0.666	0.140	-0.127	0.014	0.730	1.000												
	Non-Chironomidae/Oligochaete Taxa Richness	0.085	0.188	0.031	0.203	-0.088	-0.009	-0.234	-0.239	0.037	-0.088	0.044	-0.682	0.697	0.093	-0.142	0.041	0.751	0.972	1.000											
	Percent Dominant Taxa	-0.033	-0.032	-0.013	-0.070	0.122	-0.018	0.182	0.252	-0.058	-0.019	-0.078	0.590	-0.459	0.032	0.203	0.134	-0.536	-0.820	-0.770	1.000										
	Shannon-Weaver Diversity (H')	0.005	-0.012	-0.034	0.058	-0.184	0.006	-0.204	-0.219	0.060	0.055	-0.004	-0.610	0.530	0.068	-0.190	-0.094	0.594	0.933	0.875	-0.940	1.000									
	$LMII_{mod}$	0.110	0.099	0.169	0.310	0.000	-0.084	-0.152	-0.392	0.362	0.320	0.182	-0.524	0.502	0.039	0.012	0.317	0.548	0.738	0.708	-0.545	0.677	1.000								
	NMDS Axis 1 Score	0.025	-0.151	0.023	-0.048	0.288	0.390	0.362	0.238	0.045	0.147	0.168	0.728	-0.654	-0.130	0.073	-0.005	-0.740	-0.519	-0.592	0.282	-0.364	-0.530	1.000							
	NMDS Axis 2 Score	-0.152	-0.258	-0.099	-0.342	0.066	0.184	-0.313	0.030	-0.091	0.191	-0.118	-0.222	-0.134	0.160	-0.161	-0.073	0.077	0.154	0.101	-0.252	0.238	0.029	-0.158	1.000						
Toxicity Testing Endpoints	**Chironomus Survival**	-0.263	0.324	-0.083	0.291	-0.112	-0.259	-0.229	-0.141	-0.010	-0.145	0.005	-0.452	0.552	-0.034	-0.198	0.451	0.092	0.184	0.221	-0.043	0.097	0.338	-0.338	-0.072	1.000					
	Chironomus Biomass	-0.075	0.559	-0.147	0.108	-0.205	-0.273	-0.222	-0.114	-0.212	-0.224	-0.075	-0.484	0.748	0.019	-0.077	0.421	0.315	0.393	0.466	-0.124	0.196	0.416	-0.709	0.047	0.627	1.000				
	Chironomus Growth	-0.114	0.217	-0.457	-0.263	-0.281	0.058	0.170	0.300	-0.318	-0.315	-0.103	-0.082	0.532	0.379	-0.124	-0.129	0.259	0.426	0.424	-0.184	0.274	0.014	-0.339	0.103	-0.098	0.464	1.000			
	Hyalella Survival	-0.129	-0.308	0.120	0.272	0.407	0.422	0.414	-0.119	0.651	0.351	0.630	0.117	0.042	0.195	0.056	0.155	-0.044	-0.279	-0.314	0.194	-0.300	-0.126	0.227	-0.123	-0.069	-0.173	-0.122	1.000		
	Hyalella Biomass	-0.487	0.139	-0.653	-0.282	-0.357	-0.013	0.109	0.275	-0.310	-0.421	-0.186	-0.065	0.538	0.296	-0.083	0.242	-0.038	0.168	0.147	-0.052	0.080	-0.114	-0.110	-0.017	0.536	0.522	0.449	0.051	1.000	
	Hyalella Growth	-0.462	0.119	-0.675	-0.373	-0.394	-0.049	0.110	0.254	-0.418	-0.497	-0.301	-0.002	0.453	0.245	-0.096	0.242	-0.064	0.177	0.157	-0.057	0.090	-0.137	-0.070	-0.011	0.488	0.478	0.440	-0.070	0.981	1.000

Notes:
Critical Value for Spearman Rank Order Correlation (n=22, α=0.05, 0.425) (Zar, 1972)
PEC-Q, Probable effect quotient
SEM-AVS/f_{oc}, Molar concentration of simultaneously extractable metals (SEM) minus acid volatile sulfides (AVS) normalized to the fraction of organic carbon (f_{oc}) in sediment
SEM, Simultaneously extractable metals
ORP, Oxygen reduction potential
LMII, Lake Macroinvertebrate Integrity Index (modified from Blocksom et al., 2002)
NMDS, Non-metric multidimensional scaling

Table A-8
Summary of Benthic Invertebrate Community Abundance Data
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Taxonomic Group	Study Area	Pompton Lake Study Area																				
	Station ID	PLSA-C1-01			PLSA-C1-04			PLSA-C1-10			PLSA-C1-11			PLSA-C1-12			PLSA-C1-14			PLSA-C1-16		
	Taxa / Replicate	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Ephemeroptera	Caenis sp.	0	0	0	0	0	1	6	3	2	0	0	0	0	0	0	2	0	1	0	24	16
	Callibaetis sp.	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	6	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leptocerus americanus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oecetis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0
	Orthotrichia sp.	0	0	0	0	7	0	0	0	3	1	0	0	0	0	0	0	0	0	0	12	0
	Oxyethira sp.	0	0	0	0	1	0	19	6	2	0	0	0	0	0	0	0	0	0	0	12	0
	Polycentropodidae	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	0	0	0	0	0	1	3	4	14	0	0	0	0	0	0	0	0	0	0	6	2
	Corduliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enallagma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Epitheca princeps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Libellulidae	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Libellulidae/Corduliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Perithemis tenera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dubiraphia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Peltodytes sp.	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0
	Ablabesmyia sp.	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
	Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chironomus sp.	3	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cladopelma sp.	0	4	1	21	9	7	0	0	0	0	0	0	0	0	0	0	0	0	0	60	14
	Cladotanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinotanypus sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coelotanypus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cricotopus sp.	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Cryptochironomus sp.	0	0	0	7	3	2	0	0	0	2	0	0	0	0	0	2	4	0	2	24	7
	Cryptotendipes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Dicrotendipes modestus	0	0	0	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	5
	Dicrotendipes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dicrotendipes tritomus	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0	0	0	0	18	0
	Einfeldia natchitocheae	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	Einfeldia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Endochironomus sp.	0	0	0	1	0	0	6	3	2	0	0	0	0	0	0	0	0	0	0	0	0
	Glyptotendipes sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guttipelopia sp.	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Larsia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nanocladius sp.	0	0	0	2	5	1	10	0	3	0	0	0	0	0	0	0	0	0	2	12	0
	Parachironomus sp.	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paratanytarsus sp.	0	0	0	2	14	1	16	1	19	0	0	0	0	0	0	0	0	0	0	12	5
	Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Polypedilum bergi	0	0	0	0	1	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	2
	Polypedilum halterale gr.	0	0	0	14	2	11	3	0	0	0	0	0	0	0	0	0	2	2	0	0	0
	Polypedilum illinoense gr.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Procladius sp.	1	2	4	18	7	9	0	0	2	0	0	0	0	0	0	1	1	0	9	36	16
	Pseudochironomus sp.	0	0	0	1	1	5	13	3	26	0	0	0	0	0	0	0	0	0	2	102	9
	Tanypus sp.	1	0	0	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	6	0
	Tanytarsus sp.	0	0	0	22	12	10	0	0	0	0	0	0	0	0	0	6	6	0	0	12	2
	Thienemannimyia gr. sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tribelos sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Xenochironomus xenolabis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0
	Zavreliella marmorata	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Diptera	Bezzia/Palpomyia sp.	0	0	0	1	0	4	0	4	0	0	0	0	0	0	1	1	0	0	0	6	0
	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratopogoninae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Chaoborus sp.	4	0	5	0	0	0	0	0	0	78	147	39	58	101	38	1	0	0	14	12	7
	Dasyhelea sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Sphaeromias sp.	6	12	13	11	5	40	54	91	37	0	1	0	0	0	0	0	1	1	5	6	0
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Erpobdella sp.	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glossiphoniidae	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Helobdella elongata	0	0	0	4	0	0	0	10	0	0	0	0	0	0	0	1	0	3	0	0	0
	Helobdella sp.	0	0	0	0	8	2	0	0	2	1	0	0	0	0	0	0	0	0	2	12	0
	Helobdella stagnalis	0	0	0	2	1	4	26	63	61	0	0	0	0	0	0	8	5	17	0	0	2
	Hirudinida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	2	0	6	4	12	0	0	0	0	0	0	0	0	0	0	5	0	0	42	18
	Aulodrilus pigueti	0	1	0	20	7	15	0	0	0	0	1	1	0	0	0	11	33	1	2	6	9
	Aulodrilus pluriseta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Branchiura sowerbyi	0	0	0	0	2	2	6	3	16	0	0	0	0	0	0	0	0	0	26	24	7
	Chaetogaster diastrophus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dero digitata	0	9	0	1	0	0	10	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Dero flabelliger	0	0	0	1	0	0	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
	Dero sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnodrilus cervix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnodrilus hoffmeisteri	27	38	17	29	20	41	0	0	0	0	25	9	0	0	0	0	0	0	66	30	41
	Limnodrilus udekemianus	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nais sp.	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quistadrilus multisetosus	0	1	1	7	2	5	83	78	96	0	0	0	0	0	1	1	1	0	5	0	14
	Stylaria lacustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tubificidae w/ cap setae	0	14	9	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	6	5
	Tubificidae w/o cap setae	0	0	0	0	0	0	10	0	0	27	0	0	2	3	3	2	4	0	0	0	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Musculium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Pisidium sp.	0	0	0	8	3	0	0	0	0	0	0	0	0	0	0	19	0	1	12	60	27
	Sphaeriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	0	0	2	14	58	32	32	4	21	0	0	0	0	0	0	25	1	4	54	36	25
	Ancylidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Gyraulus sp.	0	0	0	2	4	0	45	4	12	0	0	0	0	0	0	0	1	0	21	192	11
	Helisoma anceps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Micromenetus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physa sp.	0	1	0	5	18	11	70	13	42	0	0	0	0	0	0	0	0	0	35	144	18
	Planorbidae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Promenetus exacuous	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvata bicarinata	0	0	0	9	2	2	0	3	0	0	0	0	0	0	0	38	3	9	166	222	169
	Valvata sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Valvata tricarinata	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	11
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gammarus sp.	0	0	0	1	9	2	77	13	19	0	0	0	0	0	0	12	0	2	0	0	0
	Hyalella sp.	1	0	0	2	5	5	112	1	5	0	0	0	0	0	0	0	0	0	9	120	25
Crustacea-Isopoda	Caecidotea sp.	0	0	0	0	0	0	150	100	73	0	0	0	0	0	0	107	138	43	0	0	0
Crustacea-Ostracoda	Ostracoda	0	1	0	6	1	1	13	18	0	0	0	0	0	0	0	0	0	1	12	0	21
Acari	Acari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Arrenurus sp.	0	1	0	1	2	4	0	4	7	0	0	0	0	0	0	1	0	0	7	6	9
	Forelia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Hydrodroma sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Koenikea sp.	1	0	0	0	4	1	0	1	7	0	0	0	0	0	0	8	2	1	0	18	0
	Krendowskia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lebertia sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Limnesia sp.	1	6	9	1	4	7	13	4	7	0	0	1	0	0	1	2	0	0	14	18	11
	Mideopsis sp.	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Neumania sp.	3	1	3	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0
	Oxus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Piona sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Pionidae	0	0	0	2	3	2	6	1	3	0	0	0	0	0	0	1	0	0	5	0	0
	Unionicola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	0	0	0	8	2	0	0	0	0	0	0	0	0	0	7	0	0	0	6	2
Cnidaria	Hydra sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	1	0	0	1	2	0	0	0	2	0	0	0	1	0	0	0	0	0	6	2
	Total Corrected Abundance	**51**	**101**	**70**	**238**	**251**	**267**	**810**	**455**	**509**	**113**	**174**	**50**	**60**	**105**	**46**	**270**	**217**	**86**	**485**	**1356**	**528**

Table A-8
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2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Taxonomic Group	Study Area	Pompton Lake Study Area																							
	Station ID	PLSA-C1-19			PLSA-C1-20			PLSA-C1-22			PLSA-C1-24			PLSA-C1-25			PLSA-C1-28			PLSA-C1-30			PLSA-C1-33		
	Taxa / Replicate	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Ephemeroptera	Caenis sp.	2	1	2	0	2	4	0	0	0	0	0	0	0	0	0	18	9	2	0	0	0	0	10	3
	Callibaetis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	0	4	3	3	0	0	0	1	1	0	0	1	0	0	0	12	0	0	0	0	0	0	7	0
	Leptocerus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oecetis sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0
	Orthotrichia sp.	2	8	5	2	1	22	2	3	2	19	0	4	7	0	0	78	2	4	0	1	0	5	14	3
	Oxyethira sp.	3	16	5	1	0	0	4	5	1	11	0	1	7	0	0	36	4	2	2	0	0	0	3	0
	Polycentropodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	1	3	0	3	0	9	0	0	0	0	0	0	0	0	2	30	0	2	0	0	0	3	7	3
	Corduliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	Enallagma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Epitheca princeps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Libellulidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Libellulidae/Corduliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Perithemis tenera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dubiraphia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
	Peltodytes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	2	0	0
	Ablabesmyia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	Chironomus sp.	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	Cladopelma sp.	20	15	39	2	10	31	10	0	0	5	1	6	0	0	2	0	0	0	5	14	6	33	24	21
	Cladotanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinotanypus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coelotanypus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cricotopus sp.	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	3
	Cryptochironomus sp.	4	7	12	1	3	9	12	8	5	4	13	4	0	0	0	0	0	2	0	0	0	0	0	0
	Cryptotendipes sp.	2	4	10	0	0	0	2	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
	Dicrotendipes modestus	4	19	0	2	1	13	4	0	9	8	0	0	0	0	0	6	0	0	7	10	3	0	17	3
	Dicrotendipes sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dicrotendipes tritomus	28	0	3	15	4	22	6	0	1	1	0	0	0	0	0	66	15	3	0	0	1	24	82	113
	Einfeldia natchitocheae	8	39	81	0	15	4	112	48	9	10	4	9	14	2	4	0	0	0	0	2	1	14	7	0
	Einfeldia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Endochironomus sp.	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Glyptotendipes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	3	0
	Guttipelopia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larsia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nanocladius sp.	0	0	0	0	0	0	4	0	2	0	0	0	0	0	2	12	2	0	0	0	0	5	45	34
	Parachironomus sp.	1	0	0	0	0	0	6	3	1	0	0	0	0	0	2	6	0	2	0	0	0	0	7	0
	Paralauterborniella nigrohalteralis	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paratanytarsus sp.	9	9	3	4	5	4	8	1	0	1	0	0	0	0	2	168	22	5	0	0	3	39	110	223
	Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Polypedilum bergi	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
	Polypedilum halterale gr.	5	0	2	1	2	4	0	1	5	0	0	4	0	0	0	0	0	0	0	0	0	3	0	0
	Polypedilum illinoense gr.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
	Procladius sp.	7	9	12	2	14	22	8	9	3	4	1	3	27	5	4	12	13	2	0	0	0	15	21	17
	Pseudochironomus sp.	0	5	3	3	0	4	0	0	0	0	0	0	0	0	0	120	15	2	2	0	3	5	45	7
	Tanypus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	16	2	22	7	27
	Tanytarsus sp.	2	4	15	1	4	9	96	32	14	11	1	44	0	0	0	6	15	0	0	0	0	14	14	21
	Thienemannimyia gr. sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tribelos sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xenochironomus xenolabis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zavreliella marmorata	0	0	3	0	0	0	2	0	2	1	0	2	0	0	0	0	0	0	0	0	0	0	3	0
Diptera	Bezzia/Palpomyia sp.	3	4	0	0	0	9	2	0	2	0	1	0	7	0	0	0	2	2	5	6	0	2	17	0
	Ceratopogonidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratopogoninae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chaoborus sp.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	14	1	0	0	0	0
	Dasyhelea sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephydridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sphaeromias sp.	0	0	0	0	0	0	2	7	0	1	3	1	0	0	2	0	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Desserobdella phalera	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Erpobdella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glossiphoniidae	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helobdella elongata	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Helobdella sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	13	18	0	0	0	1	0	0	0	3
	Helobdella stagnalis	11	33	7	15	4	35	10	11	97	18	1	2	261	67	153	12	0	3	89	22	16	7	17	3
	Hirudinida	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	2	0	0	9	4	0	0	11	0	1	0	5	0	0	0	0	0	0	0	9	17	14
	Aulodrilus pigueti	0	0	2	0	5	4	21	1	0	32	3	15	34	2	0	0	0	0	0	0	0	12	14	10
	Aulodrilus pluriseta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Branchiura sowerbyi	0	0	0	0	0	0	0	0	0	0	0	1	14	0	0	0	2	0	0	0	1	0	0	0
	Chaetogaster diastrophus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dero digitata	0	0	2	0	0	0	6	0	0	3	0	4	7	0	0	0	2	0	0	0	0	0	0	3
	Dero flabelliger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dero sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnodrilus cervix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnodrilus hoffmeisteri	0	9	22	0	9	0	0	0	0	21	8	4	89	7	0	36	26	6	0	0	0	3	14	0
	Limnodrilus udekemianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nais sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quistadrilus multisetosus	5	1	0	0	1	9	35	17	8	4	3	7	418	34	48	6	2	0	0	13	2	31	31	31
	Stylaria lacustris	0	0	0	0	0	0	4	0	0	0	0	0	55	2	0	0	0	0	0	0	0	0	0	0
	Tubificidae w/ cap setae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0
	Tubificidae w/o cap setae	1	0	0	2	0	9	0	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	7
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	30	7	2	0	0	0	0	0	0
	Musculium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pisidium sp.	20	7	38	4	2	26	0	9	5	0	0	4	62	46	13	54	41	11	7	3	0	9	17	27
	Sphaeriidae	0	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	7	0	0	4	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	67	51	36	83	32	79	15	40	59	10	0	18	82	48	57	138	18	36	16	10	7	36	51	10
	Ancylidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyraulus sp.	2	5	2	7	0	0	0	0	0	1	0	0	0	0	0	72	11	8	2	2	0	0	17	27
	Helisoma anceps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Micromenetus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physa sp.	0	4	0	5	3	17	0	1	1	3	0	0	0	5	2	96	7	13	0	4	2	22	55	48
	Planorbidae	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Promenetus exacuous	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Valvata bicarinata	23	17	29	49	32	57	0	5	2	0	2	1	7	46	13	114	78	53	21	6	3	3	21	3
	Valvata sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvata tricarinata	21	9	14	0	5	17	2	0	0	0	0	0	55	96	107	0	0	0	0	0	0	0	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Gammarus sp.	0	21	24	9	10	96	6	2	12	21	1	1	281	96	74	30	17	4	0	0	2	0	0	7
	Hyalella sp.	2	16	19	17	45	528	4	0	0	33	0	4	14	14	85	84	142	13	0	0	0	0	34	27
Crustacea-Isopoda	Caecidotea sp.	5	7	0	0	0	9	0	0	0	1	0	0	14	10	4	12	0	0	292	104	33	9	17	0
Crustacea-Ostracoda	Ostracoda	3	1	5	0	0	0	4	2	0	5	0	4	0	0	0	6	0	0	0	0	0	3	21	17
Acari	Acari	0	5	0	0	0	0	0	0	0	0	0	1	0	0	0	6	0	0	0	0	0	0	0	0
	Arrenurus sp.	0	1	0	2	3	0	0	0	1	0	0	0	0	0	2	0	0	1	0	0	0	0	0	3
	Forelia sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrodroma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	Koenikea sp.	3	7	9	0	0	0	0	4	1	1	0	0	0	0	2	0	0	4	12	2	0	7	0	0
	Krendowskia sp.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	Lebertia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	Limnesia sp.	0	1	0	1	1	4	0	2	2	0	0	0	0	0	4	6	0	0	0	3	0	3	7	14
	Mideopsis sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3	0	0
	Neumania sp.	0	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Oxus sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Piona sp.	0	0	0	0	2	0	0	1	5	1	0	1	0	0	0	0	0	0	2	0	0	0	0	0
	Pionidae	2	1	3	1	0	9	0	5	0	0	0	0	0	0	2	0	2	0	0	1	0	0	0	0
	Unionicola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	1	2	0	0	9	8	1	0	4	0	0	130	12	4	18	0	1	0	0	0	7	17	17
Cnidaria	Hydra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	1	3	5	0	1	0	17	0	0	1	6	8	0	0	0	0	0	0	0	0	0	2	3	0
	Total Corrected Abundance	**278**	**353**	**429**	**243**	**221**	**1095**	**420**	**225**	**255**	**258**	**65**	**159**	**1584**	**499**	**615**	**1332**	**467**	**187**	**485**	**232**	**88**	**362**	**813**	**765**

Table A-8
Summary of Benthic Invertebrate Community Abundance Data
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Taxonomic Group	Study Area	Pompton Lake Study Area						Reference Area														
	Station ID	PLSA-C1-39			PLSA-C1-40			REF-C1-01			REF-C1-02			REF-C1-03			REF-C1-04			REF-C1-05		
	Taxa / Replicate	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Ephemeroptera	Caenis sp.	0	0	0	0	0	3	0	2	8	2	2	0	0	0	1	0	0	0	0	0	0
	Callibaetis sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydroptilidae	0	0	0	0	0	0	0	4	0	0	0	0	1	0	1	0	0	0	0	0	0
	Leptocerus americanus	0	0	0	0	0	0	0	2	5	0	0	0	0	0	1	0	0	0	0	0	0
	Oecetis sp.	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orthotrichia sp.	0	0	0	0	64	0	5	6	5	3	0	0	0	0	1	0	0	0	0	0	0
	Oxyethira sp.	0	0	0	1	16	3	0	2	0	0	0	6	1	0	0	0	0	0	0	0	0
	Polycentropodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	0	0	0	0	0	0	2	0	13	2	0	2	4	0	4	0	0	0	0	0	0
	Corduliidae	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Enallagma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Epitheca princeps	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Libellulidae	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Libellulidae/Corduliidae	0	0	0	0	0	0	2	0	3	0	0	2	0	0	0	0	0	0	0	0	0
	Perithemis tenera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dubiraphia sp.	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
	Peltodytes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	Ablabesmyia sp.	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chironomus sp.	0	0	1	2	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cladopelma sp.	3	0	1	0	0	0	2	0	3	7	13	2	3	1	4	0	0	0	0	0	0
	Cladotanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Clinotanypus sp.	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Coelotanypus sp.	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cricotopus sp.	0	0	0	0	0	0	0	6	3	0	0	1	0	0	2	0	0	0	0	0	0
	Cryptochironomus sp.	9	3	13	11	0	6	0	4	0	5	11	2	2	1	12	0	0	0	0	0	0
	Cryptotendipes sp.	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Dicrotendipes modestus	0	0	1	3	40	0	0	0	0	0	2	5	3	0	0	0	0	0	0	0	0
	Dicrotendipes sp.	0	0	0	0	0	6	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Dicrotendipes tritomus	0	0	0	1	64	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0
	Einfeldia natchitocheae	0	0	0	138	328	220	2	0	8	53	49	19	1	3	1	0	0	0	0	0	0
	Einfeldia sp.	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	Endochironomus sp.	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Glyptotendipes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guttipelopia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Larsia sp.	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Nanocladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
	Parachironomus sp.	0	0	0	0	8	3	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0
	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paratanytarsus sp.	0	0	0	1	88	0	5	17	16	0	0	12	1	0	21	0	0	0	0	0	0
	Pentaneurini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polypedilum bergi	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Polypedilum halterale gr.	0	0	0	0	0	3	0	4	3	0	0	1	0	0	0	0	0	0	0	0	0
	Polypedilum illinoense gr.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Procladius sp.	3	0	3	10	24	0	5	2	5	2	2	1	0	0	3	0	0	0	0	0	0
	Pseudochironomus sp.	0	0	0	0	16	0	12	7	16	0	2	3	4	0	3	0	0	0	0	0	0
	Tanypus sp.	0	0	0	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0
	Tanytarsus sp.	22	1	33	31	216	189	2	0	0	0	0	0	1	0	2	0	0	0	0	0	0
	Thienemannimyia gr. sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tribelos sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xenochironomus xenolabis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zavreliella marmorata	0	0	1	2	8	8	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Diptera	Bezzia/Palpomyia sp.	0	0	2	0	16	6	0	0	3	2	4	0	0	1	2	0	0	0	0	0	0
	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ceratopogoninae	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	Chaoborus sp.	6	0	3	0	0	0	0	0	0	0	2	0	0	0	1	0	7	2	11	2	6
	Dasyhelea sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Ephydridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sphaeromias sp.	2	2	7	5	0	6	0	0	0	0	2	0	1	0	4	0	0	0	0	0	0
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Erpobdella sp.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helobdella elongata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Helobdella sp.	0	0	0	0	0	0	5	0	3	0	0	3	0	0	0	1	1	0	0	0	0
	Helobdella stagnalis	0	1	0	0	8	0	2	0	3	0	4	6	6	0	1	0	0	0	0	0	0
	Hirudinida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	0	0	0	3	5	0	3	7	30	1	0	0	0	0	0	0	0	0	0
	Aulodrilus pigueti	0	0	0	7	8	3	0	7	0	2	0	1	0	0	0	0	0	0	0	0	0
	Aulodrilus pluriseta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Branchiura sowerbyi	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0
	Chaetogaster diastrophus	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dero digitata	1	0	3	0	0	0	2	2	0	0	2	0	0	0	1	0	0	0	0	2	2
	Dero flabelliger	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0
	Dero sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnodrilus cervix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	10
	Limnodrilus hoffmeisteri	16	0	0	0	0	28	36	52	40	36	19	0	0	3	18	0	2	0	0	2	6
	Limnodrilus udekemianus	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
	Nais sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quistadrilus multisetosus	0	0	1	0	8	0	238	118	256	161	204	38	0	2	2	0	0	0	0	0	0
	Stylaria lacustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tubificidae w/ cap setae	0	0	0	0	0	0	0	0	0	5	6	1	0	0	1	0	0	0	0	1	8
	Tubificidae w/o cap setae	0	8	6	10	8	0	0	0	0	0	0	14	2	0	0	1	0	2	0	0	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Musculium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pisidium sp.	0	0	0	2	0	0	24	20	67	33	34	6	4	0	26	0	0	0	0	0	0
	Sphaeriidae	0	0	1	0	24	3	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	0	0	0	5	16	3	43	13	93	2	6	33	16	6	7	0	1	0	0	0	0
	Ancylidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyraulus sp.	0	0	0	0	8	6	2	20	11	2	0	4	0	2	6	0	0	0	0	0	0
	Helisoma anceps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Hydrobiidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Micromenetus sp.	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Physa sp.	0	0	0	0	24	3	50	15	35	0	0	11	16	2	8	0	0	0	0	0	0
	Planorbidae	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
	Promenetus exacuous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvata bicarinata	1	4	5	8	40	0	0	2	5	3	0	4	66	14	32	0	0	0	0	0	0
	Valvata sp.	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Valvata tricarinata	0	0	0	0	8	0	0	0	0	0	0	2	0	0	1	0	0	0	0	1	0
Crustacea-Amphipoda	Amphipoda	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gammarus sp.	0	0	1	0	176	8	2	9	8	3	19	5	2	0	0	0	0	0	0	0	0
	Hyalella sp.	0	0	0	0	560	6	24	59	29	3	17	10	2	4	20	0	0	0	0	0	0
Crustacea-Isopoda	Caecidotea sp.	0	0	0	0	0	0	7	6	8	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea-Ostracoda	Ostracoda	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Acari	Acari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Arrenurus sp.	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
	Forelia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hydrodroma sp.	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
	Koenikea sp.	1	0	0	5	8	17	0	2	0	3	0	0	0	0	1	0	0	0	0	0	0
	Krendowskia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lebertia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Limnesia sp.	7	2	2	1	8	11	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0
	Mideopsis sp.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Neumania sp.	0	0	1	6	8	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Oxus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Piona sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pionidae	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Unionicola sp.	1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	0	0	0	8	3	10	4	11	0	0	0	0	0	0	0	0	0	0	0	0
Cnidaria	Hydra sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	1	0	0	8	7	2	5	5	4	0	0	0	1	0	0	0	0	0	0
	Total Corrected Abundance	**73**	**21**	**88**	**256**	**1864**	**579**	**509**	**399**	**699**	**350**	**451**	**217**	**141**	**42**	**195**	**3**	**11**	**4**	**13**	**21**	**32**

Table A-9
Summary of Benthic Macroinvertebrate Multi-Metric Community Analyses
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Station	Lake Habitat Zone	Sample Locations Water Depth (Feet)	Total Abundance		Taxa Richness		Non-Chironomidae Non-Oligochaeta (NCO) Taxa Richness		Shannon Weaver Diversity (*H*)		Percent Dominant Taxa		Percent Abundance of Major Taxonomic Groups: Diptera		Percent Abundance of Major Taxonomic Groups: Oligochaeta		Percent Abundance of Major Taxonomic Groups: Mollusca		Percent Abundance of Major Taxonomic Groups: Crustacea		Modified Lake Macroinvertebrate Integrity Index ($LMII_{mod}$)	
			Mean Indv. Per Sample	±SE	Mean Taxa Per Sample	±SE	Mean NCO Taxa Per Sample	±SE	Mean *H*	±SE	Mean % Abundance	±SE	Mean % Abundance	±SE	Mean % Abundance	±SE	Mean % Abundance	±SE	Mean % Abundance	±SE	Mean $LMII_{mod}$	±SE
Pompton Lake Study Area																						
PLSA-C1-01	Profundal	9.0	74.0	± 14.6	13.7	± 1.7	6.0	± 0.6	0.87	± 0.06	38.3	± 8.3	33.2	± 4.8	52.6	± 7.5	1.3	± 0.8	1.0	± 0.6	2.20	± 0.11
PLSA-C1-04	Littoral/Sublittoral	3.8	252.4	± 8.8	41.7	± 2.0	21.7	± 3.0	1.35	± 0.01	16.9	± 3.2	36.7	± 5.9	24.0	± 4.8	23.1	± 5.9	4.4	± 0.9	2.81	± 0.17
PLSA-C1-10	Littoral/Sublittoral	1.0	591.0	± 110.4	32.3	± 1.9	20.0	± 1.5	1.14	± 0.05	19.8	± 1.1	19.1	± 2.9	18.7	± 2.3	12.8	± 3.8	30.6	± 7.0	2.26	± 0.18
PLSA-C1-11	Profundal	15.0	112.3	± 35.8	5.3	± 1.3	3.3	± 1.3	0.30	± 0.05	77.2	± 4.5	78.2	± 3.9	19.6	± 2.6	0.0	± 0.0	0.0	± 0.0	1.17	± 0.10
PLSA-C1-12	Profundal	15.0	70.3	± 17.8	4.0	± 1.5	2.7	± 1.2	0.16	± 0.09	91.8	± 4.6	92.5	± 3.9	5.0	± 1.9	0.7	± 0.7	0.0	± 0.0	1.06	± 0.02
PLSA-C1-14	Littoral/Sublittoral	6.3	191.2	± 54.8	19.3	± 3.5	13.7	± 2.7	0.77	± 0.10	51.1	± 6.9	5.4	± 1.5	8.8	± 5.7	17.8	± 8.5	53.7	± 5.6	2.40	± 0.31
PLSA-C1-16	Littoral/Sublittoral	8.1	789.8	± 283.4	32.7	± 3.5	17.0	± 2.1	1.17	± 0.07	27.6	± 5.6	16.1	± 4.7	15.6	± 3.9	52.5	± 3.5	7.3	± 1.5	2.42	± 0.26
PLSA-C1-19	Littoral/Sublittoral	3.2	352.6	± 43.2	36.3	± 1.2	22.3	± 1.9	1.30	± 0.03	19.0	± 2.8	37.1	± 3.5	3.9	± 1.3	34.0	± 6.8	9.3	± 2.7	2.80	± 0.20
PLSA-C1-20	Littoral/Sublittoral	4.2	519.6	± 287.4	30.0	± 1.5	17.3	± 0.7	1.05	± 0.06	34.2	± 8.1	17.8	± 4.4	3.5	± 1.7	37.9	± 12.6	31.1	± 13.9	2.56	± 0.27
PLSA-C1-22	Littoral/Sublittoral	2.7	300.1	± 60.7	28.3	± 0.3	14.7	± 1.5	1.06	± 0.06	28.7	± 4.9	45.7	± 12.7	9.9	± 4.0	18.2	± 7.2	3.3	± 0.8	2.58	± 0.46
PLSA-C1-24	Littoral/Sublittoral	2.1	160.3	± 55.4	26.7	± 5.0	13.7	± 2.6	1.17	± 0.08	20.7	± 4.3	34.7	± 8.7	23.2	± 2.4	17.2	± 6.3	10.2	± 6.7	2.47	± 0.18
PLSA-C1-25	Littoral/Sublittoral	2.3	899.5	± 344.2	21.7	± 2.7	13.7	± 2.2	1.00	± 0.00	23.5	± 2.2	2.6	± 0.6	19.3	± 9.8	30.8	± 10.1	23.4	± 2.1	1.23	± 0.13
PLSA-C1-28	Littoral/Sublittoral	5.1	662.4	± 344.5	29.7	± 1.7	18.7	± 1.5	1.16	± 0.07	23.8	± 5.6	20.3	± 5.9	4.4	± 1.2	46.8	± 9.7	17.7	± 8.2	2.48	± 0.25
PLSA-C1-30	Littoral/Sublittoral	3.5	268.2	± 115.9	20.0	± 3.0	13.0	± 2.9	0.84	± 0.10	47.5	± 6.7	17.1	± 4.7	3.1	± 1.7	11.9	± 1.2	48.4	± 6.3	2.62	± 0.06
PLSA-C1-33	Littoral/Sublittoral	3.7	646.2	± 143.4	36.0	± 1.5	19.0	± 1.0	1.31	± 0.07	17.9	± 5.7	53.9	± 4.2	11.0	± 2.1	18.3	± 1.5	6.3	± 1.6	3.29	± 0.15
PLSA-C1-39	Profundal	14.0	60.7	± 20.3	13.7	± 4.1	7.3	± 2.0	0.87	± 0.07	35.2	± 2.6	54.7	± 13.5	24.3	± 7.7	9.9	± 4.8	0.4	± 0.4	1.88	± 0.45
PLSA-C1-40	Littoral/Sublittoral	2.7	899.2	± 491.3	27.3	± 2.7	15.3	± 2.3	0.91	± 0.07	40.7	± 7.0	67.6	± 12.1	4.8	± 1.7	5.4	± 0.8	14.1	± 12.7	3.49	± 0.14
Reference Area																						
REF-C1-01	Littoral/Sublittoral	1.2	536.0	± 87.6	32.0	± 2.1	19.0	± 1.0	1.03	± 0.06	37.7	± 5.0	9.9	± 1.9	47.7	± 3.8	24.0	± 3.9	10.7	± 4.1	**2.08**	**± 0.22**
REF-C1-02	Littoral/Sublittoral	4.1	339.1	± 67.9	28.7	± 4.7	14.0	± 2.5	1.03	± 0.14	36.3	± 9.4	22.1	± 1.9	49.0	± 11.8	16.1	± 5.8	5.7	± 1.9	2.50	± 0.06
REF-C1-03	Littoral/Sublittoral	7.5	126.0	± 44.8	24.0	± 6.7	13.7	± 3.2	1.03	± 0.11	32.2	± 8.8	19.8	± 5.6	8.4	± 3.5	58.8	± 9.2	7.5	± 2.4	2.26	± 0.36
REF-C1-04	Profundal	15.0	6.0	± 2.5	3.0	± 0.6	2.0	± 0.6	0.41	± 0.06	49.0	± 8.8	37.9	± 19.3	33.8	± 9.2	14.1	± 9.9	0.0	± 0.0	**0.69**	**± 0.25**
REF-C1-05	Profundal	12.0	22.0	± 5.5	4.7	± 0.9	2.0	± 0.6	0.48	± 0.13	59.3	± 15.5	37.6	± 23.6	55.7	± 27.9	1.6	± 1.6	0.0	± 0.0	1.58	± 0.26

Notes:
Metrics calculated per sample (individuals identified to the lowest taxonomic level practical, primarily genus/species)
SE, Standard error
Reference envelope value

Table A-10
Summary of Sediment Quality Triad Lines of Evidence
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Station	Sediment and Pore Water Chemistry												Benthic Community Analyses		Sediment Toxicity Testing						
	Pore Water Toxic Units (PW-TU)				Sediment SQB Quotients (SQB-Q)						Sediment and Pore Water Chemistry Exposure Category		Relative % Difference from REV	Benthic Community Disturbance Category Relative to Reference	*28-day Hyalella azteca Relative % Difference (RPD) from REV*			*20-day Chironomus dilutus Relative % Difference (RPD) from REV*			Toxicity Category
	$PW\text{-}TU_{THg}$	$PW\text{-}TU_{MeHg}$	$PW\text{-}TU_{Sum}$	Pore Water Exposure Category	$SEL\text{-}Q_{THg}$	$PEC\text{-}Q_{metals}$	$PEC\text{-}Q_{PAHs}$	$PEC\text{-}Q_{pesticides}$	$SQB\text{-}Q_{overall}$	Sediment Exposure Category			Lake Macroinvertebrate Integrity Index (LMII)		Survival	Growth	Biomass	Survival	Growth	Biomass	
PLSA-C1-01	0.0001	0.02	0.02	Minimal Exposure	1.39	0.64	1.26	0.02	0.83	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-04	0.0001	0.02	0.02	Minimal Exposure	0.32	0.59	0.91	0.21	0.51	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-10	0.0004	0.06	0.06	Minimal Exposure	1.06	0.47	0.70	0.03	0.56	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-11	0.0002	0.01	0.01	Minimal Exposure	0.94	0.52	0.94	0.06	0.61	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-12	0.0009	0.05	0.05	Minimal Exposure	2.87	0.61	0.66	0.09	1.05	Moderate Exposure	Low Exposure		> 0	Reference	> 0	-16.8	***-22.6***	> 0	> 0	> 0	Moderate Toxicity
PLSA-C1-14	0.0001	0.03	0.03	Minimal Exposure	2.64	0.48	0.24	0.03	0.85	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-16	0.0002	0.01	0.01	Minimal Exposure	0.62	0.47	0.66	0.09	0.46	Minimal Exposure	Minimal Exposure		> 0	Reference	> 0	> 0	> 0	-3.2	> 0	> 0	Non-toxic
PLSA-C1-19	0.0002	0.03	0.03	Minimal Exposure	3.07	0.46	0.23	0.03	0.95	Low Exposure	Low Exposure		> 0	Reference	> 0	> 0	-2.3	> 0	> 0	> 0	Non-toxic
PLSA-C1-20	0.0002	0.02	0.02	Minimal Exposure	0.32	0.12	0.04	0.05	0.13	Minimal Exposure	Minimal Exposure		> 0	Reference	> 0	> 0	> 0	-1.6	> 0	> 0	Non-toxic
PLSA-C1-22	0.0005	0.02	0.02	Minimal Exposure	6.20	0.63	0.35	0.03	1.80	High Exposure	Moderate Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-24	0.0001	0.01	0.01	Minimal Exposure	1.69	0.16	0.09	0.01	0.49	Minimal Exposure	Minimal Exposure		> 0	Reference	> 0	-6.0	-11.8	> 0	-1.2	> 0	Non-toxic
PLSA-C1-25	0.0001	0.01	0.01	Minimal Exposure	1.49	0.47	0.28	0.05	0.57	Low Exposure	Low Exposure		-39.7	Moderate Disturbance	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-28	0.0002	0.02	0.02	Minimal Exposure	0.02	0.08	0.12	0.02	0.06	Minimal Exposure	Minimal Exposure		> 0	Reference	> 0	-12.6	***-9.1***	> 0	> 0	> 0	Low Toxicity
PLSA-C1-30	0.0001	0.03	0.03	Minimal Exposure	0.55	0.33	0.25	0.13	0.31	Minimal Exposure	Minimal Exposure		> 0	Reference	> 0	> 0	> 0	> 0	> 0	> 0	Non-toxic
PLSA-C1-33	0.0001	0.01	0.01	Minimal Exposure	0.54	0.40	2.00	0.06	0.75	Low Exposure	Low Exposure		> 0	Reference	> 0	-13.2	-18.9	> 0	> 0	> 0	Non-toxic
PLSA-C1-39	0.0021	0.05	0.06	Minimal Exposure	1.32	0.69	0.89	0.03	0.73	Low Exposure	Low Exposure		> 0	Reference	> 0	-3.5	-9.1	-11.3	> 0	> 0	Non-toxic
PLSA-C1-40	0.0004	0.02	0.02	Minimal Exposure	11.75	1.11	0.33	0.01	3.30	High Exposure	Moderate Exposure		> 0	Reference	> 0	-24.2	***-25.2***	> 0	-5.0	> 0	Moderate Toxicity

Notes:

Categorization basis:

Exposure	$PW\text{-}TU_{sum}$ Thresholds
Minimal	<1
Low	1.0 to 1.75
Moderate	1.75 to 2.5
High	> 2.5

Exposure	$SQB\text{-}Q_{overall}$ Thresholds
Minimal	<0.5
Low	0.5-1.0
Moderate	1.0-1.5
High	>1.5

Disturbance	LMII RPD Thresholds
Reference	> 0
Low	0 to -20
Moderate	-20 to -40
High	< -40

Toxicity Category	Endpoint RPD Thresholds: Survival	Endpoint RPD Thresholds: Growth/Biomass
Non Toxic	> 0 % Survival > TAC NS <0	> 0 NS <0
Low Toxicity	<0 to -10	<0 to -20
Moderate Toxicity	-10 to -20	-20 to -40
High Toxicity	< -20	< -40

PEC-Q, Probable effect quotient
SEL-Q, Severe effect level quotient
LMII, Lake Macroinvertebrate Integrity Index (modified from Blocksom et al., 2002)
RPD, Relative percent difference from reference envelope value: RPD = [(Endpoint/REV)-1]*100; RPD > 0 indicates that PLSA endpoint value is within the reference envelope
REV, Reference envelope value
TAC, Test acceptability criteria
SQB, Sediment quality benchmark

Table A-11
Summary of Sediment Quality Triad Weight-of-Evidence Evaluation
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

PLSA Station ID	Benthic Community Disturbance Category	Toxicity Category	Sediment and Pore Water Chemistry Exposure Category
PLSA-C1-01	Reference	Non-toxic	Low Exposure
PLSA-C1-04	Reference	Non-toxic	Low Exposure
PLSA-C1-10	Reference	Non-toxic	Low Exposure
PLSA-C1-11	Reference	Non-toxic	Low Exposure
PLSA-C1-12	Reference	Moderate Toxicity	Low Exposure
PLSA-C1-14	Reference	Non-toxic	Low Exposure
PLSA-C1-16	Reference	Non-toxic	Minimal Exposure
PLSA-C1-19	Reference	Non-toxic	Low Exposure
PLSA-C1-20	Reference	Non-toxic	Minimal Exposure
PLSA-C1-22	Reference	Non-toxic	Moderate Exposure
PLSA-C1-24	Reference	Non-toxic	Minimal Exposure
PLSA-C1-25	Moderate Disturbance	Non-toxic	Low Exposure
PLSA-C1-28	Reference	Low Toxicity	Minimal Exposure
PLSA-C1-30	Reference	Non-toxic	Minimal Exposure
PLSA-C1-33	Reference	Non-toxic	Low Exposure
PLSA-C1-39	Reference	Non-toxic	Low Exposure
PLSA-C1-40	Reference	Moderate Toxicity	Moderate Exposure

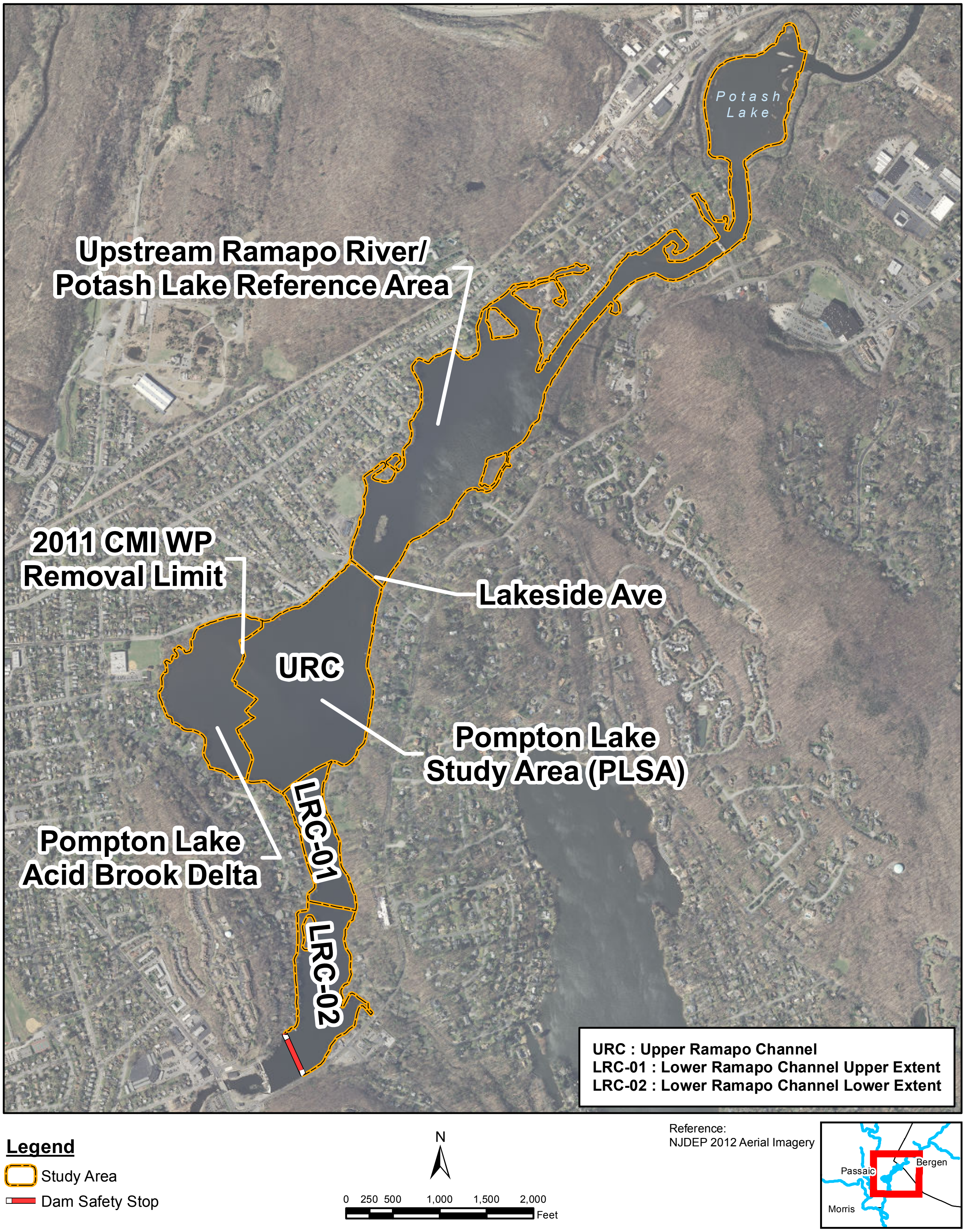
PLSA Station ID	Severity of Effects Classification	Potential That Effects Are Chemically Mediated	Weight-of-Evidence Station Classification
PLSA-C1-01	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-04	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-10	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-11	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-12	Unaffected	Moderate Potential	Likely Unimpacted
PLSA-C1-14	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-16	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-19	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-20	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-22	Unaffected	Low Potential	Unimpacted
PLSA-C1-24	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-25	Moderate Effect	Minimal Potential	Likely Unimpacted
PLSA-C1-28	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-30	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-33	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-39	Unaffected	Minimal Potential	Unimpacted
PLSA-C1-40	Unaffected	Moderate Potential	Likely Unimpacted

Table A-12
Summary of Sediment Quality Triad Weight-of-Evidence Classifications and Mercury Exposure Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

PLSA Station ID	Weight-of-Evidence Station Classification	Mercury Exposure Concentrations			
		Sediment		Pore Water	
		THg (µg/g)	MeHg (ng/g)	THg (ng/L)	MeHg (ng/L)
PLSA-C1-01	Unimpacted	2.77	0.71	0.41	0.06
PLSA-C1-04	Unimpacted	0.63	1.00	0.42	0.08
PLSA-C1-10	Unimpacted	2.12	4.70	1.45	0.23
PLSA-C1-11	Unimpacted	1.87	0.34	0.94	0.06
PLSA-C1-12	Likely Unimpacted	5.73	2.90	3.68	0.20
PLSA-C1-14	Unimpacted	5.27	1.13	0.45	0.11
PLSA-C1-16	Unimpacted	1.23	0.38	0.86	0.02
PLSA-C1-19	Unimpacted	6.14	0.98	0.64	0.13
PLSA-C1-20	Unimpacted	0.64	0.34	0.70	0.09
PLSA-C1-22	Unimpacted	12.4	1.11	1.90	0.09
PLSA-C1-24	Unimpacted	3.37	0.85	0.53	0.05
PLSA-C1-25	Likely Unimpacted	2.97	0.46	0.53	0.05
PLSA-C1-28	Unimpacted	0.04	0.05	0.60	0.06
PLSA-C1-30	Unimpacted	1.10	1.43	0.48	0.12
PLSA-C1-33	Unimpacted	1.07	0.87	0.42	0.04
PLSA-C1-39	Unimpacted	2.64	0.85	8.26	0.21
PLSA-C1-40	Likely Unimpacted	23.50	1.43	1.76	0.08
	NOEC:	23.50	4.70	8.26	0.23

Notes:
NOEC, No observed effect concentrations based on the maximum exposure point concentration for unimpacted and likely unimpacted PLSA stations.

Figures



URS

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Job: 18986427.00001

Prepared by: RRM III

Checked by: GL

Date: 3/12/2014

Figure A-1
Study Area Map
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\PomLke_ERA\Report\Figure A-1 Area Map.mxd

Legend

- Category 1
- Study Area

N

0 125 250 500 Feet

Reference:
NJDEP 2012 Aerial Imagery

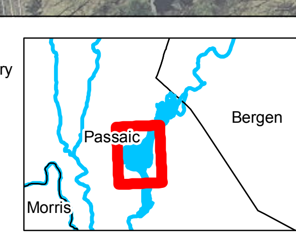

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Figure A-2a
Sediment Quality Triad Sampling Stations - PLSA URC
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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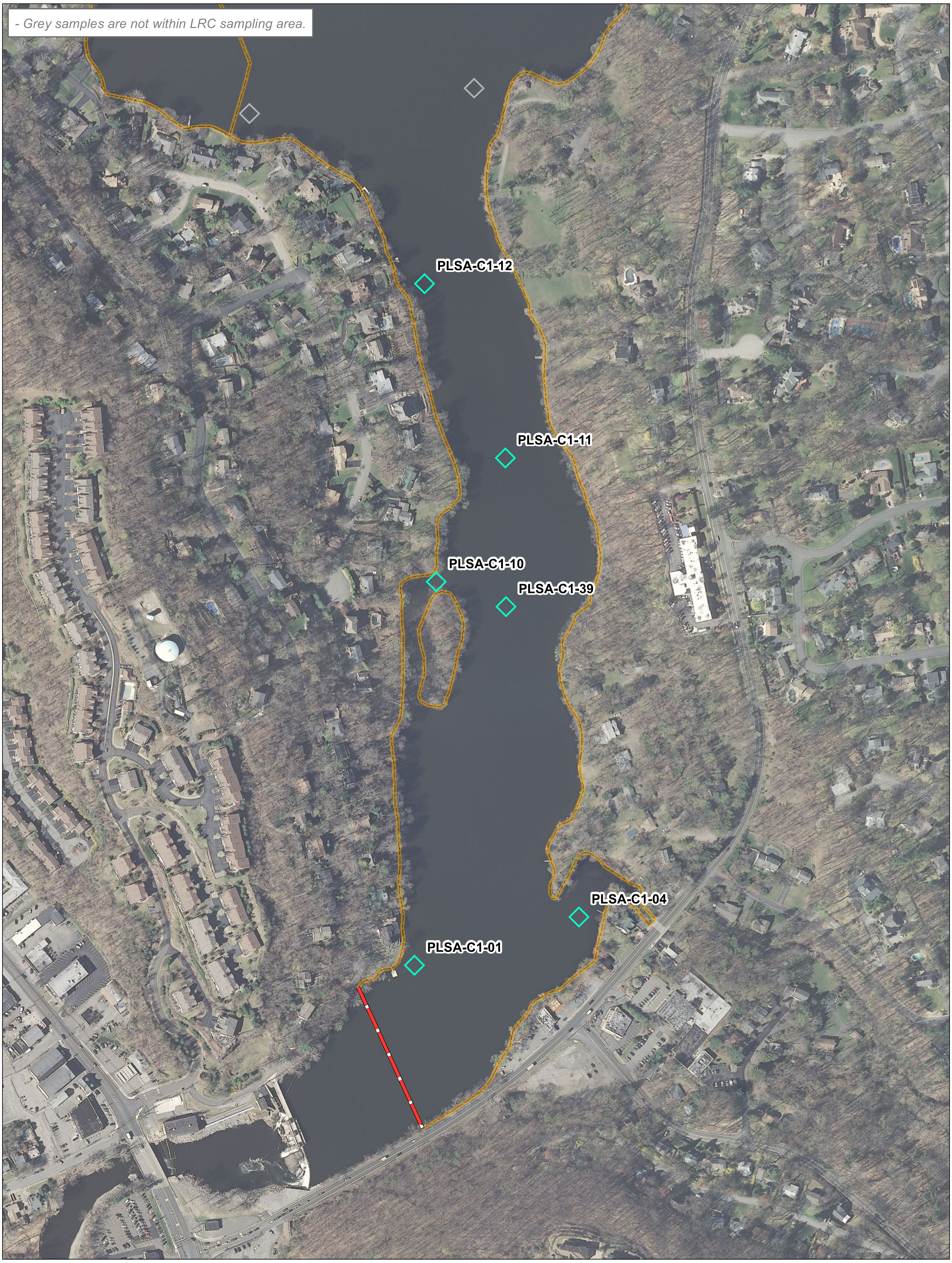


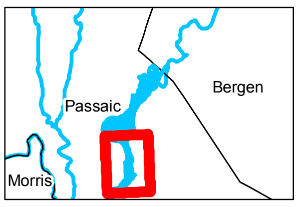
Legend

- Category 1
- Dam Safety Stop
- Study Area

N

0 125 250 500 Feet

Reference:
NJDEP 2012 Aerial Imagery



URS 335 Commerce Drive, Suite 300 Fort Washington, PA 19034 Phone: (215) 367-2500 Fax: (215) 367-1000	Job: 18986427.00001 Prepared by: RRM III Checked by: GL Date: 3/12/2014	Figure A-2b Sediment Quality Triad Sampling Stations - PLSA LRC 2013 Pompton Lake Ecological Investigation Report DuPont Pompton Lakes Works Pompton Lakes, New Jersey

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Legend

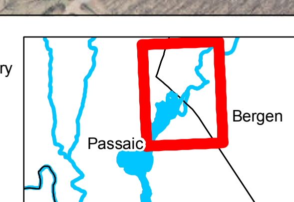
Category 1

Study Area

N

0 125 250 500 750 1,000 Feet

Reference:
NJDEP 2012 Aerial Imagery



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Prepared by: RRM III

Checked by: GL

Date: 3/12/2014

Figure A-2c
Sediment Quality Triad Sampling Stations - Reference Areas
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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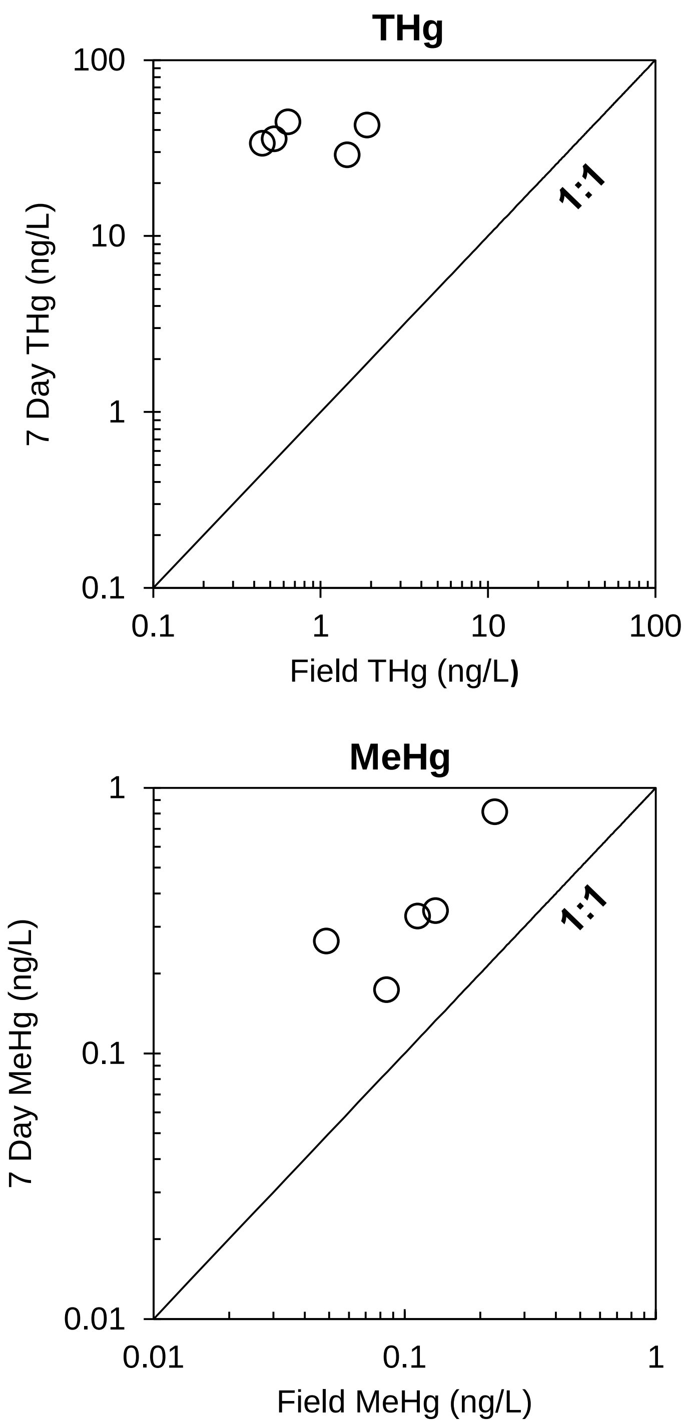
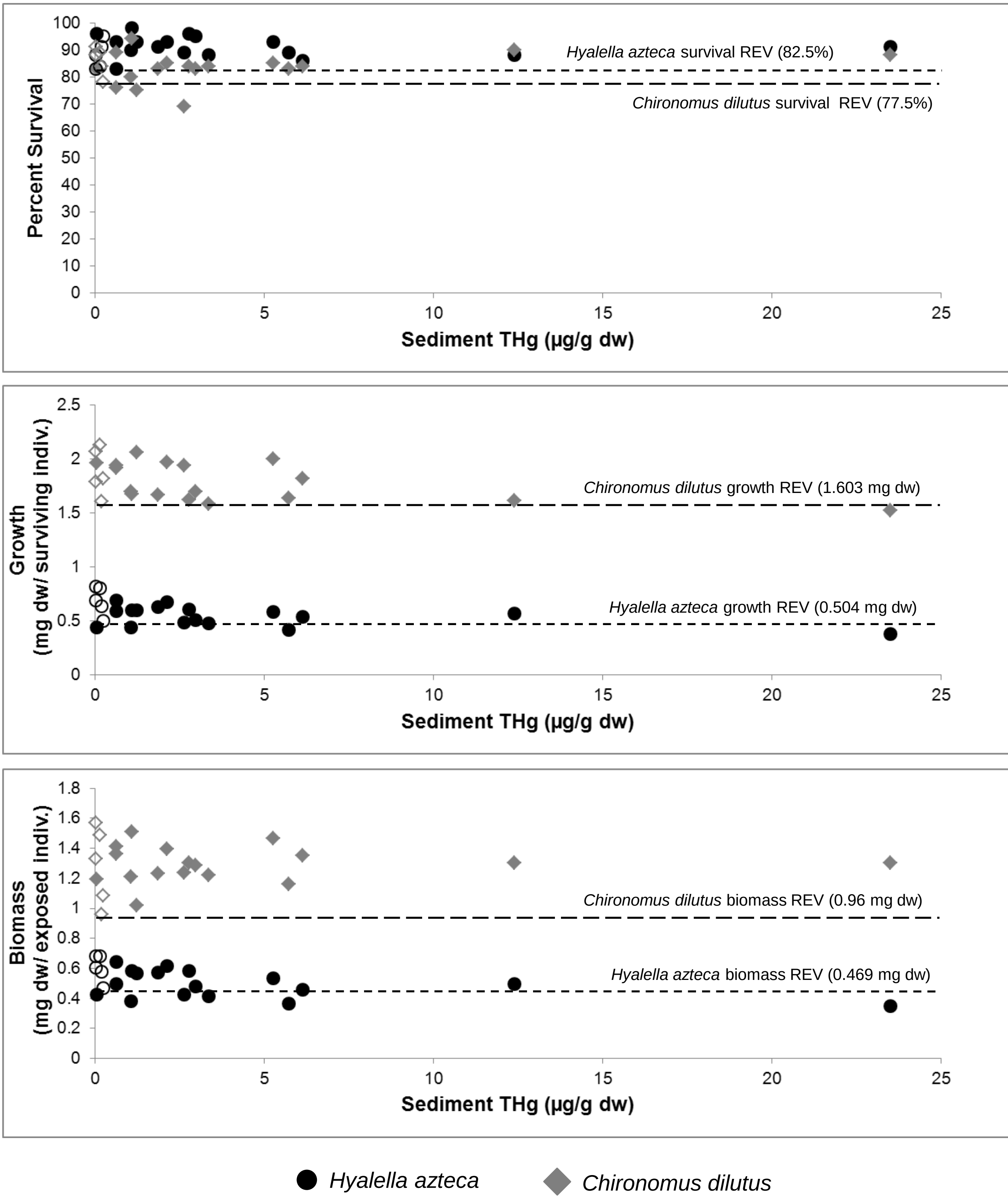
Figure A-3
Total and Methylmercury Concentrations in Toxicity Test Day 7 and Field Pore Water Samples
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are a comparison of THg and MeHg concentrations measured in pore water samples collected from surrogate test chambers on Day 7 of the sediment toxicity test and pore water samples extracted from bulk sediment samples collected in the field. The line represents a 1:1 relationship between Day 7 toxicity test pore water concentrations and field pore water concentrations.

Figure A-4
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Sediment THg Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure A-5
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Sediment MeHg Concentrations
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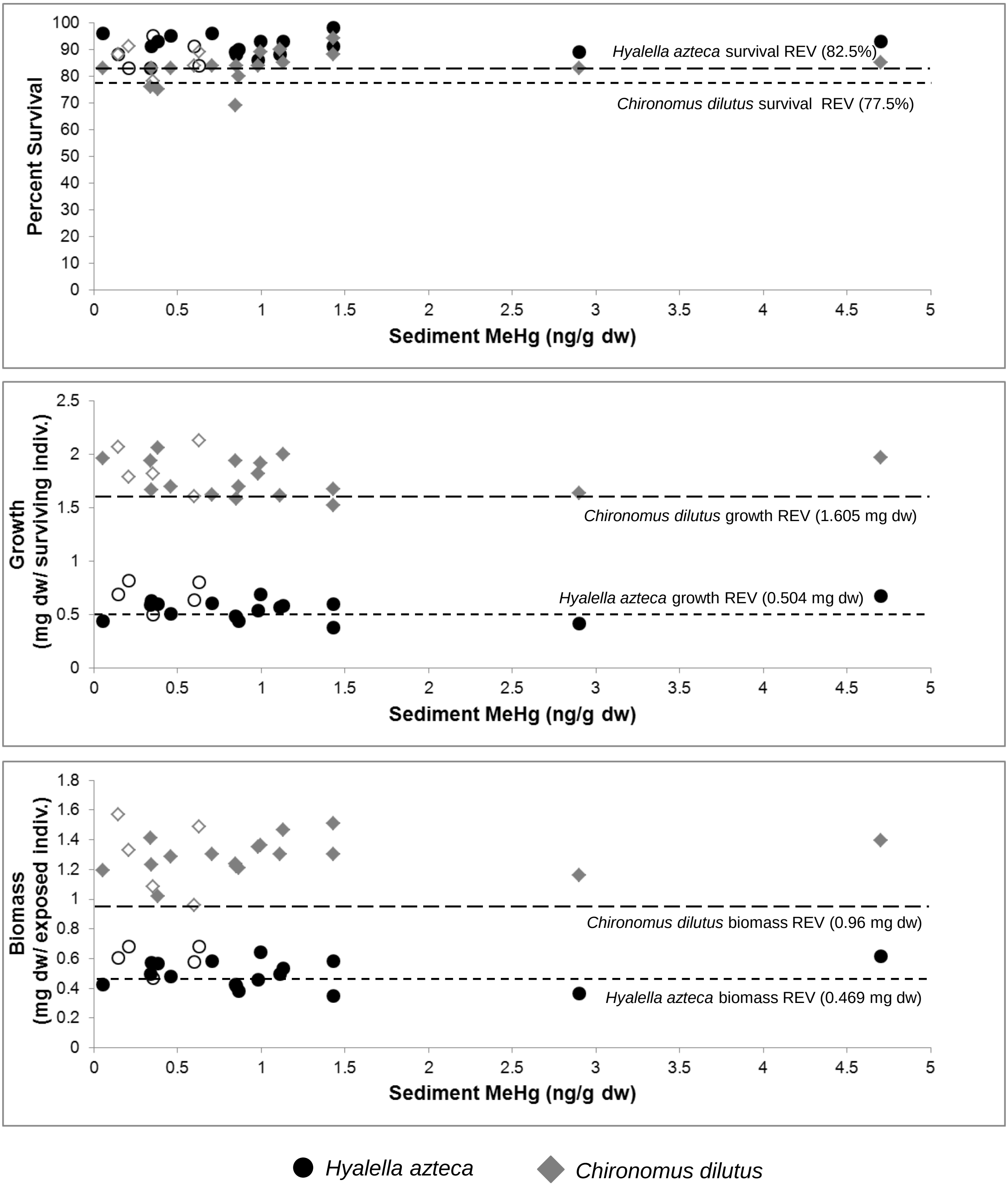
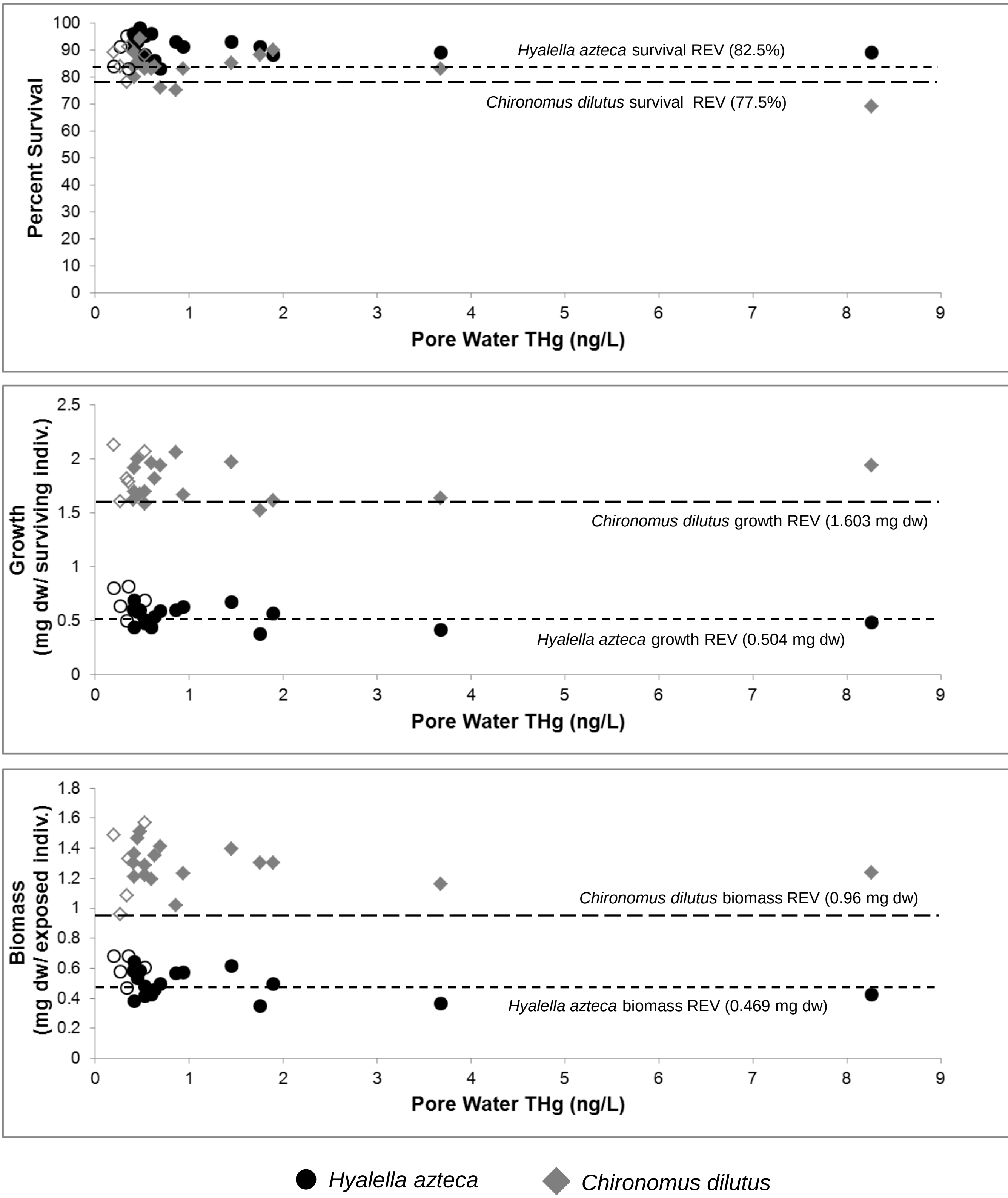


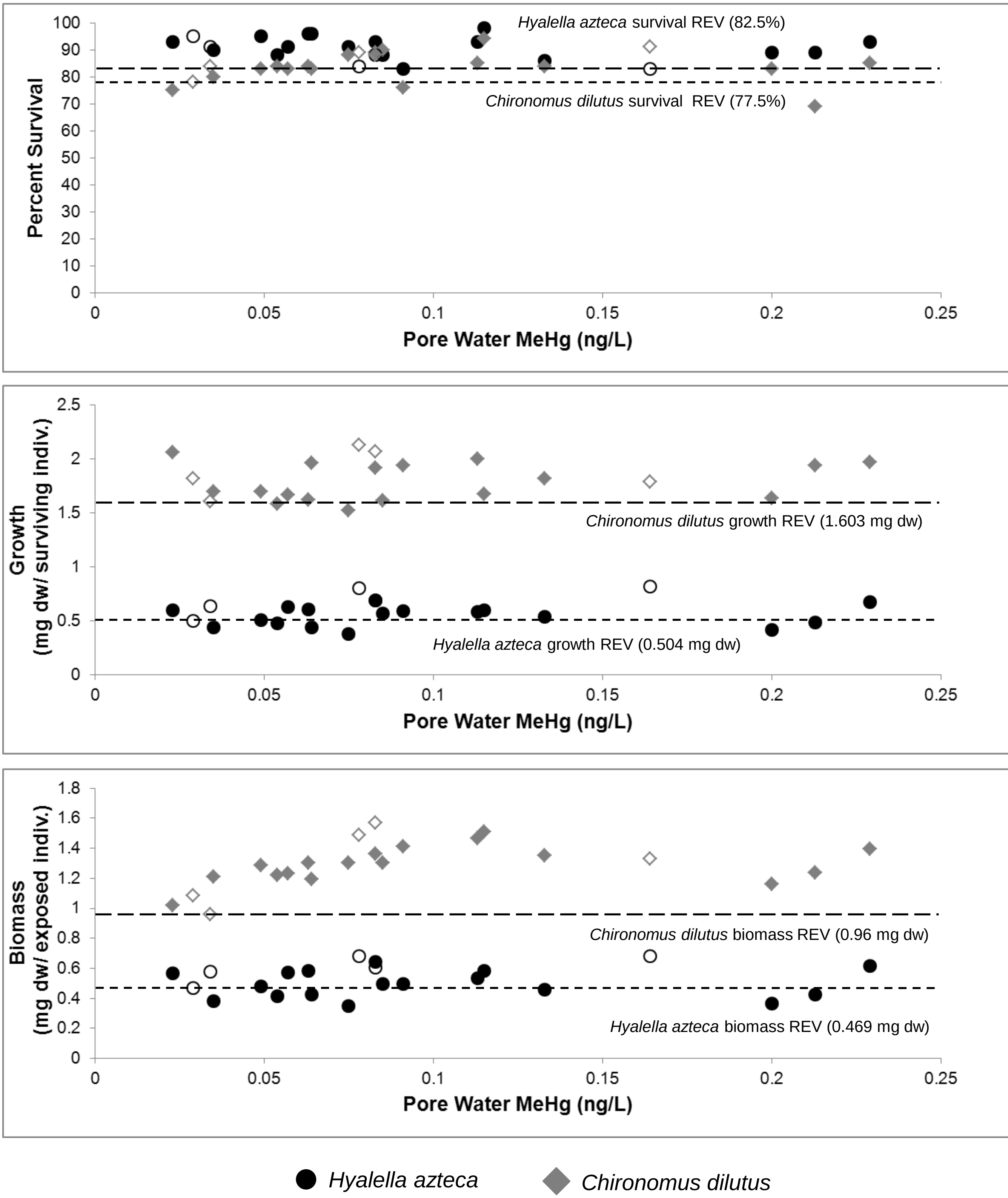
Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure A-6
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Pore Water THg Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



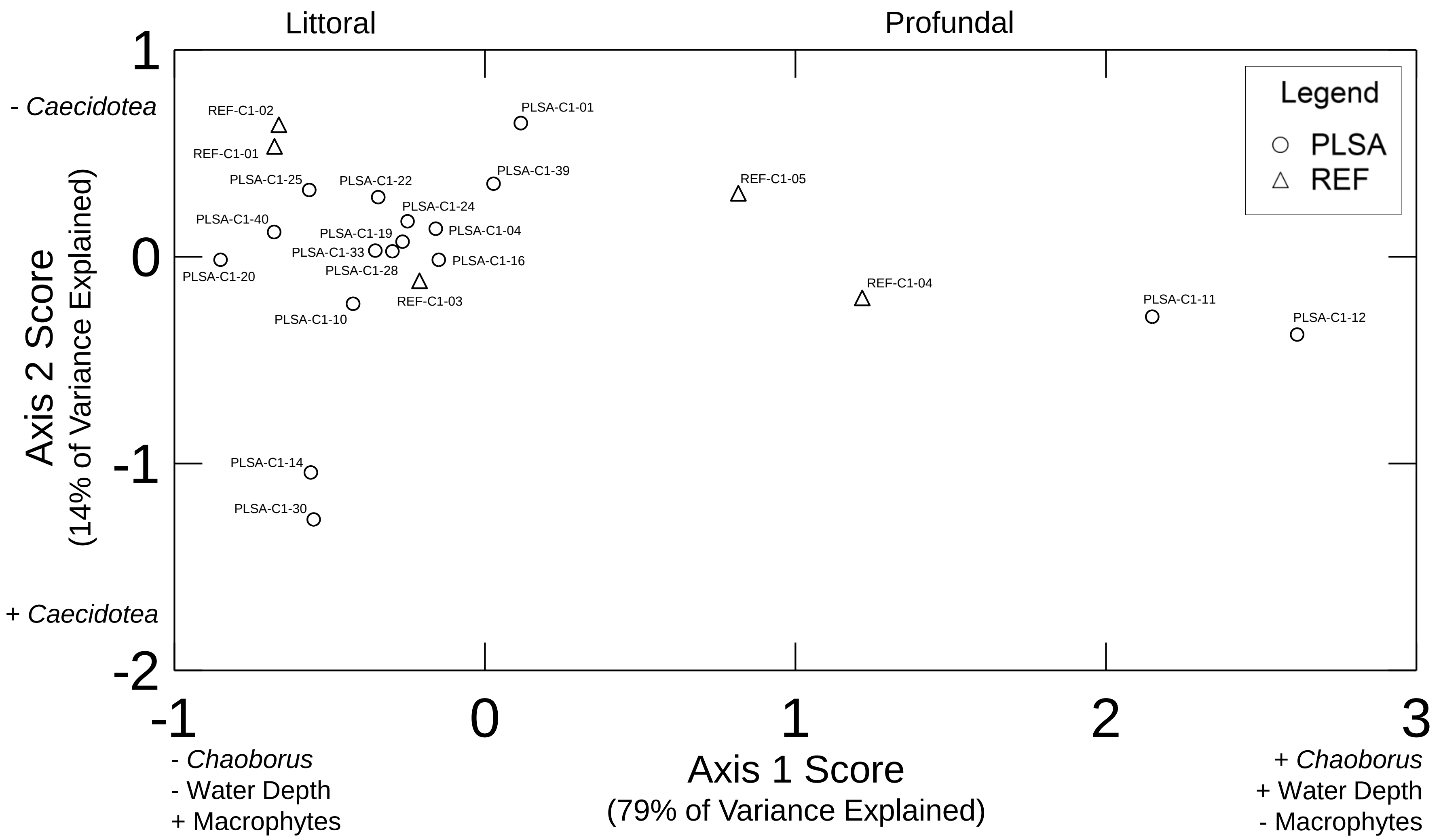
Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure A-7
28-Day *Hyalella azteca* and 20-Day *Chironomus dilutus* Endpoints Relative to Pore Water MeHg Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



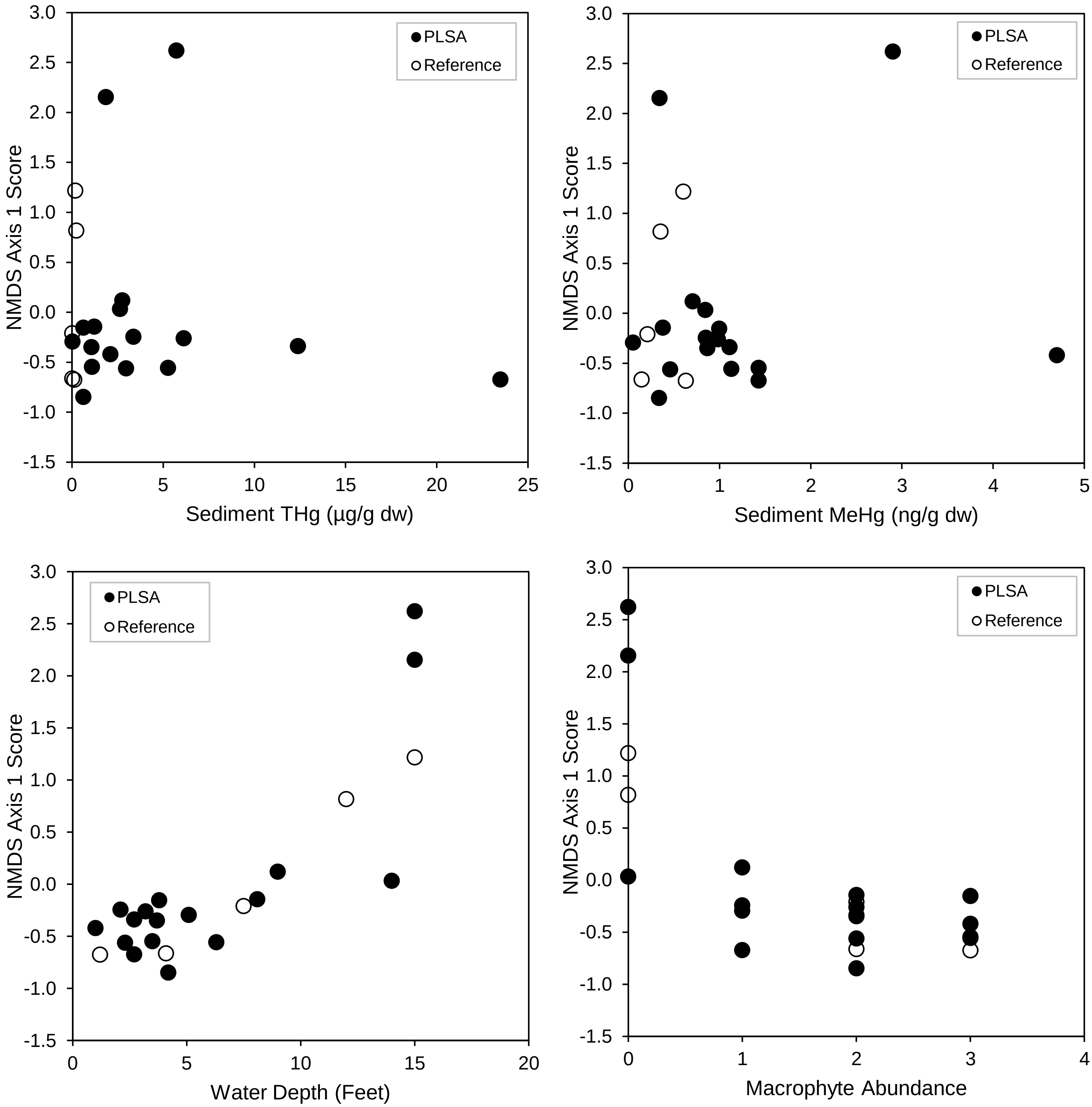
Notes: Open symbols denote reference stations. REV, reference envelope value established as the lower limit of reference station endpoints.

Figure A-8
Non-Metric Multidimensional Scaling (NMDS) Ordination of Benthic Macroinvertebrate Relative Abundance Data
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



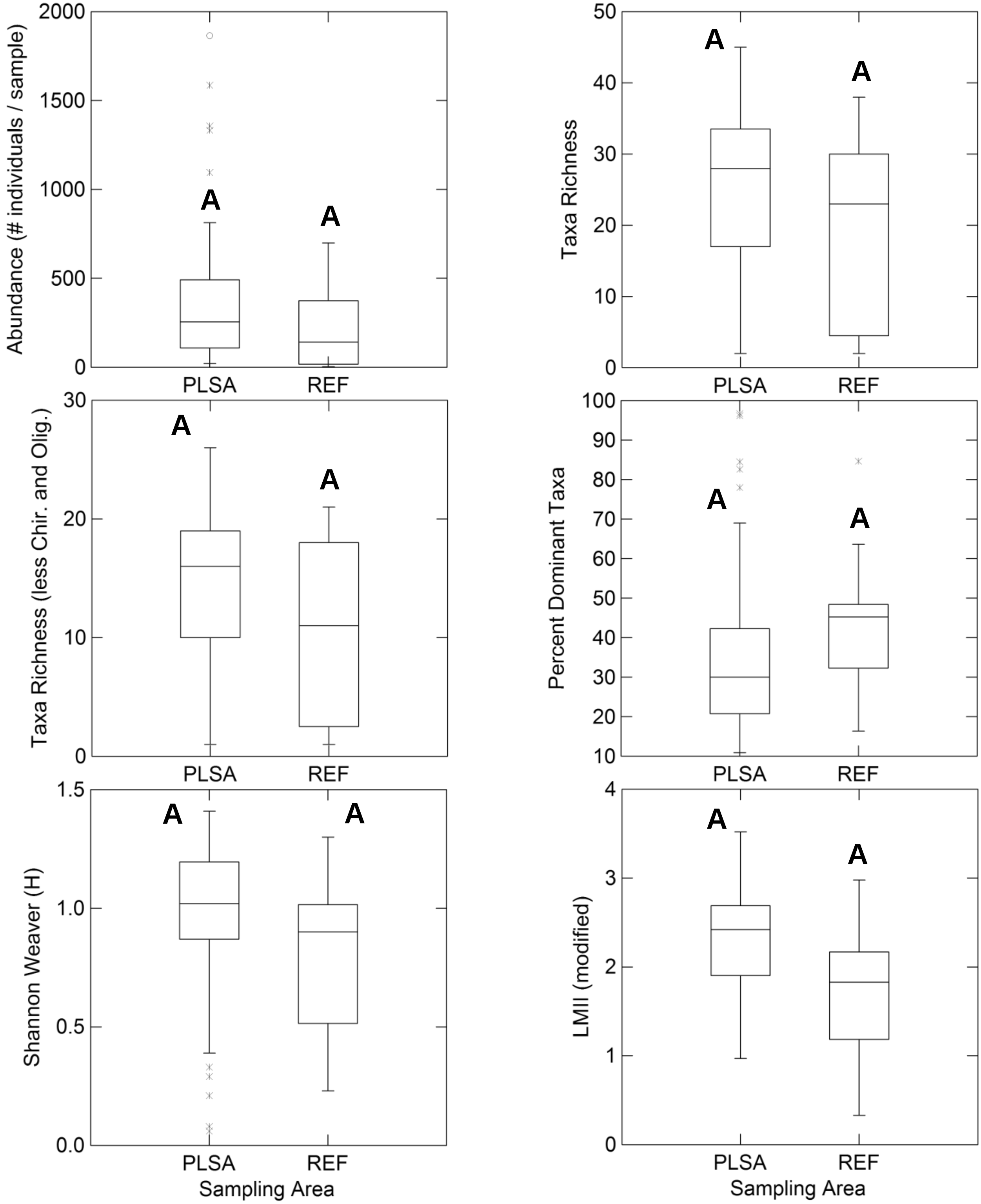
Notes: Data shown is an ordination of relative abundance data based on non-metric multidimensional scaling (NMDS) of benthic community data collected at Pompton Lake Study Area (PLSA) and Reference Area (REF) sediment quality triad (SQT) stations.

Figure A-9
NMDS Axis 1 Scores Relative to Mercury Exposure Concentrations and Habitat Attributes
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



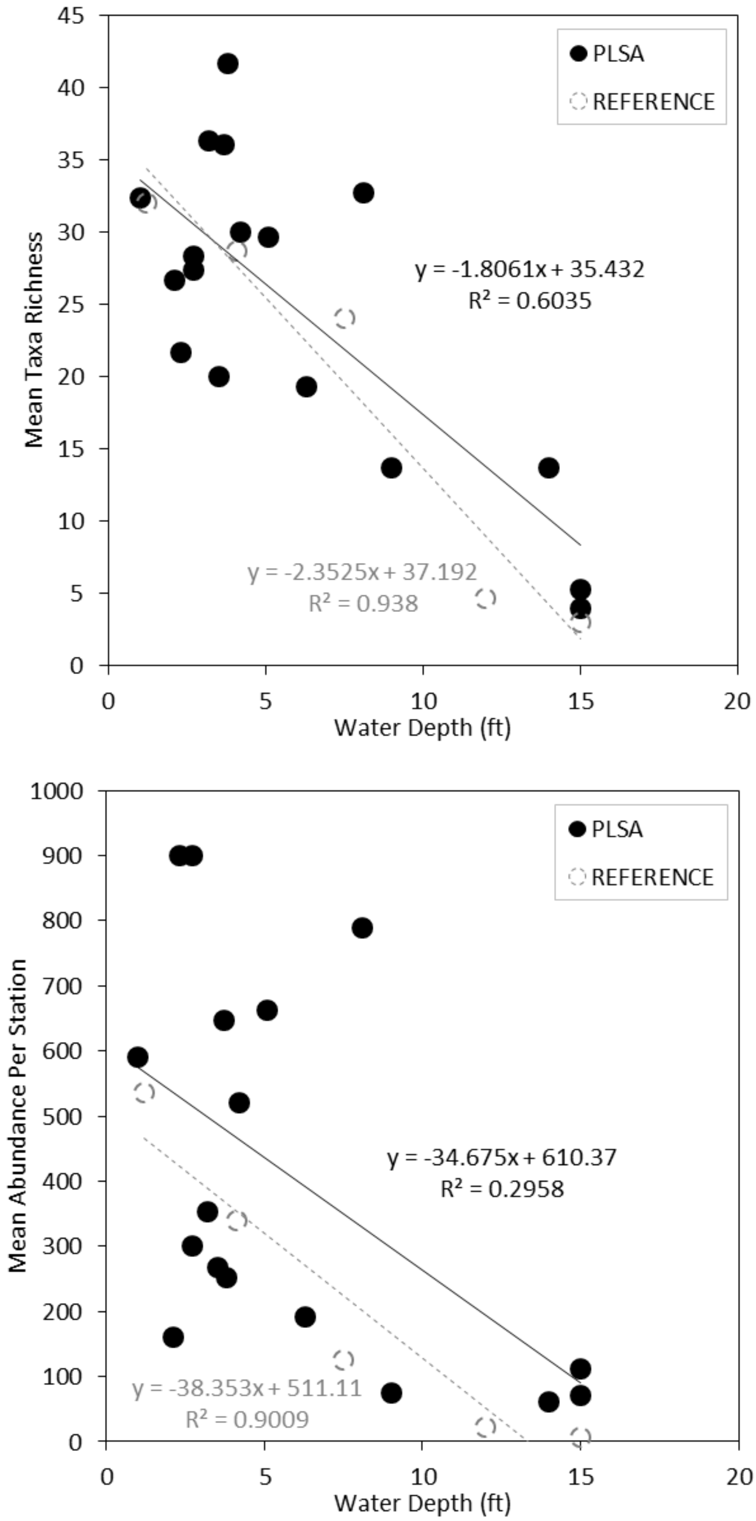
Notes: Data shown are NMDS Axis 1 compared to sediment total mercury (THg) concentrations, sediment methylmercury (MeHg) concentrations, water depth, and macrophyte abundance measured at stations sampled within the Pompton Lake Study Area (PLSA) and Reference Area (REF). Macrophyte abundance is presented as ordinal data based on classifications from qualitative field observations during SQT sampling where: 0) no macrophytes observed; 1) trace abundance; 2) moderate abundance; and 3) abundant.

Figure A-10
Summary of Benthic Macroinvertebrate Community Metric Values- Standard Metrics
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



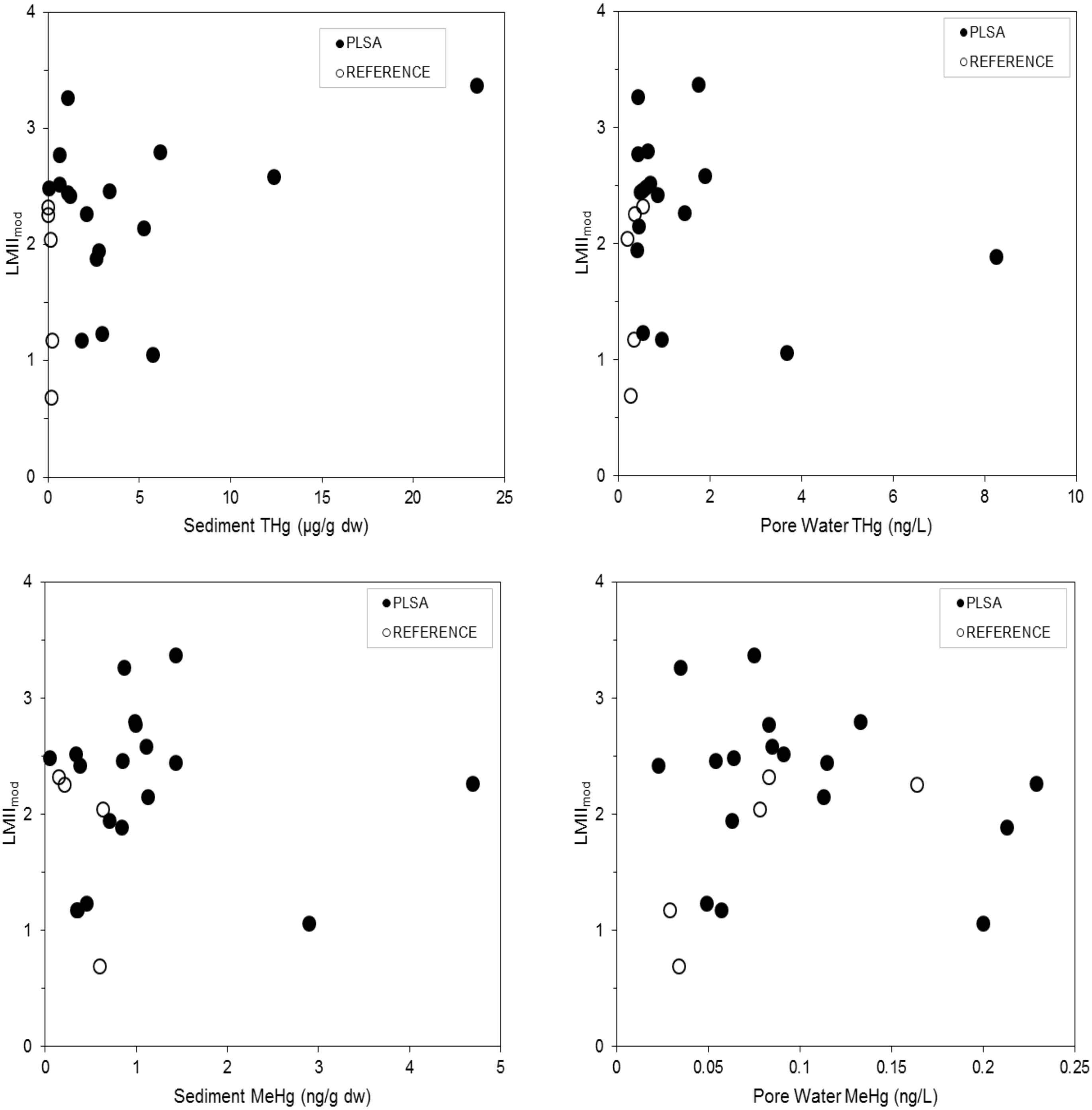
Notes: Data shown are standard metrics [abundance, taxa richness, taxa richness (less Chironomidae and Oligochaeta), percent dominant taxa, Shannon Weaver Diversity (H'), and modified Lake Macroinvertebrate Integrity Index (LMII)] calculated from benthic community samples collected at Pompton Lake Study Area (PLSA) and Reference Area (REF) sample locations. Data are represented as box and whisker plots. Depending on normality of data distribution, a two sample one-tailed t-Test (TT) or Mann-Whitney Test (MW) was used to test for a significant difference between PLSA and REF (significant difference indicated by different letters, α= 0.05). Where possible, data were transformed to meet assumptions of normality.

Figure A-11
Benthic Taxa Richness and Abundance Relative to Station Water Depth
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are mean taxa richness and mean abundance of benthic macroinvertebrates (individuals per sample) measured in benthic macroinvertebrate community samples (*n*=3 replicates per station) compared to water depth at sediment quality triad (SQT) stations within the Pompton Lake Study Area (PLSA) and Reference Area (REF).

Figure A-12
Modified Lake Macroinvertebrate Integrity Index Relative to Mercury Exposure Concentrations
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are mean modified Lake Macroinvertebrate Integrity Index ($LMII_{mod}$) values calculated from benthic macroinvertebrate community samples (*n*=3 replicates per station) compared to total mercury (THg) and methylmercury (MeHg) exposure concentrations measured at sediment quality triad (SQT) stations within the Pompton Lake Study Area (PLSA) and Reference Area (REF).

Appendices

Appendix A-1

Sediment Toxicity Testing Reports

ESI

EnviroSystems, Inc.
One Lafayette Road
P.O. Box 778
Hampton, NH 03843-0778
603-926-3345

Cert# L-2340 Testing

LETTER OF TRANSMITTAL

TO: Gary Long
URS Corporation
335 Commerce Drive, Suite 300
Fort Washington, Pennsylvania 19034-2623

FROM: Renée McIsaac
DATE: November 22, 2013
RE: Pompton Lake Ecological Investigations
DuPont Pompton Lakes Works
Work Authorization Number 295997.US

Attached please find the following document:

20 Day *Chironomus dilutus* Survival and Growth Sediment Toxicity Test

If you need additional copies on disk or have any questions please let me know.

Regards,

Renée McIsaac
ERA Project Manager

ESI

EnviroSystems, Inc.
One Lafayette Road
P.O. Box 778
Hampton, NH 03843-0778
603-926-3345

Cert# L-2340 Testing

LETTER OF TRANSMITTAL

TO: Gary Long
URS Corporation
335 Commerce Drive, Suite 300
Fort Washington, Pennsylvania 19034-2623

FROM: Renée McIsaac
DATE: November 22, 2013
RE: Pompton Lake Ecological Investigations
DuPont Pompton Lakes Works
Work Authorization Number 295997.US

Attached please find the following document:

28 Day *Hyalella azteca* Survival and Growth Sediment Toxicity Test

If you need additional copies on disk or have any questions please let me know.

Regards,

Renée McIsaac
ERA Project Manager

Appendix A-2

Benthic Macroinvertebrate Taxonomic Analysis Reports

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-01-A	PLSA-C1-01-B	PLSA-C1-01-C	PLSA-C1-04-A	PLSA-C1-04-B	PLSA-C1-04-C	PLSA-C1-10-A
	Time							
	Collection Date	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-11-2013
	Percent Subsampled	100.00	100.00	100.00	85.42	91.07	80.95	31.25
	EcoAnalysts Sample ID	6468.1-1	6468.1-2	6468.1-3	6468.1-4	6468.1-5	6468.1-6	6468.1-7
Ephemeroptera	Caenis sp.	0	0	0	0	0	1	2
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	0	1
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	1	0
Trichoptera	Hydroptilidae	0	0	0	0	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	1	0	0
Trichoptera	Oecetis sp.	0	0	0	0	0	0	0
Trichoptera	Orthotrichia sp.	0	0	0	0	6	0	0
Trichoptera	Oxyethira sp.	0	0	0	0	1	0	6
Trichoptera	Polycentropodidae	0	0	0	0	2	0	0
Odonata	Coenagrionidae	0	0	0	0	0	1	1
Odonata	Corduliidae	0	0	0	0	0	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	1
Odonata	Libellulidae/Corduliidae	0	0	0	0	0	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	1
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	1	2	1	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	3	5	4	1	0	0	0
Diptera-Chironomidae	Cladopelma sp.	0	4	1	18	8	6	0
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	0	0	0	6	3	2	0
Diptera-Chironomidae	Cryptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes modestus	0	0	0	3	1	2	0
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes tritomus	0	0	0	0	0	0	1
Diptera-Chironomidae	Einfeldia natchitocheae	2	2	2	2	0	0	0
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	0	0	1	0	0	2
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	1	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	0	0	0	2	5	1	3
Diptera-Chironomidae	Parachironomus sp.	0	0	0	0	1	2	0
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	0	0	0	2	13	1	5
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum bergi	0	0	0	0	1	0	1
Diptera-Chironomidae	Polypedilum halterale gr.	0	0	0	12	2	9	1
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	1	2	4	15	6	7	0
Diptera-Chironomidae	Pseudochironomus sp.	0	0	0	1	1	4	4
Diptera-Chironomidae	Tanypus sp.	1	0	0	1	0	1	0
Diptera-Chironomidae	Tanytarsus sp.	0	0	0	19	11	8	0
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	1	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	0	0	0	0	1	0
Diptera	Bezzia/Palpomyia sp.	0	0	0	1	0	3	0
Diptera	Ceratopogonidae	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	4	0	5	0	0	0	0
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	6	12	13	9	5	32	17

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-01-A	PLSA-C1-01-B	PLSA-C1-01-C	PLSA-C1-04-A	PLSA-C1-04-B	PLSA-C1-04-C	PLSA-C1-10-A
	Time							
	Collection Date	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-10-2013	09-11-2013
	Percent Subsampled	100.00	100.00	100.00	85.42	91.07	80.95	31.25
	EcoAnalysts Sample ID	6468.1-1	6468.1-2	6468.1-3	6468.1-4	6468.1-5	6468.1-6	6468.1-7
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	0	0	0	3	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	0	0	0	7	2	0
Annelida-Hirudinida	Helobdella stagnalis	0	0	0	2	1	3	8
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	2	0	5	4	10	0
Annelida-Oligochaeta	Aulodrilus pigueti	0	1	0	17	6	12	0
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	0	2	2	2
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	9	0	1	0	0	3
Annelida-Oligochaeta	Dero flabelliger	0	0	0	1	0	0	1
Annelida-Oligochaeta	Dero sp.	1	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	27	38	17	25	18	33	0
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	2
Annelida-Oligochaeta	Quistadrilus multisetosus	0	1	1	6	2	4	26
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	0	14	9	2	1	3	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	0	0	0	0	0	0	3
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	0	0	0	7	3	0	0
Mollusca-Bivalvia	Sphaeriidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	0	0	2	12	53	26	10
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	0	0	0	2	4	0	14
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	0	1	0	4	16	9	22
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	1	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	1	1	0	0
Mollusca-Gastropoda	Valvata bicarinata	0	0	0	8	2	2	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	0	0	0	0	1	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	0	0	0	1	8	2	24
Crustacea-Amphipoda	Hyalella sp.	1	0	0	2	5	4	35
Crustacea-Isopoda	Caecidotea sp.	0	0	0	0	0	0	47
Crustacea-Ostracoda	Ostracoda	0	1	0	5	1	1	4
Acari	Acari	0	0	0	0	0	0	0
Acari	Arrenurus sp.	0	1	0	1	2	3	0
Acari	Forelia sp.	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	1	0	0
Acari	Koenikea sp.	1	0	0	0	4	1	0
Acari	Krendowskia sp.	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	0	0	0	0	0	0
Acari	Limnesia sp.	1	6	9	1	4	6	4
Acari	Mideopsis sp.	0	0	0	0	1	1	0
Acari	Neumania sp.	3	1	3	0	1	1	0
Acari	Oxus sp.	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	0	0	0
Acari	Pionidae	0	0	0	2	3	2	2
Acari	Unionicola sp.	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	0	0	0	7	2	0
Cnidaria	Hydra sp.	0	0	0	0	0	1	0
Other Organisms	Nematoda	0	1	0	0	1	2	0
	TOTAL	**51**	**101**	**70**	**203**	**229**	**216**	**253**

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

Sample ID	PLSA-C1-10-B	PLSA-C1-10-C	PLSA-C1-11-A	PLSA-C1-11-B	PLSA-C1-11-C	PLSA-C1-12-A	PLSA-C1-12-B
Time							
Collection Date	09-11-2013	09-11-2013	09-11-2013	09-11-2013	09-11-2013	09-12-2013	09-12-2013
Percent Subsampled	67.86	57.14	100.00	100.00	100.00	100.00	100.00
EcoAnalysts Sample ID	6468.1-8	6468.1-9	6468.1-10	6468.1-11	6468.1-12	6468.1-13	6468.1-14
Ephemeroptera Caenis sp.	2	1	0	0	0	0	0
Ephemeroptera Callibaetis sp.	0	0	0	0	0	0	0
Plecoptera Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera Hydroptila sp.	0	2	0	0	0	0	0
Trichoptera Hydroptilidae	0	0	0	0	0	0	0
Trichoptera Leptocerus americanus	0	0	0	0	0	0	0
Trichoptera Oecetis sp.	0	0	0	0	0	0	0
Trichoptera Orthotrichia sp.	0	2	1	0	0	0	0
Trichoptera Oxyethira sp.	4	1	0	0	0	0	0
Trichoptera Polycentropodidae	0	0	0	0	0	0	0
Odonata Coenagrionidae	3	8	0	0	0	0	0
Odonata Corduliidae	0	0	0	0	0	0	0
Odonata Enallagma sp.	0	0	0	0	0	0	0
Odonata Epitheca princeps	0	0	0	0	0	0	0
Odonata Libellulidae	0	1	0	0	0	0	0
Odonata Libellulidae/Corduliidae	0	0	0	0	0	0	0
Odonata Perithemis tenera	0	0	0	0	0	0	0
Coleoptera Berosus sp.	0	0	0	0	0	0	0
Coleoptera Dubiraphia sp.	0	0	0	0	0	0	0
Coleoptera Peltodytes sp.	2	0	0	0	0	0	0
Diptera-Chironomidae Ablabesmyia (Karelia) sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Ablabesmyia sp.	1	1	0	0	0	0	0
Diptera-Chironomidae Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae Chironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Cladopelma sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Clinotanypus sp.	1	0	0	0	0	0	0
Diptera-Chironomidae Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Cricotopus sp.	0	1	0	0	0	0	0
Diptera-Chironomidae Cryptochironomus sp.	0	0	2	0	0	0	0
Diptera-Chironomidae Cryptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes modestus	0	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes tritomus	0	1	0	0	0	0	0
Diptera-Chironomidae Einfeldia natchitocheae	0	0	0	0	0	0	0
Diptera-Chironomidae Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Endochironomus sp.	2	1	0	0	0	0	0
Diptera-Chironomidae Glyptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Guttipelopia sp.	0	2	0	0	0	0	0
Diptera-Chironomidae Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Nanocladius sp.	0	2	0	0	0	0	0
Diptera-Chironomidae Parachironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0
Diptera-Chironomidae Paratanytarsus sp.	1	11	0	0	0	0	0
Diptera-Chironomidae Pentaneurini	0	0	0	0	0	0	0
Diptera-Chironomidae Polypedilum bergi	0	1	0	0	0	0	0
Diptera-Chironomidae Polypedilum halterale gr.	0	0	0	0	0	0	0
Diptera-Chironomidae Polypedilum illinoense gr.	0	0	0	0	0	0	0
Diptera-Chironomidae Procladius sp.	0	1	0	0	0	0	0
Diptera-Chironomidae Pseudochironomus sp.	2	15	0	0	0	0	0
Diptera-Chironomidae Tanypus sp.	0	1	0	0	0	0	0
Diptera-Chironomidae Tanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Thienemannimyia gr. sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Tribelos sp.	0	0	0	0	0	0	0
Diptera-Chironomidae Xenochironomus xenolabis	0	0	0	0	0	0	0
Diptera-Chironomidae Zavreliella marmorata	0	1	0	0	0	0	0
Diptera Bezzia/Palpomyia sp.	3	0	0	0	0	0	0
Diptera Ceratopogonidae	0	0	0	0	0	0	0
Diptera Ceratopogoninae	0	0	1	0	0	0	0
Diptera Chaoborus sp.	0	0	78	147	39	58	101
Diptera Dasyhelea sp.	0	0	0	0	0	0	0
Diptera Diptera	0	0	0	0	0	0	0
Diptera Ephydridae	0	1	0	0	0	0	0
Diptera Sphaeromias sp.	62	21	0	1	0	0	0

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-10-B	PLSA-C1-10-C	PLSA-C1-11-A	PLSA-C1-11-B	PLSA-C1-11-C	PLSA-C1-12-A	PLSA-C1-12-B
	Time							
	Collection Date	09-11-2013	09-11-2013	09-11-2013	09-11-2013	09-11-2013	09-12-2013	09-12-2013
	Percent Subsampled	67.86	57.14	100.00	100.00	100.00	100.00	100.00
	EcoAnalysts Sample ID	6468.1-8	6468.1-9	6468.1-10	6468.1-11	6468.1-12	6468.1-13	6468.1-14
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	2	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	1	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	7	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	1	1	0	0	0	0
Annelida-Hirudinida	Helobdella stagnalis	43	35	0	0	0	0	0
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus pigueti	0	0	0	1	1	0	0
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	2	9	0	0	0	0	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero flabelliger	2	2	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	0	0	0	25	9	0	0
Annelida-Oligochaeta	Limnodrilus udekemianus	1	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	53	55	0	0	0	0	0
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	0	0	27	0	0	2	3
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Sphaeriidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	3	12	0	0	0	0	0
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	3	7	0	0	0	0	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	9	24	0	0	0	0	0
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	2	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	0	0	0	0	0	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	9	11	0	0	0	0	0
Crustacea-Amphipoda	Hyalella sp.	1	3	0	0	0	0	0
Crustacea-Isopoda	Caecidotea sp.	68	42	0	0	0	0	0
Crustacea-Ostracoda	Ostracoda	12	0	0	0	0	0	0
Acari	Acari	0	0	0	0	0	0	0
Acari	Arrenurus sp.	3	4	0	0	0	0	0
Acari	Forelia sp.	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	0	0	0
Acari	Koenikea sp.	1	4	0	0	0	0	0
Acari	Krendowskia sp.	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	0	1	0	0	0	0
Acari	Limnesia sp.	3	4	0	0	1	0	0
Acari	Mideopsis sp.	1	0	0	0	0	0	0
Acari	Neumania sp.	0	0	0	0	0	0	0
Acari	Oxus sp.	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	0	0	0
Acari	Pionidae	1	2	0	0	0	0	0
Acari	Unionicola sp.	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	0	0	0	0	0	0
Cnidaria	Hydra sp.	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	2	0	0	0	1
	TOTAL	**309**	**291**	**113**	**174**	**50**	**60**	**105**

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-12-C	PLSA-C1-14-A	PLSA-C1-14-B	PLSA-C1-14-C	PLSA-C1-16-A	PLSA-C1-16-B	PLSA-C1-16-C
	Time		9:15	9:15	9:15			
	Collection Date	09-12-2013	09-04-2013	09-04-2013	09-04-2013	09-13-2013	09-13-2013	09-13-2013
	Percent Subsampled	100.00	84.72	94.44	100.00	42.71	16.67	43.75
	EcoAnalysts Sample ID	6468.1-15	6468.1-16	6468.1-17	6468.1-18	6468.1-19	6468.1-20	6468.1-21
Ephemeroptera	Caenis sp.	0	2	0	1	0	4	7
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	1	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptilidae	0	0	0	0	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	0	0	0
Trichoptera	Oecetis sp.	0	0	0	0	0	2	0
Trichoptera	Orthotrichia sp.	0	0	0	0	0	2	0
Trichoptera	Oxyethira sp.	0	0	0	0	0	2	0
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0
Odonata	Coenagrionidae	0	0	0	0	0	1	1
Odonata	Corduliidae	0	0	0	0	0	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	0	0	0	0
Odonata	Perithemis tenera	0	0	2	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	0	0	3	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cladopelma sp.	0	0	0	0	0	10	6
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	0	2	4	0	1	4	3
Diptera-Chironomidae	Cryptotendipes sp.	0	0	2	0	0	0	0
Diptera-Chironomidae	Dicrotendipes modestus	0	0	0	0	0	1	2
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes tritomus	0	0	0	0	0	3	0
Diptera-Chironomidae	Einfeldia natchitocheae	0	0	0	0	0	0	3
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	0	0	0	0	1	2	0
Diptera-Chironomidae	Parachironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	0	0	0	0	0	2	2
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	1
Diptera-Chironomidae	Polypedilum bergi	0	0	0	0	0	0	1
Diptera-Chironomidae	Polypedilum halterale gr.	0	0	2	2	0	0	0
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	0	1	1	0	4	6	7
Diptera-Chironomidae	Pseudochironomus sp.	0	0	0	0	1	17	4
Diptera-Chironomidae	Tanypus sp.	0	0	0	0	0	1	0
Diptera-Chironomidae	Tanytarsus sp.	0	5	6	0	0	2	1
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	1	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	1	1	0
Diptera-Chironomidae	Zavreliella marmorata	0	0	0	0	1	0	1
Diptera	Bezzia/Palpomyia sp.	1	1	0	0	0	1	0
Diptera	Ceratopogonidae	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	38	1	0	0	6	2	3
Diptera	Dasyhelea sp.	0	0	1	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	0	0	1	1	2	1	0

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Data are not adjusted for subsampling

ECO ANALYSTS, INC.

Sample ID	PLSA-C1-12-C	PLSA-C1-14-A	PLSA-C1-14-B	PLSA-C1-14-C	PLSA-C1-16-A	PLSA-C1-16-B	PLSA-C1-16-C
Time		9:15	9:15	9:15			
Collection Date	09-12-2013	09-04-2013	09-04-2013	09-04-2013	09-13-2013	09-13-2013	09-13-2013
Percent Subsampled	100.00	84.72	94.44	100.00	42.71	16.67	43.75
EcoAnalysts Sample ID	6468.1-15	6468.1-16	6468.1-17	6468.1-18	6468.1-19	6468.1-20	6468.1-21
Annelida-Hirudinida Desserobdella phalera	0	0	0	0	0	0	0
Annelida-Hirudinida Erpobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida Glossiphoniidae	0	0	0	0	0	0	0
Annelida-Hirudinida Helobdella elongata	0	1	0	3	0	0	0
Annelida-Hirudinida Helobdella sp.	0	0	0	0	1	2	0
Annelida-Hirudinida Helobdella stagnalis	0	7	5	17	0	0	1
Annelida-Hirudinida Hirudinida	0	0	0	0	0	0	0
Annelida-Oligochaeta Aulodrilus limnobius	0	0	5	0	0	7	8
Annelida-Oligochaeta Aulodrilus pigueti	0	9	31	1	1	1	4
Annelida-Oligochaeta Aulodrilus pluriseta	0	0	0	0	0	0	1
Annelida-Oligochaeta Branchiura sowerbyi	0	0	0	0	11	4	3
Annelida-Oligochaeta Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta Dero digitata	0	0	0	0	1	0	0
Annelida-Oligochaeta Dero flabelliger	0	0	0	0	0	0	0
Annelida-Oligochaeta Dero sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta Limnodrilus hoffmeisteri	0	0	0	0	28	5	18
Annelida-Oligochaeta Limnodrilus udekemianus	0	0	0	0	0	0	0
Annelida-Oligochaeta Nais sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta Quistadrilus multisetosus	1	1	1	0	2	0	6
Annelida-Oligochaeta Stylaria lacustris	0	0	0	0	0	0	0
Annelida-Oligochaeta Tubificidae w/ cap setae	0	0	0	0	0	1	2
Annelida-Oligochaeta Tubificidae w/o cap setae	3	2	4	0	0	0	0
Annelida-Polychaeta Manayunkia speciosa	0	0	0	0	0	0	0
Mollusca-Bivalvia Corbicula sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia Musculium sp.	0	1	0	0	0	0	0
Mollusca-Bivalvia Pisidium sp.	0	16	0	1	5	10	12
Mollusca-Bivalvia Sphaeriidae	0	0	2	0	0	0	0
Mollusca-Gastropoda Amnicola sp.	0	21	1	4	23	6	11
Mollusca-Gastropoda Ancylidae	0	0	1	0	0	0	0
Mollusca-Gastropoda Gyraulus sp.	0	0	1	0	9	32	5
Mollusca-Gastropoda Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda Hydrobiidae	0	0	0	0	0	0	0
Mollusca-Gastropoda Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda Physa sp.	0	0	0	0	15	24	8
Mollusca-Gastropoda Planorbidae	0	0	0	0	0	0	0
Mollusca-Gastropoda Promenetus exacuous	0	0	0	0	0	0	0
Mollusca-Gastropoda Valvata bicarinata	0	32	3	9	71	37	74
Mollusca-Gastropoda Valvata sp.	1	0	0	0	0	0	0
Mollusca-Gastropoda Valvata tricarinata	0	6	0	0	0	0	5
Crustacea-Amphipoda Amphipoda	0	0	0	0	0	0	0
Crustacea-Amphipoda Gammarus sp.	0	10	0	2	0	0	0
Crustacea-Amphipoda Hyalella sp.	0	0	0	0	4	20	11
Crustacea-Isopoda Caecidotea sp.	0	91	130	43	0	0	0
Crustacea-Ostracoda Ostracoda	0	0	0	1	5	0	9
Acari Acari	0	0	0	0	0	0	0
Acari Arrenurus sp.	0	1	0	0	3	1	4
Acari Forelia sp.	0	1	0	0	0	0	0
Acari Hydrodroma sp.	0	0	0	0	0	0	0
Acari Koenikea sp.	0	7	2	1	0	3	0
Acari Krendowskia sp.	0	0	0	0	0	0	0
Acari Lebertia sp.	0	0	0	0	0	0	0
Acari Limnesia sp.	1	2	0	0	6	3	5
Acari Mideopsis sp.	0	0	0	0	0	0	0
Acari Neumania sp.	0	2	0	0	2	0	0
Acari Oxus sp.	0	0	0	0	0	0	0
Acari Piona sp.	1	0	0	0	0	0	0
Acari Pionidae	0	1	0	0	2	0	0
Acari Unionicola sp.	0	0	0	0	0	0	0
Turbellaria Turbellaria	0	6	0	0	0	1	1
Cnidaria Hydra sp.	0	0	0	0	0	0	0
Other Organisms Nematoda	0	0	0	0	0	1	1
TOTAL	**46**	**229**	**205**	**86**	**207**	**226**	**231**

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Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-19-A	PLSA-C1-19-B	PLSA-C1-19-C	PLSA-C1-20-A	PLSA-C1-20-B	PLSA-C1-20-C	PLSA-C1-22-A
	Time	15:30	15:30	15:30	10:15	10:15	10:15	12:30
	Collection Date	09-04-2013	09-04-2013	09-04-2013	09-06-2013	09-06-2013	09-06-2013	09-05-2013
	Percent Subsampled	91.67	75.00	58.33	91.67	93.75	22.92	48.09
	EcoAnalysts Sample ID	6468.1-22	6468.1-23	6468.1-24	6468.1-25	6468.1-26	6468.1-27	6468.1-28
Ephemeroptera	Caenis sp.	2	1	1	0	2	1	0
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	3	0	0	0	2	0	0
Trichoptera	Hydroptilidae	0	3	2	3	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	0	0	0
Trichoptera	Oecetis sp.	0	0	0	0	1	0	0
Trichoptera	Orthotrichia sp.	2	6	3	2	1	5	1
Trichoptera	Oxyethira sp.	3	12	3	1	0	0	2
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0
Odonata	Coenagrionidae	1	2	0	3	0	2	0
Odonata	Corduliidae	0	0	0	0	0	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	0	0	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	1	0	0	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cladopelma sp.	18	11	23	2	9	7	5
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	2	0	0	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	4	5	7	1	3	2	6
Diptera-Chironomidae	Cryptotendipes sp.	2	3	6	0	0	0	1
Diptera-Chironomidae	Dicrotendipes modestus	4	14	0	2	1	3	2
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes tritomus	26	0	2	14	4	5	3
Diptera-Chironomidae	Einfeldia natchitocheae	7	29	47	0	14	1	54
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	1	0	0	0	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	0	0	0	0	0	0	2
Diptera-Chironomidae	Parachironomus sp.	1	0	0	0	0	0	3
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	1	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	8	7	2	4	5	1	4
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum bergi	0	0	0	0	0	1	0
Diptera-Chironomidae	Polypedilum halterale gr.	5	0	1	1	2	1	0
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	6	7	7	2	13	5	4
Diptera-Chironomidae	Pseudochironomus sp.	0	4	2	3	0	1	0
Diptera-Chironomidae	Tanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tanytarsus sp.	2	3	9	1	4	2	46
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	0	2	0	0	0	1
Diptera	Bezzia/Palpomyia sp.	3	3	0	0	0	2	1
Diptera	Ceratopogonidae	0	0	0	1	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	0	0	1	0	0	0	0
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	0	0	0	0	0	0	1

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Data are not adjusted for subsampling

EcoAnalysts, Inc.

Sample ID		PLSA-C1-19-A	PLSA-C1-19-B	PLSA-C1-19-C	PLSA-C1-20-A	PLSA-C1-20-B	PLSA-C1-20-C	PLSA-C1-22-A
Time		15:30	15:30	15:30	10:15	10:15	10:15	12:30
Collection Date		09-04-2013	09-04-2013	09-04-2013	09-06-2013	09-06-2013	09-06-2013	09-05-2013
Percent Subsampled		91.67	75.00	58.33	91.67	93.75	22.92	48.09
EcoAnalysts Sample ID		6468.1-22	6468.1-23	6468.1-24	6468.1-25	6468.1-26	6468.1-27	6468.1-28
Annelida-Hirudinida	Desserobdella phalera	2	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	1	0
Annelida-Hirudinida	Helobdella elongata	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	0	0	1	0	0	0
Annelida-Hirudinida	Helobdella stagnalis	10	25	4	14	4	8	5
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	1	0	0	2	2
Annelida-Oligochaeta	Aulodrilus pigueti	0	0	1	0	5	1	10
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	0	0	0	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	1	0	0	0	3
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	0	7	13	0	8	0	0
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	5	1	0	0	1	2	17
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	2
Annelida-Oligochaeta	Tubificidae w/ cap setae	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	1	0	0	2	0	2	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	18	5	22	4	2	6	0
Mollusca-Bivalvia	Sphaeriidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	61	38	21	76	30	18	7
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	2	4	1	6	0	0	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	0	3	0	5	3	4	0
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	1	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	1	1	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	21	13	17	45	30	13	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	19	7	8	0	5	4	1
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	0	16	14	8	9	22	3
Crustacea-Amphipoda	Hyalella sp.	2	12	11	16	42	121	2
Crustacea-Isopoda	Caecidotea sp.	5	5	0	0	0	2	0
Crustacea-Ostracoda	Ostracoda	3	1	3	0	0	0	2
Acari	Acari	0	4	0	0	0	0	0
Acari	Arrenurus sp.	0	1	0	2	3	0	0
Acari	Forelia sp.	1	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	0	0	0
Acari	Koenikea sp.	3	5	5	0	0	0	0
Acari	Krendowskia sp.	0	0	1	0	0	0	0
Acari	Lebertia sp.	0	0	0	0	0	0	0
Acari	Limnesia sp.	0	1	0	1	1	1	0
Acari	Mideopsis sp.	0	1	0	0	0	0	0
Acari	Neumania sp.	0	1	1	0	0	0	0
Acari	Oxus sp.	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	2	0	0
Acari	Pionidae	2	1	2	1	0	2	0
Acari	Unionicola sp.	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	1	1	0	0	2	4
Cnidaria	Hydra sp.	0	0	0	0	0	0	0
Other Organisms	Nematoda	1	2	3	0	1	0	8
TOTAL		**255**	**265**	**250**	**223**	**207**	**251**	**202**

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Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-22-B	PLSA-C1-22-C	PLSA-C1-24-A	PLSA-C1-24-B	PLSA-C1-24-C	PLSA-C1-25-A	PLSA-C1-25-B
	Time	12:30	12:30				8:30	8:30
	Collection Date	09-05-2013	09-05-2013	09-09-2013	09-09-2013	09-09-2013	09-05-2013	09-05-2013
	Percent Subsampled	100.00	100.00	79.17	100.00	100.00	14.58	41.67
	EcoAnalysts Sample ID	6468.1-29	6468.1-30	6468.1-31	6468.1-32	6468.1-33	6468.1-34	6468.1-35
Ephemeroptera	Caenis sp.	0	0	0	0	0	0	0
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptilidae	1	1	0	0	1	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	0	0	0
Trichoptera	Oecetis sp.	0	0	0	0	0	0	0
Trichoptera	Orthotrichia sp.	3	2	15	0	4	1	0
Trichoptera	Oxyethira sp.	5	1	9	0	1	1	0
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0
Odonata	Coenagrionidae	0	0	0	0	0	0	0
Odonata	Corduliidae	0	0	0	0	0	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	0	0	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	1	0	2	0	0
Diptera-Chironomidae	Cladopelma sp.	0	0	4	1	6	0	0
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	8	5	3	13	4	0	0
Diptera-Chironomidae	Cryptotendipes sp.	0	3	0	0	2	0	0
Diptera-Chironomidae	Dicrotendipes modestus	0	9	6	0	0	0	0
Diptera-Chironomidae	Dicrotendipes sp.	1	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes tritomus	0	1	1	0	0	0	0
Diptera-Chironomidae	Einfeldia natchitocheae	48	9	8	4	9	2	1
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	1	0	0	0	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	0	2	0	0	0	0	0
Diptera-Chironomidae	Parachironomus sp.	3	1	0	0	0	0	0
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	1	0	1	0	0	0	0
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum bergi	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum halterale gr.	1	5	0	0	4	0	0
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	9	3	3	1	3	4	2
Diptera-Chironomidae	Pseudochironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tanytarsus sp.	32	14	9	1	44	0	0
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	2	1	0	2	0	0
Diptera	Bezzia/Palpomyia sp.	0	2	0	1	0	1	0
Diptera	Ceratopogonidae	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	0	0	0	0	0	0	0
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	7	0	1	3	1	0	0

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ECOANALYSTS, INC.

	Sample ID	PLSA-C1-22-B	PLSA-C1-22-C	PLSA-C1-24-A	PLSA-C1-24-B	PLSA-C1-24-C	PLSA-C1-25-A	PLSA-C1-25-B
	Time	12:30	12:30				8:30	8:30
	Collection Date	09-05-2013	09-05-2013	09-09-2013	09-09-2013	09-09-2013	09-05-2013	09-05-2013
	Percent Subsampled	100.00	100.00	79.17	100.00	100.00	14.58	41.67
	EcoAnalysts Sample ID	6468.1-29	6468.1-30	6468.1-31	6468.1-32	6468.1-33	6468.1-34	6468.1-35
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	0	0	1	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella stagnalis	11	97	14	1	2	38	28
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	1
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	9	0	1	0	2
Annelida-Oligochaeta	Aulodrilus pigueti	1	0	25	3	15	5	1
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	0	1	2	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	2	0	4	1	0
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	0	0	17	8	4	13	3
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	17	8	3	3	7	61	14
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	8	1
Annelida-Oligochaeta	Tubificidae w/ cap setae	0	0	1	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	4	0	0	0	0	0	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	1	1	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	9	5	0	0	4	9	19
Mollusca-Bivalvia	Sphaeriidae	0	0	4	2	0	0	0
Mollusca-Gastropoda	Amnicola sp.	40	59	8	0	18	12	20
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	0	0	1	0	0	0	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	14	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	1	1	2	0	0	0	2
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	5	2	0	2	1	1	19
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	0	0	0	0	0	8	40
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	2	12	17	1	1	41	40
Crustacea-Amphipoda	Hyalella sp.	0	0	26	0	4	2	6
Crustacea-Isopoda	Caecidotea sp.	0	0	1	0	0	2	4
Crustacea-Ostracoda	Ostracoda	2	0	4	0	4	0	0
Acari	Acari	0	0	0	0	1	0	0
Acari	Arrenurus sp.	0	1	0	0	0	0	0
Acari	Forelia sp.	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	0	0	0
Acari	Koenikea sp.	4	1	1	0	0	0	0
Acari	Krendowskia sp.	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	0	0	0	0	0	0
Acari	Limnesia sp.	2	2	0	0	0	0	0
Acari	Mideopsis sp.	0	0	0	0	0	0	0
Acari	Neumania sp.	1	0	0	0	0	0	0
Acari	Oxus sp.	0	1	0	0	0	0	0
Acari	Piona sp.	1	5	1	0	1	0	0
Acari	Pionidae	5	0	0	0	0	0	0
Acari	Unionicola sp.	0	0	0	0	0	0	0
Turbellaria	Turbellaria	1	0	3	0	0	19	5
Cnidaria	Hydra sp.	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	1	6	8	0	0
	TOTAL	**225**	**255**	**204**	**65**	**159**	**231**	**208**

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Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-25-C	PLSA-C1-28-A	PLSA-C1-28-B	PLSA-C1-28-C	PLSA-C1-30-A	PLSA-C1-30-B	PLSA-C1-30-C
	Time	8:30						
	Collection Date	09-05-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013
	Percent Subsampled	45.83	16.67	54.17	100.00	42.86	100.00	100.00
	EcoAnalysts Sample ID	6468.1-36	6468.1-37	6468.1-38	6468.1-39	6468.1-40	6468.1-41	6468.1-42
Ephemeroptera	Caenis sp.	0	3	5	2	0	0	0
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0
Trichoptera	Hydroptilidae	0	2	0	0	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	0	0	0
Trichoptera	Oecetis sp.	0	0	0	1	0	0	0
Trichoptera	Orthotrichia sp.	0	13	1	4	0	1	0
Trichoptera	Oxyethira sp.	0	6	2	2	1	0	0
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0
Odonata	Coenagrionidae	1	5	0	2	0	0	0
Odonata	Corduliidae	0	0	0	0	0	0	2
Odonata	Enallagma sp.	0	0	0	0	0	0	1
Odonata	Epitheca princeps	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	0	1	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	1	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	2	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cladopelma sp.	1	0	0	0	2	14	6
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	0	1	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	0	0	0	2	0	0	0
Diptera-Chironomidae	Cryptotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes modestus	0	1	0	0	3	10	3
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes tritomus	0	11	8	3	0	0	1
Diptera-Chironomidae	Einfeldia natchitocheae	2	0	0	0	0	2	1
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	0	0	1	0	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	1	0	1	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	1	2	1	0	0	0	0
Diptera-Chironomidae	Parachironomus sp.	1	1	0	2	0	0	0
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	1	28	12	5	0	0	3
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	1	0
Diptera-Chironomidae	Polypedilum bergi	0	0	1	0	0	0	0
Diptera-Chironomidae	Polypedilum halterale gr.	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum illinoense gr.	0	1	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	2	2	7	2	0	0	0
Diptera-Chironomidae	Pseudochironomus sp.	0	20	8	2	1	0	3
Diptera-Chironomidae	Tanypus sp.	0	0	0	0	2	16	2
Diptera-Chironomidae	Tanytarsus sp.	0	1	8	0	0	0	0
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	0	0	0	0	0	0
Diptera	Bezzia/Palpomyia sp.	0	0	1	2	2	6	0
Diptera	Ceratopogonidae	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	0	0	1	0	6	1	0
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	1	0	0	0	0	0	0

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Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	PLSA-C1-25-C	PLSA-C1-28-A	PLSA-C1-28-B	PLSA-C1-28-C	PLSA-C1-30-A	PLSA-C1-30-B	PLSA-C1-30-C
	Time	8:30						
	Collection Date	09-05-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013	09-17-2013
	Percent Subsampled	45.83	16.67	54.17	100.00	42.86	100.00	100.00
	EcoAnalysts Sample ID	6468.1-36	6468.1-37	6468.1-38	6468.1-39	6468.1-40	6468.1-41	6468.1-42
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	6	3	0	0	0	1	0
Annelida-Hirudinida	Helobdella stagnalis	70	2	0	3	38	22	16
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus pigueti	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	1	0	0	0	1
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	1	0	0	0	0
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	0	6	14	6	0	0	0
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	22	1	1	0	0	13	2
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	1	0	0	0	0	1	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	2	0	0	0	0	0	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	1	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	5	4	2	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	6	9	22	11	3	3	0
Mollusca-Bivalvia	Sphaeriidae	0	0	4	0	0	4	0
Mollusca-Gastropoda	Amnicola sp.	26	23	10	36	7	10	7
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	0	12	6	8	1	2	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	1	16	4	13	0	4	2
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	0	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	1	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	6	19	42	53	9	6	3
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	49	0	0	0	0	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	1	0	0
Crustacea-Amphipoda	Gammarus sp.	34	5	9	4	0	0	2
Crustacea-Amphipoda	Hyalella sp.	39	14	77	13	0	0	0
Crustacea-Isopoda	Caecidotea sp.	2	2	0	0	125	104	33
Crustacea-Ostracoda	Ostracoda	0	1	0	0	0	0	0
Acari	Acari	0	1	0	0	0	0	0
Acari	Arrenurus sp.	1	0	0	1	0	0	0
Acari	Forelia sp.	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	0	0	0
Acari	Koenikea sp.	1	0	0	4	5	2	0
Acari	Krendowskia sp.	0	0	0	0	0	2	0
Acari	Lebertia sp.	0	0	0	0	0	0	0
Acari	Limnesia sp.	2	1	0	0	0	3	0
Acari	Mideopsis sp.	1	0	0	0	0	1	0
Acari	Neumania sp.	0	0	0	0	0	1	0
Acari	Oxus sp.	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	1	0	0
Acari	Pionidae	1	0	1	0	0	1	0
Acari	Unionicola sp.	0	0	0	0	0	0	0
Turbellaria	Turbellaria	2	3	0	1	0	0	0
Cnidaria	Hydra sp.	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	0	0	0	0	0
	TOTAL	**282**	**222**	**253**	**187**	**208**	**232**	**88**

	Sample ID	PLSA-C1-33-A	PLSA-C1-33-B	PLSA-C1-33-C	REF-C1-01-A	REF-C1-01-B	REF-C1-01-C	REF-C1-02-A	REF-C1-02-B
	Time								
	Collection Date	09-16-2013	09-16-2013	09-16-2013	09-20-2013	09-20-2013	09-20-2013	09-19-2013	09-19-2013
	Percent Subsampled	58.33	29.17	29.17	41.67	54.17	37.50	58.33	46.53
	EcoAnalysts Sample ID	6468.1-43	6468.1-44	6468.1-45	6468.1-46	6468.1-47	6468.1-48	6468.1-49	6468.1-50
Ephemeroptera	Caenis sp.	0	3	1	0	1	3	1	1
Ephemeroptera	Callibaetis sp.	0	2	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	0	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0	0
Trichoptera	Hydroptilidae	0	2	0	0	2	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	1	2	0	0
Trichoptera	Oecetis sp.	1	0	0	0	0	0	0	0
Trichoptera	Orthotrichia sp.	3	4	1	2	3	2	2	0
Trichoptera	Oxyethira sp.	0	1	0	0	1	0	0	0
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	2	2	1	1	0	5	1	0
Odonata	Corduliidae	0	0	0	0	0	1	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	1	0	0	0	0
Odonata	Libellulidae	1	0	0	0	1	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	1	0	1	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	1	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomini	0	1	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Cladopelma sp.	19	7	6	1	0	1	4	6
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	2	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	3	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	1	1	0	3	1	0	0
Diptera-Chironomidae	Cryptochironomus sp.	0	0	0	0	2	0	3	5
Diptera-Chironomidae	Cryptotendipes sp.	0	0	1	0	0	0	1	0
Diptera-Chironomidae	Dicrotendipes modestus	0	5	1	0	0	0	0	1
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	1	0
Diptera-Chironomidae	Dicrotendipes tritomus	14	24	33	0	1	0	0	0
Diptera-Chironomidae	Einfeldia natchitocheae	8	2	0	1	0	3	31	23
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	0	0	0	0	2	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	1	0	0	0	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	2	0	0
Diptera-Chironomidae	Nanocladius sp.	3	13	10	0	0	0	0	0
Diptera-Chironomidae	Parachironomus sp.	0	2	0	0	0	0	0	0
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	23	32	65	2	9	6	0	0
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum bergi	0	0	1	0	0	0	0	0
Diptera-Chironomidae	Polypedilum halterale gr.	2	0	0	0	2	1	0	0
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	9	6	5	2	1	2	1	1
Diptera-Chironomidae	Pseudochironomus sp.	3	13	2	5	4	6	0	1
Diptera-Chironomidae	Tanypus sp.	13	2	8	1	2	1	0	0
Diptera-Chironomidae	Tanytarsus sp.	8	4	6	1	0	0	0	0
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	1	0	0	0	0	1	0
Diptera	Bezzia/Palpomyia sp.	1	5	0	0	0	1	1	2
Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	1	0	0
Diptera	Chaoborus sp.	0	0	0	0	0	0	0	1
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	0	0	0	0	0	0	0	1

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

EcoAnalysts, Inc.

		PLSA-C1-33-A	PLSA-C1-33-B	PLSA-C1-33-C	REF-C1-01-A	REF-C1-01-B	REF-C1-01-C	REF-C1-02-A	REF-C1-02-B
	Sample ID	**PLSA-C1-33-A**	**PLSA-C1-33-B**	**PLSA-C1-33-C**	**REF-C1-01-A**	**REF-C1-01-B**	**REF-C1-01-C**	**REF-C1-02-A**	**REF-C1-02-B**
	Time								
	Collection Date	**09-16-2013**	**09-16-2013**	**09-16-2013**	**09-20-2013**	**09-20-2013**	**09-20-2013**	**09-19-2013**	**09-19-2013**
	Percent Subsampled	**58.33**	**29.17**	**29.17**	**41.67**	**54.17**	**37.50**	**58.33**	**46.53**
	EcoAnalysts Sample ID	**6468.1-43**	**6468.1-44**	**6468.1-45**	**6468.1-46**	**6468.1-47**	**6468.1-48**	**6468.1-49**	**6468.1-50**
Annelida-Hirudinida	Desserobdella phalera	0	0	0	1	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	1	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	1	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	0	1	2	0	1	0	0
Annelida-Hirudinida	Helobdella stagnalis	4	5	1	1	0	1	0	2
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	5	5	4	2	0	1	4	14
Annelida-Oligochaeta	Aulodrilus pigueti	7	4	3	0	4	0	1	0
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	0	0	1	0	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	1	1	1	0	0	1
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0	5
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	2	4	0	15	28	15	21	9
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	2	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	18	9	9	99	64	96	94	95
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	0	0	0	0	0	0	3	3
Annelida-Oligochaeta	Tubificidae w/o cap setae	0	0	2	0	0	0	0	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	5	5	8	10	11	25	19	16
Mollusca-Bivalvia	Sphaeriidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Amnicola sp.	21	15	3	18	7	35	1	3
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	0	5	8	1	11	4	1	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	2	0	0
Mollusca-Gastropoda	Physa sp.	13	16	14	21	8	13	0	0
Mollusca-Gastropoda	Planorbidae	1	0	0	0	0	0	0	1
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	2	6	1	0	1	2	2	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	0	0	0	0	0	0	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	0	0	2	1	5	3	2	9
Crustacea-Amphipoda	Hyalella sp.	0	10	8	10	32	11	2	8
Crustacea-Isopoda	Caecidotea sp.	5	5	0	3	3	3	0	0
Crustacea-Ostracoda	Ostracoda	2	6	5	0	1	0	0	0
Acari	Acari	0	0	0	0	0	0	0	0
Acari	Arrenurus sp.	0	0	1	0	0	0	0	0
Acari	Forelia sp.	0	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	1	0	0	0	0	0
Acari	Koenikea sp.	4	0	0	0	1	0	2	0
Acari	Krendowskia sp.	0	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	1	0	0	0	0	0	0
Acari	Limnesia sp.	2	2	4	0	0	0	0	0
Acari	Mideopsis sp.	2	0	0	1	0	0	0	0
Acari	Neumania sp.	0	0	0	0	0	0	0	0
Acari	Oxus sp.	1	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	0	0	0	0
Acari	Pionidae	0	0	0	0	0	0	0	0
Acari	Unionicola sp.	0	0	0	0	0	0	0	0
Turbellaria	Turbellaria	4	5	5	4	2	4	0	0
Cnidaria	Hydra sp.	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	1	1	0	3	1	2	3	2
	TOTAL	**211**	**237**	**223**	**212**	**216**	**262**	**204**	**210**

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

Sample ID	REF-C1-02-C	REF-C1-03-A	REF-C1-03-B	REF-C1-03-C	REF-C1-04-A	REF-C1-04-B	REF-C1-04-C	REF-C1-05-A
Time								
Collection Date	09-19-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-19-2013
Percent Subsampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
EcoAnalysts Sample ID	6468.1-51	6468.1-52	6468.1-53	6468.1-54	6468.1-55	6468.1-56	6468.1-57	6468.1-58
Ephemeroptera Caenis sp.	0	0	0	1	0	0	0	0
Ephemeroptera Callibaetis sp.	1	0	0	0	0	0	0	0
Plecoptera Allocapnia sp.	0	0	0	0	0	0	0	0
Trichoptera Hydroptila sp.	0	0	0	0	0	0	0	0
Trichoptera Hydroptilidae	0	1	0	1	0	0	0	0
Trichoptera Leptocerus americanus	0	0	0	1	0	0	0	0
Trichoptera Oecetis sp.	0	0	0	0	0	0	0	0
Trichoptera Orthotrichia sp.	0	0	0	1	0	0	0	0
Trichoptera Oxyethira sp.	6	1	0	0	0	0	0	0
Trichoptera Polycentropodidae	0	0	0	0	0	0	0	0
Odonata Coenagrionidae	2	4	0	4	0	0	0	0
Odonata Corduliidae	0	0	0	0	0	0	0	0
Odonata Enallagma sp.	0	0	0	0	0	0	0	0
Odonata Epitheca princeps	0	0	0	0	0	0	0	0
Odonata Libellulidae	0	0	0	0	0	0	0	0
Odonata Libellulidae/Corduliidae	2	0	0	0	0	0	0	0
Odonata Perithemis tenera	0	0	0	0	0	0	0	0
Coleoptera Berosus sp.	0	0	0	0	0	0	0	0
Coleoptera Dubiraphia sp.	3	0	0	0	0	0	0	0
Coleoptera Peltodytes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Ablabesmyia (Karelia) sp.	2	0	0	0	0	0	0	0
Diptera-Chironomidae Ablabesmyia sp.	0	0	0	1	0	0	0	0
Diptera-Chironomidae Chironomini	0	0	0	0	0	0	0	0
Diptera-Chironomidae Chironomus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Cladopelma sp.	2	3	1	4	0	0	0	0
Diptera-Chironomidae Cladotanytarsus sp.	0	0	0	1	0	0	0	0
Diptera-Chironomidae Clinotanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Coelotanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Cricotopus sp.	1	0	0	2	0	0	0	0
Diptera-Chironomidae Cryptochironomus sp.	2	2	1	12	0	0	0	0
Diptera-Chironomidae Cryptotendipes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes modestus	5	3	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Dicrotendipes tritomus	4	0	0	0	0	0	0	0
Diptera-Chironomidae Einfeldia natchitocheae	19	1	3	1	0	0	0	0
Diptera-Chironomidae Einfeldia sp.	2	0	0	0	0	0	0	0
Diptera-Chironomidae Endochironomus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Glyptotendipes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Guttipelopia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Larsia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Nanocladius sp.	0	0	0	2	0	0	0	0
Diptera-Chironomidae Parachironomus sp.	1	1	0	1	0	0	0	0
Diptera-Chironomidae Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0	0
Diptera-Chironomidae Paratanytarsus sp.	12	1	0	21	0	0	0	0
Diptera-Chironomidae Pentaneurini	0	0	0	0	0	0	0	0
Diptera-Chironomidae Polypedilum bergi	1	0	0	0	0	0	0	0
Diptera-Chironomidae Polypedilum halterale gr.	1	0	0	0	0	0	0	0
Diptera-Chironomidae Polypedilum illinoense gr.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Procladius sp.	1	0	0	3	0	0	0	0
Diptera-Chironomidae Pseudochironomus sp.	3	4	0	3	0	0	0	0
Diptera-Chironomidae Tanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Tanytarsus sp.	0	1	0	2	0	0	0	0
Diptera-Chironomidae Thienemannimyia gr. sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Tribelos sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae Xenochironomus xenolabis	0	0	0	0	0	0	0	0
Diptera-Chironomidae Zavreliella marmorata	0	0	0	0	0	0	0	0
Diptera Bezzia/Palpomyia sp.	0	0	1	2	0	0	0	0
Diptera Ceratopogonidae	0	0	0	0	0	0	0	0
Diptera Ceratopogoninae	0	0	0	0	0	0	0	0
Diptera Chaoborus sp.	0	0	0	1	0	7	2	11
Diptera Dasyhelea sp.	0	0	0	0	0	0	0	0
Diptera Diptera	0	0	1	0	0	0	0	0
Diptera Ephydridae	0	0	0	0	0	0	0	0
Diptera Sphaeromias sp.	0	1	0	4	0	0	0	0

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECOANALYSTS, INC.

	Sample ID	REF-C1-02-C	REF-C1-03-A	REF-C1-03-B	REF-C1-03-C	REF-C1-04-A	REF-C1-04-B	REF-C1-04-C	REF-C1-05-A
	Time								
	Collection Date	09-19-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-18-2013	09-19-2013
	Percent Subsampled	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	EcoAnalysts Sample ID	6468.1-51	6468.1-52	6468.1-53	6468.1-54	6468.1-55	6468.1-56	6468.1-57	6468.1-58
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	3	0	0	0	1	1	0	0
Annelida-Hirudinida	Helobdella stagnalis	6	6	0	1	0	0	0	0
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	1	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus pigueti	1	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	1	0	0	0	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero digitata	0	0	0	1	0	0	0	0
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	0	0	3	18	0	2	0	0
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	38	0	2	2	0	0	0	0
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	1	0	0	1	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	14	2	0	0	1	0	2	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	1	0	0	0	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	6	4	0	26	0	0	0	0
Mollusca-Bivalvia	Sphaeriidae	0	0	2	0	1	0	0	0
Mollusca-Gastropoda	Amnicola sp.	33	16	6	7	0	1	0	0
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	4	0	2	6	0	0	0	0
Mollusca-Gastropoda	Helisoma anceps	0	0	0	1	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	11	16	2	8	0	0	0	0
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	4	66	14	32	0	0	0	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata tricarinata	2	0	0	1	0	0	0	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	0	0	0
Crustacea-Amphipoda	Gammarus sp.	5	2	0	0	0	0	0	0
Crustacea-Amphipoda	Hyalella sp.	10	2	4	20	0	0	0	0
Crustacea-Isopoda	Caecidotea sp.	0	0	0	0	0	0	0	0
Crustacea-Ostracoda	Ostracoda	0	0	0	0	0	0	0	0
Acari	Acari	0	0	0	0	0	0	0	0
Acari	Arrenurus sp.	1	0	0	0	0	0	0	1
Acari	Forelia sp.	0	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	2	1	0	0	0	0	0	0
Acari	Koenikea sp.	0	0	0	1	0	0	0	0
Acari	Krendowskia sp.	0	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	0	0	0	0	0	0	0
Acari	Limnesia sp.	4	2	0	0	0	0	0	0
Acari	Mideopsis sp.	0	0	0	0	0	0	0	0
Acari	Neumania sp.	1	0	0	0	0	0	0	0
Acari	Oxus sp.	0	0	0	0	0	0	0	1
Acari	Piona sp.	0	0	0	0	0	0	0	0
Acari	Pionidae	0	0	0	0	0	0	0	0
Acari	Unionicola sp.	0	0	0	0	0	0	0	0
Turbellaria	Turbellaria	0	0	0	0	0	0	0	0
Cnidaria	Hydra sp.	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	0	1	0	0	0	0
	TOTAL	**217**	**141**	**42**	**195**	**3**	**11**	**4**	**13**

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

ECO ANALYSTS, INC.

	Sample ID	REF-C1-05-B	REF-C1-05-C	PLSA-C1-39-A	PLSA-C1-39-B	PLSA-C1-39-C	PLSA-C1-40-A	PLSA-C1-40-B	PLSA-C1-40-C
	Time								
	Collection Date	09-19-2013	09-19-2013	09-24-2013	09-24-2013	09-24-2013	09-25-2013	09-25-2013	09-25-2013
	Percent Subsampled	100.00	100.00	100.00	100.00	100.00	87.50	12.50	35.42
	EcoAnalysts Sample ID	6468.1-59	6468.1-60	6468.1-61	6468.1-62	6468.1-63	6468.1-64	6468.1-65	6468.1-66
Ephemeroptera	Caenis sp.	0	0	0	0	0	0	0	1
Ephemeroptera	Callibaetis sp.	0	0	0	0	0	0	0	0
Plecoptera	Allocapnia sp.	0	0	0	0	0	3	0	0
Trichoptera	Hydroptila sp.	0	0	0	0	0	0	0	0
Trichoptera	Hydroptilidae	0	0	0	0	0	0	0	0
Trichoptera	Leptocerus americanus	0	0	0	0	0	0	0	0
Trichoptera	Oecetis sp.	0	0	0	0	0	0	5	0
Trichoptera	Orthotrichia sp.	0	0	0	0	0	0	8	0
Trichoptera	Oxyethira sp.	0	0	0	0	0	1	2	1
Trichoptera	Polycentropodidae	0	0	0	0	0	0	0	0
Odonata	Coenagrionidae	0	0	0	0	0	0	0	0
Odonata	Corduliidae	0	0	0	0	0	0	0	0
Odonata	Enallagma sp.	0	0	0	0	0	0	0	0
Odonata	Epitheca princeps	0	0	0	0	0	0	0	0
Odonata	Libellulidae	0	0	0	0	0	0	0	0
Odonata	Libellulidae/Corduliidae	0	0	0	0	0	0	0	0
Odonata	Perithemis tenera	0	0	0	0	0	0	0	0
Coleoptera	Berosus sp.	0	0	0	0	0	0	0	0
Coleoptera	Dubiraphia sp.	0	0	0	0	0	0	0	0
Coleoptera	Peltodytes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Ablabesmyia sp.	0	0	0	0	0	0	0	1
Diptera-Chironomidae	Chironomini	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Chironomus sp.	0	0	0	0	1	2	0	3
Diptera-Chironomidae	Cladopelma sp.	0	0	3	0	1	0	0	0
Diptera-Chironomidae	Cladotanytarsus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Clinotanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Coelotanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Cricotopus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Cryptochironomus sp.	0	0	9	3	13	10	0	2
Diptera-Chironomidae	Cryptotendipes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Dicrotendipes modestus	0	0	0	0	1	3	5	0
Diptera-Chironomidae	Dicrotendipes sp.	0	0	0	0	0	0	0	2
Diptera-Chironomidae	Dicrotendipes tritomus	0	0	0	0	0	1	8	0
Diptera-Chironomidae	Einfeldia natchitocheae	0	0	0	0	0	121	41	78
Diptera-Chironomidae	Einfeldia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Endochironomus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Glyptotendipes sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Guttipelopia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Larsia sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Nanocladius sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Parachironomus sp.	0	0	0	0	0	0	1	1
Diptera-Chironomidae	Paralauterborniella nigrohalteralis	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Paratanytarsus sp.	0	0	0	0	0	1	11	0
Diptera-Chironomidae	Pentaneurini	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum bergi	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Polypedilum halterale gr.	0	0	0	0	0	0	0	1
Diptera-Chironomidae	Polypedilum illinoense gr.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Procladius sp.	0	0	3	0	3	9	3	0
Diptera-Chironomidae	Pseudochironomus sp.	0	0	0	0	0	0	2	0
Diptera-Chironomidae	Tanypus sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Tanytarsus sp.	0	0	22	1	33	27	27	67
Diptera-Chironomidae	Thienemannimyia gr. sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Xenochironomus xenolabis	0	0	0	0	0	0	0	0
Diptera-Chironomidae	Zavreliella marmorata	0	0	0	0	1	2	1	3
Diptera	Bezzia/Palpomyia sp.	0	0	0	0	2	0	2	2
Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0
Diptera	Ceratopogoninae	0	0	0	0	0	0	0	0
Diptera	Chaoborus sp.	2	6	6	0	3	0	0	0
Diptera	Dasyhelea sp.	0	0	0	0	0	0	0	0
Diptera	Diptera	0	0	0	0	0	0	0	0
Diptera	Ephydridae	0	0	0	0	0	0	0	0
Diptera	Sphaeromias sp.	0	0	2	2	7	4	0	2

URS New Jersey Lake Benthos July 2013
Data are not adjusted for subsampling

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	Sample ID	REF-C1-05-B	REF-C1-05-C	PLSA-C1-39-A	PLSA-C1-39-B	PLSA-C1-39-C	PLSA-C1-40-A	PLSA-C1-40-B	PLSA-C1-40-C
	Time								
	Collection Date	09-19-2013	09-19-2013	09-24-2013	09-24-2013	09-24-2013	09-25-2013	09-25-2013	09-25-2013
	Percent Subsampled	100.00	100.00	100.00	100.00	100.00	87.50	12.50	35.42
	EcoAnalysts Sample ID	6468.1-59	6468.1-60	6468.1-61	6468.1-62	6468.1-63	6468.1-64	6468.1-65	6468.1-66
Annelida-Hirudinida	Desserobdella phalera	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Erpobdella sp.	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Glossiphoniidae	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella elongata	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella sp.	0	0	0	0	0	0	0	0
Annelida-Hirudinida	Helobdella stagnalis	0	0	0	1	0	0	1	0
Annelida-Hirudinida	Hirudinida	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Aulodrilus limnobius	0	0	0	0	0	0	0	1
Annelida-Oligochaeta	Aulodrilus pigueti	0	0	0	0	0	6	1	1
Annelida-Oligochaeta	Aulodrilus pluriseta	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Branchiura sowerbyi	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Chaetogaster diastrophus	0	0	0	0	0	0	0	1
Annelida-Oligochaeta	Dero digitata	2	2	1	0	3	0	0	0
Annelida-Oligochaeta	Dero flabelliger	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Dero sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus cervix	13	10	0	0	0	0	0	0
Annelida-Oligochaeta	Limnodrilus hoffmeisteri	2	6	16	0	0	0	0	10
Annelida-Oligochaeta	Limnodrilus udekemianus	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Nais sp.	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Quistadrilus multisetosus	0	0	0	0	1	0	1	0
Annelida-Oligochaeta	Stylaria lacustris	0	0	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/ cap setae	1	8	0	0	0	0	0	0
Annelida-Oligochaeta	Tubificidae w/o cap setae	0	0	0	8	6	9	1	0
Annelida-Polychaeta	Manayunkia speciosa	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Corbicula sp.	0	0	1	0	1	0	0	0
Mollusca-Bivalvia	Musculium sp.	0	0	0	0	0	0	0	0
Mollusca-Bivalvia	Pisidium sp.	0	0	0	0	0	2	0	0
Mollusca-Bivalvia	Sphaeriidae	0	0	0	0	1	0	3	1
Mollusca-Gastropoda	Amnicola sp.	0	0	0	0	0	4	2	1
Mollusca-Gastropoda	Ancylidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Gyraulus sp.	0	0	0	0	0	0	1	2
Mollusca-Gastropoda	Helisoma anceps	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Hydrobiidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Micromenetus sp.	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Physa sp.	0	0	0	0	0	0	3	1
Mollusca-Gastropoda	Planorbidae	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Promenetus exacuous	0	0	0	0	0	0	0	0
Mollusca-Gastropoda	Valvata bicarinata	0	0	1	4	5	7	5	0
Mollusca-Gastropoda	Valvata sp.	0	0	0	0	0	0	0	3
Mollusca-Gastropoda	Valvata tricarinata	1	0	0	0	0	0	1	0
Crustacea-Amphipoda	Amphipoda	0	0	0	0	0	1	0	0
Crustacea-Amphipoda	Gammarus sp.	0	0	0	0	1	0	22	3
Crustacea-Amphipoda	Hyalella sp.	0	0	0	0	0	0	70	2
Crustacea-Isopoda	Caecidotea sp.	0	0	0	0	0	0	0	0
Crustacea-Ostracoda	Ostracoda	0	0	0	0	0	0	0	0
Acari	Acari	0	0	0	0	0	0	0	0
Acari	Arrenurus sp.	0	0	0	0	1	0	0	0
Acari	Forelia sp.	0	0	0	0	0	0	0	0
Acari	Hydrodroma sp.	0	0	0	0	0	1	0	0
Acari	Koenikea sp.	0	0	1	0	0	4	1	6
Acari	Krendowskia sp.	0	0	0	0	0	0	0	0
Acari	Lebertia sp.	0	0	0	0	0	0	0	0
Acari	Limnesia sp.	0	0	7	2	2	1	1	4
Acari	Mideopsis sp.	0	0	0	0	0	0	0	0
Acari	Neumania sp.	0	0	0	0	1	5	1	1
Acari	Oxus sp.	0	0	0	0	0	0	0	0
Acari	Piona sp.	0	0	0	0	0	0	0	0
Acari	Pionidae	0	0	0	0	0	0	1	0
Acari	Unionicola sp.	0	0	1	0	0	0	1	0
Turbellaria	Turbellaria	0	0	0	0	0	0	1	1
Cnidaria	Hydra sp.	0	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	0	0	0	1	0	0	3
	TOTAL	**21**	**32**	**73**	**21**	**88**	**224**	**233**	**205**

EcoAnalysts, Inc.
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Moscow, Idaho 83843 U.S.A.
(208) 882 - 2588

Taxonomy ID QC Percent Similarity

URS Corporation
6468: URS NJ Lake Benthos 2013

Report Count: 21

6468.1-12

Comparison Date: 10/31/2013 09:56:14

Component: Chironomidae

Sample ID	Time
PLSA-C1-11-C	

		Original Taxonomist - Charles Watson					QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
											Difference =	
											Percent Similarity =	N/A

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Taxonomy ID QC Percent Similarity

6468.1-12

Comparison Date: 10/31/2013 11:43:02

Component: General

Sample ID	Time
PLSA-C1-11-C	

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
1201	Chaoborus		39	38	1	0	39	38	1	0		0
3132	Limnesia		1	1	0	0	1	1	0	0		0
			40				40				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-12
Comparison Date: 11/01/2013 10:05:15
Component: Oligochaete

Sample ID **Time**
PLSA-C1-11-C

		Original Taxonomist - G4 Wallace					QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
13	Aulodrilus pigueti		1	1	0	0	1	1	0	0		0
21	Limnodrilus hoffmeisteri		9	9	0	0	9	9	0	0		0
			10				10				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-27

Comparison Date: 10/31/2013 01:47:49

Component: Chironomidae

Sample ID	Time
PLSA-C1-20-C	10:15

		Original Taxonomist - Charles Watson					QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
931	Cladopelma	pupa partial	7	6	1	0	7	6	1	0		0
934	Cryptochironomus		2	2	0	0	2	2	0	0		0
942	Dicrotendipes modestus	1 small	3	2	1	0	3	2	1	0		0
4037	Dicrotendipes tritomus	2 small agg.	5	5	0	0	5	5	0	0		0
3294	Einfeldia natchitocheae		1	1	0	0	1	1	0	0		0
1015	Paratanytarsus		1	1	0	0	1	1	0	0		0
3748	Polypedilum bergi		1	1	0	0	1	1	0	0		0
3320	Polypedilum halterale gr.		1	1	0	0	1	1	0	0		0
799	Procladius		5	5	0	0	5	5	0	0		0
989	Pseudochironomus		1	1	0	0	1	1	0	0		0
1029	Tanytarsus		2	2	0	0	2	2	0	0		0
			29				29				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-27

Comparison Date: 10/31/2013 02:08:21

Component: General

Sample ID	**Time**
PLSA-C1-20-C	10:15

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
81	Amnicola		18	18	0	0	16	16	0	0		2
3034	Bezzia/Palpomyia		2	2	0	0	2	2	0	0		0
115	Caecidotea		2	2	0	0	2	2	0	0		0
153	Caenis		1	1	0	0	1	1	0	0		0
271	Coenagrionidae		2	2	0	0	2	2	0	0		0
118	Gammarus		22	22	0	0	21	21	0	0		1
70	Glossiphoniidae		1	1	0	0	1	1	0	0		0
74	Helobdella stagnalis		6	6	0	0	7	7	0	0		-1
1157	Hyalella		121	121	0	0	115	115	0	0		6
3132	Limnesia		1	1	0	0	3	3	0	0		-2
579	Orthotrichia		5	5	0	0	5	3	2	0		0
93	Physa		4	4	0	0	4	4	0	0		0
3100	Pionidae		2	2	0	0	1	1	0	0		1
103	Pisidium		6	6	0	0	4	4	0	0		2
95	Planorbidae		1	1	0	0	1	1	0	0		0
2	Turbellaria		2	2	0	0	2	2	0	0		0
3836	Valvata bicarinata		13	13	0	0	13	13	0	0		0
1167	Valvata tricarinata		4	4	0	0	4	4	0	0		0
			213				204				Difference =	9
											Percent Similarity =	97.62

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Taxonomy ID QC Percent Similarity

6468.1-27

Comparison Date: 11/01/2013 10:04:17

Component: Oligochaete

Sample ID	**Time**
PLSA-C1-20-C	10:15

			Original Taxonomist - G4 Wallace				QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
12	Aulodrilus limnobius		2	2	0	0	2	2	0	0		0
13	Aulodrilus pigueti		1	1	0	0	1	1	0	0		0
1161	Quistadrilus multisetosus		2	2	0	0	2	2	0	0		0
1348	Tubificidae w/o cap setae		2	2	0	0	2	2	0	0		0
			7				7				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-28 Comparison Date: 10/31/2013 10:59:54

Component: Chironomidae

Sample ID	Time
PLSA-C1-22-A	12:30

		Original Taxonomist - Charles Watson					QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
931	Cladopelma	1 short pick aDDED	5	5	0	0	5	5	0	0		0
934	Cryptochironomus		6	6	0	0	6	6	0	0		0
938	Cryptotendipes		1	1	0	0	1	1	0	0		0
944	Dicrotendipes	distinct	2	2	0	0	3	3	0	0		-1
942	Dicrotendipes modestus		3	3	0	0	2	2	0	0		1
3294	Einfeldia natchitocheae	3 SHORT PICKS ADDED	54	54	0	0	54	54	0	0		0
878	Nanocladius		2	2	0	0	2	2	0	0		0
964	Parachironomus		3	3	0	0	3	3	0	0		0
1015	Paratanytarsus		2	2	0	0	4	4	0	0		-2
799	Procladius		4	4	0	0	4	4	0	0		0
1029	Tanytarsus	1 short pick added	46	46	0	0	42	42	0	0		4
3815	Zavreliella marmorata	short pick	1	1	0	0	1	1	0	0		0
			129				127				Difference =	2
											Percent Similarity =	96.66

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Taxonomy ID QC Percent Similarity

6468.1-28

Comparison Date: 10/31/2013 01:20:29

Component: General

Sample ID	Time
PLSA-C1-22-A	12:30

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
81	Amnicola		7	7	0	0	7	7	0	0		0
3034	Bezzia/Palpomyia		1	1	0	0	1	1	0	0		0
118	Gammarus		3	3	0	0	4	4	0	0		-1
74	Helobdella stagnalis		4	4	0	0	4	4	0	0		0
1157	Hyalella		2	2	0	0	1	1	0	0		1
67	Nematoda		8	8	0	0	8	8	0	0		0
579	Orthotrichia		1	1	0	0	1	1	0	0		0
121	Ostracoda		2	2	0	0	1	1	0	0		1
580	Oxyethira		2	2	0	0	2	2	0	0		0
1974	Sphaeromias		1	1	0	0	1	1	0	0		0
2	Turbellaria		4	4	0	0	4	4	0	0		0
1167	Valvata tricarinata		1	1	0	0	1	1	0	0		0
			36				35				Difference =	1
											Percent Similarity =	94.60

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6468: URS NJ Lake Benthos 2013

Report Count: 21

6468.1-28

Comparison Date: 10/31/2013 05:34:57

Component: Oligochaete

Sample ID	**Time**
PLSA-C1-22-A	12:30

			Original Taxonomist - G4 Wallace				QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
12	Aulodrilus limnobius		2	2	0	0	2	2	0	0		0
13	Aulodrilus pigueti		10	10	0	0	12	12	0	0		-2
36	Dero digitata		3	3	0	0	4	4	0	0		-1
1161	Quistadrilus multisetosus		17	17	0	0	17	17	0	0		0
64	Stylaria lacustris		2	2	0	0	2	2	0	0		0
1029	Tanytarsus		1	1	0	0	1	1	0	0		0
			35				38				Difference =	-3
											Percent Similarity =	95.04

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Taxonomy ID QC Percent Similarity

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6468: URS NJ Lake Benthos 2013

Report Count: 21

6468.1-35 Comparison Date: 10/31/2013 11:07:53

Component: Chironomidae

Sample ID	Time
PLSA-C1-25-B	8:30

		Original Taxonomist - Charles Watson					QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
3294	Einfeldia natchitocheae		1	1	0	0	1	1	0	0		0
799	Procladius		2	2	0	0	2	2	0	0		0
			3				3				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-35

Comparison Date: 10/31/2013 01:31:35

Component: General

Sample ID	Time
PLSA-C1-25-B	8:30

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
81	Amnicola		20	20	0	0	20	20	0	0		0
115	Caecidotea		4	4	0	0	4	4	0	0		0
118	Gammarus		40	40	0	0	41	41	0	0		-1
74	Helobdella stagnalis		25	25	0	0	25	25	0	0		0
1157	Hyalella		6	6	0	0	4	4	0	0		2
93	Physa		2	2	0	0	2	2	0	0		0
103	Pisidium		19	19	0	0	19	19	0	0		0
2	Turbellaria		5	5	0	0	6	6	0	0		-1
3836	Valvata bicarinata		19	19	0	0	19	19	0	0		0
1167	Valvata tricarinata		40	40	0	0	40	40	0	0		0
			180				180				Difference =	0
											Percent Similarity =	98.89

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Taxonomy ID QC Percent Similarity

6468.1-35

Comparison Date: 10/31/2013 04:04:28

Component: Oligochaete

Sample ID	Time
PLSA-C1-25-B	8:30

			Original Taxonomist - G4 Wallace				QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
12	Aulodrilus limnobius		2	2	0	0	2	2	0	0		0
13	Aulodrilus pigueti		1	1	0	0	1	1	0	0		0
1047	Hirudinida		1	1	0	0	1	1	0	0		0
21	Limnodrilus hoffmeisteri		3	3	0	0	3	3	0	0		0
1161	Quistadrilus multisetosus		14	14	0	0	11	11	0	0		3
64	Stylaria lacustris		1	1	0	0	1	1	0	0		0
			22				19				Difference =	3
											Percent Similarity =	94.26

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Taxonomy ID QC Percent Similarity

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6468: URS NJ Lake Benthos 2013

Report Count: 21

6468.1-45

Comparison Date: 10/31/2013 12:02:52

Component: Chironomidae

Sample ID	Time
PLSA-C1-33-C	

			Original Taxonomist - Charles Watson				QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
931	Cladopelma		6	6	0	0	6	6	0	0		0
853	Cricotopus		1	1	0	0	1	1	0	0		0
938	Cryptotendipes		1	1	0	0	1	1	0	0		0
942	Dicrotendipes modestus		1	1	0	0	1	1	0	0		0
4037	Dicrotendipes tritomus	6 small/teneral larvae & 1 partial pupa agg	33	31	2	0	33	31	2	0		0
878	Nanocladius		10	9	1	0	10	9	1	0		0
1015	Paratanytarsus		64	59	5	0	66	61	5	0		-2
3748	Polypedilum bergi		1	1	0	0	1	1	0	0		0
799	Procladius		1	1	0	0	5	5	0	0		-4
989	Pseudochironomus		2	1	1	0	2	1	1	0		0
802	Tanypus		12	12	0	0	8	8	0	0		4
1029	Tanytarsus		6	5	1	0	6	5	1	0		0
			138				140				Difference =	-2
											Percent Similarity =	96.39

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Taxonomy ID QC Percent Similarity

6468.1-45

Comparison Date: 10/31/2013 01:54:24

Component: General

Sample ID	Time
PLSA-C1-33-C	

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
81	Amnicola		3	3	0	0	4	4	0	0		-1
3080	Arrenurus		1	1	0	0	1	1	0	0		0
153	Caenis		1	1	0	0	1	1	0	0		0
271	Coenagrionidae		1	1	0	0	1	1	0	0		0
118	Gammarus		2	2	0	0	2	2	0	0		0
96	Gyraulus		8	8	0	0	7	7	0	0		1
2382	Helobdella		1	1	0	0	0	0	0	0		1
74	Helobdella stagnalis		1	1	0	0	2	2	0	0		-1
1157	Hyalella		8	8	0	0	6	6	0	0		2
3186	Hydrodroma		1	1	0	0	1	1	0	0		0
3132	Limnesia		4	4	0	0	4	4	0	0		0
579	Orthotrichia		1	1	0	0	1	1	0	0		0
121	Ostracoda		5	5	0	0	6	6	0	0		-1
93	Physa		14	14	0	0	13	13	0	0		1
103	Pisidium		8	8	0	0	8	8	0	0		0
2	Turbellaria		5	5	0	0	6	6	0	0		-1
3836	Valvata bicarinata		1	1	0	0	2	2	0	0		-1
			65				65				Difference =	0
											Percent Similarity =	92.31

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Taxonomy ID QC Percent Similarity

6468.1-45

Comparison Date: 10/31/2013 04:31:55

Component: Oligochaete

Sample ID **Time**

PLSA-C1-33-C

TIN	TAXON	NOTE	Original Taxonomist - G4 Wallace AB	L	P	A	QC Taxonomist - Charles Watson AB	L	P	A	NOTE	DIFF.
12	Aulodrilus limnobius		4	4	0	0	4	4	0	0		0
13	Aulodrilus pigueti		3	3	0	0	4	4	0	0		-1
36	Dero digitata		1	1	0	0	1	1	0	0		0
1161	Quistadrilus multisetosus		9	9	0	0	9	9	0	0		0
1348	Tubificidae w/o cap setae		2	2	0	0	2	2	0	0		0
			19				20				Difference =	-1
											Percent Similarity =	95.79

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Taxonomy ID QC Percent Similarity

6468.1-55

Comparison Date: 10/31/2013 12:04:54

Component: Chironomidae

Sample ID	Time
REF-C1-04-A	

		Original Taxonomist - Charles Watson					QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.

Difference =

Percent Similarity = N/A

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Taxonomy ID QC Percent Similarity

6468.1-55

Comparison Date: 10/31/2013 01:34:33

Component: General

Sample ID	**Time**
REF-C1-04-A	

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
2382	Helobdella		1	1	0	0	1	1	0	0		0
101	Sphaeriidae		1	1	0	0	1	1	0	0		0
			2				2				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

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6468: URS NJ Lake Benthos 2013

Report Count: 21

6468.1-55

Comparison Date: 10/31/2013 04:35:48

Component: Oligochaete

Sample ID	Time
REF-C1-04-A	

		Original Taxonomist - G4 Wallace					QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
1348	Tubificidae w/o cap setae		1	1	0	0	1	1	0	0		0
			1				1				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-61

Comparison Date: 10/31/2013 12:16:04

Component: Chironomidae

Sample ID	Time
PLSA-C1-39-A	

			Original Taxonomist - Charles Watson				QC Taxonomist - G4 Wallace					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
931	Cladopelma		3	3	0	0	3	3	0	0		0
934	Cryptochironomus		9	9	0	0	9	9	0	0		0
799	Procladius		3	3	0	0	3	3	0	0		0
1029	Tanytarsus		22	22	0	0	22	22	0	0		0
			37				37				Difference =	0
											Percent Similarity =	100.00

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Taxonomy ID QC Percent Similarity

6468.1-61

Comparison Date: 10/31/2013 01:43:48

Component: General

Sample ID **Time**

PLSA-C1-39-A

			Original Taxonomist - J4 Pfeiffer				QC Taxonomist - B4 LaVoie					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
1201	Chaoborus		6	6	0	0	6	6	0	0		0
2368	Corbicula		1	1	0	0	1	1	0	0		0
3223	Koenikea		1	1	0	0	1	1	0	0		0
3132	Limnesia		7	7	0	0	6	6	0	0		1
1974	Sphaeromias		2	2	0	0	2	2	0	0		0
3126	Unionicola		1	1	0	0	1	1	0	0		0
3836	Valvata bicarinata		1	1	0	0	1	1	0	0		0
			19				18				Difference =	1
											Percent Similarity =	96.49

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Taxonomy ID QC Percent Similarity

6468.1-61

Comparison Date: 10/31/2013 06:16:51

Component: Oligochaete

Sample ID	Time
PLSA-C1-39-A	

			Original Taxonomist - G4 Wallace				QC Taxonomist - Charles Watson					
TIN	TAXON	NOTE	AB	L	P	A	AB	L	P	A	NOTE	DIFF.
36	Dero digitata		1	1	0	0	1	1	0	0		0
21	Limnodrilus hoffmeisteri		16	16	0	0	16	16	0	0		0
			17				17				Difference =	0
											Percent Similarity =	100.00

Appendix B

DuPont Data Review

Appendix C

Wildlife Exposure Modeling Description

Wildlife Dietary Exposure Evaluation 2013 Pompton Lake Ecological Investigation DuPont Pompton Lakes Works

1.0 Introduction

Ecological investigations were conducted in 2013 to confirm or further refine the ecological conceptual site model (ECSM) for potential direct contact and bioaccumulation exposure pathways in Pompton Lake [Exponent and Academy of Natural Sciences (ANSP), 2003; DuPont Corporate Remediation Group (CRG), 2006]. The refined ECSM will be used to support remedial decision-making for mercury in sediments outside of the Acid Brook Delta (ABD) remedial action area, as defined in the Corrective Measures Implementation Work Plan (CMI WP; ARCADIS et al., 2011).

The framework for these investigations was provided in the *Pompton Lake Ecological Investigation Framework Document* (Framework Document; URS, 2013). The preliminary ECSM presented in the Framework Document identified complete exposure pathways for several wildlife receptor categories that may be exposed to mercury while foraging in Pompton Lake. Following discussions with the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (USFWS), and the New Jersey Department of Environmental Protection (NJDEP) during a July 16, 2013 meeting regarding the Framework Document, additional wildlife receptor categories were included in the ECSM. As a result of these discussions, the following wildlife receptor categories and representative species were identified in the ECSM for the evaluation of potential mercury exposure through dietary ingestion pathways.

Wildlife Receptor Category	Representative Wildlife Receptor Species								
	Great blue heron (*Ardea herodias*)	Belted kingfisher (*Megaceryle alcyon*)	Double-crested cormorant (*Phalacrocorax auritus*)	Mallard (*Anas platyrhynchos*)	Tree swallow (*Tachycineta bicolor*)	Carolina wren (*Thryothorus ludovicianus*)	Mink (*Mustela vison*)	River otter (*Lontra canadensis*)	Little brown bat (*Myotis lucifugus*)
Semi-aquatic piscivorous birds	●	●	●						
Semi-aquatic invertivorous/omnivorous birds				●					
Semi-aquatic aerial insectivorous birds					●				
Terrestrial invertivorous songbirds						●			
Semi-aquatic piscivorous mammals							●	●	
Aerial insectivorous mammals									●

This appendix presents the approach for evaluating dietary exposure to mercury for the above wildlife receptor categories. In this approach, dietary doses were estimated by modeling the dose obtained by representative receptor species through the direct ingestion of mercury in dietary items and drinking water, and for select receptors, through the incidental or indirect ingestion of sediment. The following sections present the study objectives, dietary exposure modeling approach, and the evaluation of wildlife toxicity based on dietary doses.

2.0 Objectives

The overall objective of this appendix is to provide a framework to evaluate dietary exposure to mercury for representative wildlife species identified in the ECSM. Specific tasks of this evaluation include the following:

- Estimate the doses of inorganic mercury (IHg[1]) and methylmercury (MeHg) obtained by representative avian and mammalian species via ingestion pathways using dietary exposure modeling; and
- Derive toxicity reference values (TRVs) for IHg and MeHg from available avian and mammalian toxicological data to evaluate potential wildlife toxicity based on comparisons with modeled doses.

In accordance with the EPA guidance for conducting probabilistic ecological risk assessment (EPA, 2001), a tiered approach consisting of the following models was used to quantitatively assess potential risks to representative wildlife receptors:

- Deterministic exposure modeling: Based on conventional single point estimates of exposure point concentrations (EPCs) and typical exposure parameters; and
- Probabilistic exposure modeling: If estimated doses based on deterministic modeling exceeded doses associated with no observable ecological effects, probabilistic models were developed to estimate exposure based on the distributions of EPCs and exposure parameters to account for the inherent variability and/or uncertainty in model parameters.

For the dietary modeling, the following exposure areas were evaluated (see Figure C-1):

- Pompton Lake Study Areas (PLSA): Areas within Pompton Lake east of the 2011 CMI WP removal limit extending upstream to the Lakeside Avenue Bridge and downstream to a safety buffer area upstream of the Pompton Lake Dam.
- Upstream Ramapo River/Potash Lake Reference Area (Reference Area): Upstream reference area on the Ramapo River extending from Lakeside Avenue Bridge upstream approximately 1.5 miles to Potash Lake.

[1] The concentration of inorganic mercury (IHg) is quantified as the difference between measurements of total mercury (THg) and methylmercury (MeHg) in site-specific samples.

3.0 Dietary Exposure Modeling

The objective of dietary exposure modeling for the PLSA was to estimate the doses of IHg and MeHg potentially obtained by each representative wildlife receptor in terms of the Daily Mercury Intake Rate (DMIR) and Average DMIR (ADMIR). These rates were based on the direct ingestion of mercury in dietary items and drinking water, and for selected receptors, the incidental or indirect ingestion of sediment. The following sections describe the structure and the primary parameters included in the dietary exposure models.

3.1 Model Structure

Dietary exposure estimates considered the typical dietary preference and composition for each receptor, in terms of representative dietary items at the site. The model incorporated site-specific measurements of IHg and MeHg in representative dietary items, drinking water (surface water), and sediment. The model also considered the spatial extents of dietary exposure as a function of the typical foraging range of the receptor. Area use factors (AUFs) were included in the model, as appropriate, to account for the proportion of the dietary exposure that a receptor was likely to experience from foraging within the PLSA relative to the total exposure experienced while foraging within its entire foraging area.

Based on these components, the DMIR for each receptor was estimated as follows:

$$DMIR = \frac{1}{BW}\sum_{i=1}^{N}\left(FIR_{ww} \times \sum_{j=1}^{M}\left(f_j \times C_j\right) + SIR \times C_{SD} + WIR \times C_{SW}\right)_i \times AUF_i \qquad (1)$$

where:

i	=	Number of exposure areas (e.g., PLSA and reference areas for those receptors that may forage outside of the PLSA based on overall foraging range)
j	=	Receptor-specific dietary items
BW	=	Receptor-specific body weight
FIR_{ww}	=	Receptor-specific daily food ingestion rate (wet weight)
f	=	Proportion of dietary item j to total dietary composition
C_j	=	IHg or MeHg concentration in dietary item j
SIR	=	Receptor-specific incidental sediment ingestion rate
C_{SD}	=	IHg or MeHg concentration in sediment
WIR	=	Receptor-specific daily drinking-water ingestion rate
C_{SW}	=	IHg or MeHg concentration in unfiltered surface water
AUF	=	Area use factor

The underlying algorithm in Equation (1) was the same for deterministic and probabilistic exposure models. However, deterministic estimates used single, discrete values for model parameters (i.e., representative of a typical or a worst case), whereas probabilistic estimates used a distribution of values for model parameters to account for the inherent variability and/or uncertainty in the estimation of those parameters.

Deterministic estimates of DMIR were calculated based on Equation (1) using the discrete parameter/variable values summarized in Table C-1 and discussed further in Section 3.2.

Procedures for calculating probabilistic exposure estimates were consistent with EPA (2001) guidance on probabilistic ecological risk assessments and EPA (1997) guidance on Monte Carlo analyses. As warranted based on the outcome of deterministic exposure estimates, Monte Carlo simulations were conducted using Crystal Ball ® v11.1.2 (Crystal Ball) to estimate DMIR and the ADMIR distributions for each receptor based on the following procedures:

- To estimate DMIR distribution for a receptor:
  1. Crystal Ball was used to randomly select a BW from its literature-derived distribution and calculate corresponding FIR, SIR, and WIR.
  2. f_i was selected based on dietary composition (see *Dietary Composition* in Section 3.2.1).
  3. C_i, C_{SD}, and C_{SW} were randomly selected from their corresponding distributions from site-specific concentrations measured during the 2013 Ecological Investigation.
  4. DMIR was calculated using Equation (1) above.
  5. Steps #1 to #4 were repeated a pre-set number of times to estimate the DMIR distribution; the number of iterations was pre-set at 10,000 based on convergence criteria provide in Sample et al. (1996a).
- To estimate ADMIR Distribution for a receptor:
  1. Crystal Ball Bootstrapping Method was used to randomly select N number of DMIR from the DMIR distribution above, where N = Number of days/year the receptor is exposed within Pompton Lake study areas.
  2. ADMIR, defined as the arithmetic mean of the selected DMIRs, was calculated.
  3. Steps #1 and #2 were repeated a pre-set number of times to estimate the ADMIR distribution; the number of iterations was pre-set at 10,000 based on convergence criteria provide in Sample et al. (1996a).

The following section presents the basis for model parameters used in deterministic and probabilistic dietary exposure modeling for Pompton Lake study areas.

3.2 Model Parameters

Dietary exposure models included parameters relating to receptor-specific exposure factors, EPCs, and AUFs. Exposure factors refer to receptor-specific variables (e.g., BW, FIR_{ww}, SIR, WIR, etc.), which are typically derived from literature sources. Exposure variables refer to site-specific measurements, namely mercury concentrations measured in exposure media. The following sections describe the estimation of these parameters and the major assumptions of model parameterization.

3.2.1 Receptor-Specific Exposure Factors

The primary data source of exposure factors for the wildlife receptor species used to represent the receptor categories identified in the ECSM (see Section 1.0) was the EPA *Wildlife Exposure Factors Handbook* ["the Handbook" (EPA, 1993)]. Additional receptor-specific literature sources were also used to supplement exposure data compiled in the Handbook. Approaches to estimate exposure factors for the wildlife receptor categories are summarized in Table C-1 and are briefly discussed below.

Deterministic exposure modeling used exposure factors that are representative of typical or average (e.g., mean parameter) exposure conditions. Probabilistic exposure modeling evaluated a range of potential exposure factors to capture the individual- and population-level variation in exposure factors that are likely to occur within the PLSA. Specific values of exposure factors used in the deterministic and the range of exposure factors used in probabilistic exposure models are presented in Tables C-2a and C-2b, respectively. Appendix C-1 provides the basis for exposure factors identified for each receptor included in the evaluation.

Body Weight (BW, g wet weight)

In deterministic exposure models, representative body weights were estimated as arithmetic mean values of adult body weights (male and female) reported in the literature or midpoints of the range of body weights when arithmetic mean values were not available (see Tables C-1 and C-2a).

For probabilistic exposure estimates, distributions of potential body weights of adult receptors (males and females combined) were estimated using Crystal Ball based on the following:

- Available arithmetic mean (μ) and standard deviation (σ) of body weights reported in the literature were used for the selected receptors
- A normal distribution of potential body weights for each receptor was assumed
- Distributions of potential body weights were truncated to the range of body weights reported in the literature to avoid unrealistic estimates of receptor body weight (i.e., the distribution of potential body weights does not include values that were greater than or less than the range of body weights reported in the literature).

Food Ingestion Rate (FIR, g ww/day)

Food ingestion rate values FIR_{ww} were estimated based on receptor-specific BW values using appropriate empirical allometric (scaling) relationships developed by Nagy (2001). Potential distributions of FIR_{ww} values were not developed directly from literature-reported values for the following reasons:

- Literature-derived FIRs (primarily mean values) are insufficient to generate robust distributions.
- It is inappropriate to evaluate FIR_{ww} independent of BW; if BW and FIR_{ww} are independent in a probabilistic simulation, a receptor at the lower end of the BW

distribution may be unrealistically paired with a FIR_{ww} value at the higher end of the FIR_{ww} distribution.

Nagy (2001) derived allometric relationships for various avian and mammalian feeding groups based on taxon, habitat, and diet. For each of the wildlife receptors, evaluated in dietary exposure models for the PLSA, the most appropriate allometric equation from Nagy (2001) based on fresh (wet) weight was used to estimate FIR_{ww} using the following relationship to BW:

$$FIR_{ww} = a \times BW^b \quad (2)$$

where,

FIR_{ww} = Wet weight (or fresh weight) food ingestion rate (g ww/d)

BW = Receptor-specific body weight (g)

a and b = Parameters whose values are specific to an allometric equation (see Tables C-2a and C-2b)

In deterministic exposure models, the receptor-specific FIR_{ww} estimated from the appropriate allometric relationship derived from Nagy (2001) was used in the point estimate calculation of the DMIR. For probabilistic exposure models, a distribution of FIRs was developed based on allometric relationships using the randomly selected body weights from the body weight distribution described in the preceding section. The resulting distribution of FIRs is representative of the range of feeding rates that may be observed within a given receptor population as a function of the potential range of body weights of individuals within the population.

Sediment Ingestion Rate (SIR, g dw/day)

Exposure models account for the dietary intake of sediment that may be ingested incidentally as a result of the feeding behavior of select receptors or indirectly through the ingestion of prey. Sediment ingestion was estimated as a percentage of dry food intake for the following receptors based on feeding behaviors (see Table C-1):

- Great blue heron: Great blue heron are predominantly piscivorous that forage primarily in shallow waters, capturing fish by stabbing with their beaks. In addition to fish, heron may also capture other prey in shallow waters, including crustaceans (e.g., crayfish) and amphibians. Although sediment ingestion by piscivores is typically considered to be negligible (Sample and Suter, 1994), the exposure models assumed that sediment ingestion represents two percent of dry food intake for great blue heron to account for potential incidental ingestion resulting from foraging on fish, crayfish, or amphibians while wading in shallow waters. An estimated sediment ingestion rate of two percent is consistent with other assessments of dietary ingestion by great blue heron (TAMS Consultants and Menzie-Cura & Associates, 2000).
- Belted kingfisher: Receptor-specific data regarding incidental sediment ingestion in belted kingfisher were not identified. Belted kingfishers are predominantly piscivores that dive into the water to capture fish near the surface. In addition to fish, belted kingfisher may also consume crayfish and amphibians as part of their diet. While negligible sediment ingestion is likely associated with capturing fish

within the water column, the exposure models assumed that incidental sediment ingestion represents one percent of dry food intake as a result of foraging on crayfish and amphibians.

- Mallard: Mallard are omnivorous waterfowl that may have a large component of benthic invertebrates in their diets during certain times of the year. Mallard may incidentally ingest sediment while foraging for benthic invertebrates in sediment. The exposure models estimated that incidental sediment ingestion represents 3.3 percent of dry food intake based on species-specific estimates from Beyer et al. (1994).
- Mink and river otter: Receptor-specific data regarding incidental sediment ingestion in piscivorous mammals were not identified. Mink and river otter diets consist primarily of fish; however, both receptors may be opportunistic and forage on other available food sources including amphibians and crustaceans (e.g., crayfish). While the incidental ingestion of sediment is typically considered to be negligible for piscivores (Sample and Suter, 1994), the exposure models assumed that incidental sediment ingestion represents one percent of dry food intake for mink and river otter as a result of foraging on amphibians and crayfish.

In the exposure models, the receptor-specific SIR was estimated based on the assumed percentage of dry food intake as incidental sediment ingestion and the appropriate allometric relationship for dry food ingestion rates (FIR_{dw}) derived by Nagy (2001). SIRs were expressed as a proportion of the dry food ingestion rate, as follows:

$$SIR = FIR_{dw} \times \left(\frac{Ps}{100}\right)$$

$$SIR = a \times BW^{b} \times \left(\frac{Ps}{100}\right) \quad (3)$$

where,

SIR = Sediment ingestion rate (g dw/d)

FIR_{dw} = Dry weight food ingestion rate (g dw/d)

BW = Receptor-specific body weight (g)

a and b = Parameters whose values are specific to an allometric equation

P_s = Percentage of dry food intake ingested as sediment

FIR_{dw} values were obtained from Nagy (2001) using dry weight intake equations that correspond to the fresh weight FIR_{ww} equations described in the preceding section. For the deterministic exposure model, the receptor-specific SIR was estimated as a single point estimate based on the appropriate dry weight allometric relationship derived by Nagy (2001) and the assumed percentage of dry food intake as incidental sediment ingestion.

For the probabilistic exposure model, a distribution of potential SIRs was developed for each receptor. The distribution of SIRs was developed based on the randomly selected body weights used to develop the distribution of FIR_{ww}, as described in the preceding section. For each randomly selected body weight, a corresponding SIR was calculated using the dry weight FIR_{dw} from Nagy (2001) and the assumed percentage of dry food intake as incidental sediment ingestion. The estimated SIRs calculated for each randomly selected body weight forms a receptor-specific distribution of SIRs. This distribution is representative of the range of rates that may be observed within a given receptor population as a function of the potential range of body weights and corresponding food ingestion rates of individuals within the population.

The feeding behaviors of representative species from the remaining receptor categories are expected to result in negligible incidental sediment ingestion (SIR = 0). The basis for the assumptions of negligible sediment ingestion for other receptors is presented below by feeding behavior:

- Pelagic piscivores: Double crested cormorant forage primarily on fish in the water column that are captured by diving from the surface. Because fish are captured from within the water column, there is negligible contact with sediments that would result in incidental ingestion. Any potential sediment that may be ingested indirectly from the gut tract of fish would be included in the mercury concentrations reported from whole body analyses of non-depurated fish tissue samples.
- Aerial insectivores: Tree swallow and little brown bat forage almost exclusively on flying insects captured during flight. As a result of this feeding behavior, there is no complete pathway with sediments; therefore, incidental sediment ingestion for these representative aerial insectivores is assumed to be negligible.
- Terrestrial invertivorous songbirds: Receptor-specific data regarding incidental sediment ingestion in Carolina wren were not identified. However, Mayoh and Zach (1986) reported negligible soil ingestion (< 0.1 percent dry food intake) in house wren (*Troglodytes aedon*), an invertivorous songbird with a similar diet to Carolina wren. Any potential ingestion of substrate by Carolina wren would not be associated with sediment particles because there is no complete pathway to subaqueous sediments.

Drinking-Water Ingestion Rate (WIR, L/day)

Drinking-water ingestion rates (WIRs) were also derived based on an allometric relationship to body weight. For birds, Calder and Braun (1983) developed an equation for drinking-water ingestion based on a dataset representing 21 bird species with a body weights ranging from 0.011 to 3.15 kg, which encompasses the range of avian body weights included in the exposure modeling for Pompton Lake study areas. WIRs for avian receptors were estimated based on body weight as follows:

$$WIR_{avian} = 0.059 \times BW^{0.67} (4)$$

where,

WIR_{avian} = Avian drinking water ingestion rate (L/d)

BW = Receptor-specific body weight (kg)

Drinking-water ingestion rates for mammalian receptors ($WIR_{mammalian}$) were also estimated based on an allometric relationship to body weight using a parallel equation from Calder and Braun (1983):

$$WIR_{mammalian} = 0.099 \times BW^{0.90} \quad (5)$$

where,

$WIR_{mammalian}$ = Mammalian drinking-water ingestion rate (L/d)

BW = Receptor body weight (kg)

Similar to other rates based on allometric relationships (e.g., FIR_{ww} and SIR), estimates of WIR in deterministic exposure models were based on arithmetic mean values of adult body weights (male and female) reported in the literature or midpoints of the range of body weights when arithmetic mean values were not available (see Tables C-1 and C-2a). For probabilistic exposure models, WIRs were calculated for the randomly selected body weights used to develop the receptor-specific distributions of body weight, FIR_{ww}, and SIR. The estimated WIRs calculated for each randomly selected body weight form a receptor-specific distribution of WIRs that is representative of the range of rates that may be observed within a given receptor population as a function of the potential range of body weights of individuals within the population.

Area Use Factor (AUF, fraction)

In the dietary exposure models, the AUF reflects the proportion of the dose that a receptor may obtain as a result of foraging activities within the study area (e.g., PLSA) relative to foraging within the typical home range of the receptor. The AUF is simply the ratio of the size of the study area to the receptor home range or territory size. Species with very relatively small home ranges (e.g., little brown bat or Carolina wren) may forage entirely within the study area. However, for species with larger home ranges (e.g., the double-crested cormorant), the majority of the diet of a receptor may come from outside of the study area.

Available literature use various metrics to represent the size of the area used by a receptor: feeding or foraging radius, feeding or foraging distance, and home range or territory size, etc. In most cases, the size of the area used by a receptor for foraging and feeding is reported in hectares or acres and is referred to as the home range or territory. For initial exposure modeling, AUFs were assigned a value of 1 (i.e., 100 percent foraging within the study area) and adjusted subsequently, if necessary, based on the corresponding sizes of the receptor-specific home range and the exposure area.

Dietary Preference/Composition

Dietary models were developed to evaluate exposure to various trophic categories of wildlife based on typical feeding behaviors. Receptors select dietary items based on species-specific foraging strategies and behaviors, which are also influenced by the availability and abundance of dietary items within an exposure area. Because it is impractical to sample each possible dietary item within an exposure area, only representative dietary items were sampled during the 2013 Ecological Investigation. Dietary items were selected for sampling based on their dietary significance at the site and also to represent different trophic positions of prey items. The *Framework Document* included SOWs for THg and MeHg analyses in tissue samples from the PLSA to provide site-specific data to support quantitative modeling of dietary exposures. Site-specific dietary items sampled during the 2013 Ecological Investigation and representative wildlife receptors are summarized below.

2013 Pompton Lake Ecological Investigation Scope of Work	**Representative Wildlife Receptor**								
	Great blue heron	**Belted kingfisher**	**Double-crested cormorant**	**Mallard**	**Tree swallow**	**Carolina wren**	**Mink**	**River otter**	**Little brown bat**
Invertivorous Songbird Pathway Evaluation (SOW #3)									
Spiders (Family: Tetragnathidae and Lycosidae)					●	●			
Amphibian Tissue Evaluation (SOW #5)									
American bullfrog (*Rana catesbeiana*)	●	●					●	●	
Fish Tissue Evaluation (SOW #6)									
Small fish (< 130 mm total length [TL])	●	●	●	●			●	●	
Large fish (> 130 mm TL)	●		●					●	
Invertebrate Tissue Evaluation (SOW #8)									
Larval insects (Chironomidae)				●					
Adult insects (Chironomidae)					●	●			●
Crayfish	●	●		●			●	●	

The relative composition of prey items in the diets of select wildlife receptors were estimated based on dietary studies obtained from the literature and summarized in the Handbook and other compilations [U.S. Army Center for Health Promotion & Preventative Medicine (USACHPPM), 2004; Sample and Suter, 1994]. Literature data were evaluated for dietary composition in the context of exposure conditions in Pompton Lake study areas. For example, the dietary composition of the omnivorous mallard duck was conservatively assumed to include exclusively animal tissue, which is typical of the shift that occurs from a largely herbivorous diet in winter to a high protein of mainly animal tissue during spring molt and spring/summer egg production (Swanson and Meyer, 1973; Swanson et al., 1979; Swanson et al., 1985; Heitmeyer, 1988). This dietary composition for mallard likely represents the most sensitive dietary exposure to mercury during a likely period of high foraging activity within the PLSA.

The estimation of dietary composition also considered receptor-specific prey size preferences for piscivores. As specified in the *Fish Tissue Evaluation SOW* #6, fish tissue samples were collected from two size classes based on prey selection characteristics of piscivores: samples less than 130 millimeters (mm) total length (TL) and samples greater than 130 mm TL. Samples from smaller fish were used to estimate the dietary dose to belted kingfisher and mink, which typically forage on fish that are generally less than 130 mm TL (Alexander, 1977; Hamilton, 1940; and Gilbert and Nancekivell, 1982). Samples of fish from both size classes were used to estimate the dietary exposures to other piscivorous receptors that may consume a broader range of size classes. However, no fish greater than 350 mm TL were included in dietary exposure modeling due to the limited ability of piscivores to capture and consume fish larger than 350 mm TL.

Estimates of dietary composition in deterministic exposure models were simplified initially to represent the predominant dietary items and/or more conservative exposure scenarios based on literature. For example, belted kingfisher was assumed to consume 90% < 130 mm size class fish (i.e., 90 percent of its diet consists of fish < 130 mm) and 5% each of crayfish and bullfrogs. Table C-2a presents the relative composition of dietary items used as inputs to deterministic exposure models.

Probabilistic exposure estimates considered the probability of a receptor selecting and ingesting a certain dietary item during foraging. EPA (2003) developed an algorithm to construct a unique and randomly selected diet for receptors based on a dietary matrix. A similar approach was used to account for the potential variability in daily diet in the probabilistic exposure models. Briefly, the approach estimated dietary composition based on the following procedure:

- Assign a receptor-specific range of potential dietary compositions (minimum and maximum preference in percent) for each dietary item based on literature-reported values of dietary composition/preference.
- Rank the representative dietary items first in order of minimum preference and then in order of maximum preference.
- For each simulation (i.e., a day), use Crystal Ball to randomly select a dietary composition value between the minimum and maximum (to the nearest one percent) – starting with the most consumed item and ending with the least consumed item based on the rank order. Repeat the process iteratively until the sum of the relative compositions of each dietary item equals 100 percent. Note that the proposed rank ordering approach ensures that dietary items with minimum relative composition > 0 percent are selected.

A hypothetical example of rank orders and a dietary composition “realized” for a day are shown below.

Dietary Item	Dietary Composition Range	Rank Order	Modeled Dietary Composition
A	70-85%	1	75%
B	5-10%	2	5%
C	1-5%	3	2%
D	0-25%	4	10%
E	0-15%	5	8%

Potential ranges of the relative composition of each dietary item sampled during the 2013 Ecological Investigation were estimated for each receptor based on a review of the available literature for each receptor. Because sampling all possible dietary items reported in the literature was impractical, professional judgment was used to estimate the range of the relative compositions of the major dietary components for which site-specific THg and MeHg concentration data were available. Table C-2b presents the potential ranges of the relative compositions of dietary items in the total diets of selected receptors evaluated in probabilistic exposure models; receptor-specific information obtained from the literature to support the estimation of dietary composition is summarized in Appendix A-1.

3.2.2 Exposure Variables

Exposure variables represent the concentrations of mercury (i.e., EPCs) to which wildlife receptors may be exposed through dietary ingestion pathways. As discussed in the previous section, the 2013 Ecological Investigation included site-specific analyses of THg and MeHg in biotic exposure media that may be consumed by wildlife receptors. In addition to mercury analyses in biotic exposure media, THg and MeHg concentrations were characterized in sediment and surface water within the Pompton Lake study areas. These biotic and abiotic datasets collected during the 2013 Ecological Investigation provided the basis for estimating mercury exposure in the dietary models. The following sections describe the estimation of exposure variables for the deterministic and probabilistic exposure models developed for the Pompton Lake study areas.

Deterministic Exposure Models

Deterministic exposure models calculated a point estimate of dietary exposure based on a single EPC for each relevant exposure medium for a given receptor. EPCs used in deterministic models were primarily calculated as a concentration representing the upper confidence limit of the mean concentration (UCL_{mean}) of THg and MeHg measured in the biotic and abiotic components of the receptor diet, as described above. Calculations of UCL_{mean} were conducted using EPA ProUCL 5.0 software (ProUCL). ProUCL recommendations for the appropriate estimate of the UCL_{mean} concentration, based on the underlying distributions of the datasets, were generally selected as EPCs for dose rate models; however, UCL_{mean} values calculated based on Land's H-Statistic were not used as representative EPCs due to the uncertainties associated with this method in estimating the UCL_{mean} (EPA, 2013). In cases where there were less than eight samples, point estimates based on the maximum concentration were used because there were an insufficient number of observations to estimate UCL_{mean} concentrations[2]. In cases where the recommended UCL_{mean} exceeded the maximum concentration, an alternative approach provided in the ProUCL output for estimating the UCL_{mean} concentration was used (e.g., Chebyshev methods) to represent the EPC.

Probabilistic Exposure Models

For probabilistic estimates, wildlife exposures were evaluated based on the distribution of possible exposure concentrations, in contrast to the single EPCs described above for deterministic models. Distributions of potential exposure concentrations were developed in Crystal Ball based on site-specific measurements of THg and MeHg concentrations in

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[2] It is important to note that point estimates bases on the maximum detected concentration were only used in a limited number of datasets within the reference area.

abiotic (e.g., sediment and surface water) and biotic (e.g., biological tissues) exposure media collected during the 2013 Ecological Investigation. These distributions represent the range of potential exposure concentrations that may be experienced by a given receptor foraging in PLSA study areas. The distributions were truncated, as necessary, to exclude exposure concentrations that are not realistic (e.g., negative or extremely high concentrations). Potential truncation of the exposure distributions was based on representative upper and lower tolerance limits of the measured concentrations in the site-specific data set.

4.0 Toxicity Reference Values

Toxicity reference values were derived to evaluate the potential for adverse ecological effects associated with the dietary doses (e.g., DMIR and ADMIR) estimated using the approach described in the preceding sections. Reference doses to evaluate potential effects were derived from the following sources:

- Literature-derived TRVs: An evaluation of mercury toxicity to avian and mammalian wildlife was conducted to identify TRVs for comparisons with the DMIR and ADMIR doses calculated for IHg and MeHg. TRVs were derived from the review of toxicity studies from the literature as no observed adverse effects levels (NOAELs) or lowest observed adverse effects levels (LOAELs). Selections of the appropriate TRVs to evaluate potential risks due to mercury at the site were based on their direct relevance to the assessment endpoints for the maintenance and sustainability of wildlife populations (survival, growth, and reproduction). These assessment endpoints were selected for the protection of local populations and communities of representative ecological receptors, consistent with the objectives of EPA (1997) and EPA *Principles for Ecological Risk Assessment and Risk Management* (EPA, 1999). As such observations of physiological (e.g., immunotoxicity, endocrine effects), behavioral, or other sublethal endpoints were not included in the derivation of TRVs because their dose-dependence and population-level implications are unclear.
- Reference area doses: Daily doses estimated based on site-specific measurements of mercury in dietary items from the upstream reference areas were also considered in the evaluation of potential site-related ecological effects. Mercury is a global contaminant, with regional impacts in the northeastern United States (Driscoll et al., 2007); the bioaccumulation of mercury in aquatic ecosystems has resulted in a state-wide fish consumption advisory in New Jersey and over a dozen other states [U.S. Geological Survey (USGS), 2000]. Due to the regional impact of mercury on aquatic systems, it was necessary to quantify reference area doses to assess potential site-related exposures relative to exposure due to ambient conditions in northern New Jersey. In addition, for receptors with prey items having limited range, the reference area dose essentially represents a site-independent effect dose because exposure pathways are not complete between the site and reference area. The site-independent dose from the reference areas may be useful in evaluating the relevance of literature-derive TRVs with high uncertainty (due to limited toxicological data, inter-species extrapolation, etc.) in characterizing potential site-related risks to wildlife populations.

The following sections describe the derivation of literature-derived TRVs for comparisons to doses calculated for avian and mammalian wildlife receptors.

4.1 Avian Toxicity Reference Values

Avian sensitivity to MeHg differs between species (Heinz et al., 2009; Heinz et al., 2011). In a study evaluating the sensitivities of embryonic exposure to MeHg, Heinz et al. (2009) injected MeHg into the air cell of eggs of 26 species of birds. Embryo survival (median lethal concentration, LC_{50}) varied between species, indicating relative differences in the sensitivities of birds to MeHg exposure. Based on the relative sensitivities described by Heinz et al. (2009), existing literature studies for dietary exposures were evaluated to identify TRVs representative of the potential variation in MeHg sensitivities between receptors. In addition, literature studies for dietary MeHg exposure to small-bodied avian species (e.g., passerines) were evaluated separately in the derivation of TRVs, given the higher mass-specific metabolic rates and higher food requirements per unit mass of passerines relative to larger bodied birds included in most toxicological studies. Dietary TRVs were developed for the following categories of avian receptors:

- High sensitivity piscivores/waterfowl: Defined as receptors or related taxa with egg survival LC_{50} values lower than 0.25 mg/kg (Heinz et al., 2009). TRVs derived based on high sensitivity piscivores/waterfowl were compared to doses estimated for great blue heron and belted kingfisher. Great blue heron was included in the high sensitivity group based on its relation (Family: Ardeidae) to tricolored heron (*Egretta tricolor*), which was classified as high sensitivity in Heinz et al. (2009). Belted kingfisher were conservatively included in the high sensitivity category due to their relatively small size; however, belted kingfisher are likely moderately sensitive to mercury exposure.
- Low-moderate sensitivity[3] piscivores/waterfowl: Defined as receptors or related taxa with egg survival LC_{50} values greater than 0.25 mg/kg (Heinz et al., 2009). TRVs derived based on low sensitivity piscivores/waterfowl were compared to estimated doses for mallard and double crested cormorant. Heinz et al. (2009) reported that of the 26 species with eggs dosed with MeHg, only double crested cormorant were less sensitive than mallard (LC_{50} values of 2.42 and 1.79, respectively).
- Passerines: Defined as small-bodied receptors included in the avian order Passeriformes. TRVs derived based on studies evaluating mercury exposure to passerines were applied to tree swallow and Carolina wren.

Avian TRVs for mercury were selected using data from various controlled studies, as summarized in Table C-3. These derivations generally used the critical study approach (CSA), as used in other studies deriving TRVs for the evaluation of dietary dose models [Canadian Council of Ministers of the Environment (CCME), 1998; EPA, 1995a; EPA, 1995b; Sample and Suter, 1993; USACHPPM, 2004).

[3] Heinz et al. (2009) separated species with moderate sensitivity (LC_{50} values between 0.25 and 1.0 µg/g) and low sensitivity (LC_{50} values greater than 1.0 µg/g); for the purposes of the ecological investigation, dietary toxicity studies, including receptors or related taxa with moderate and low sensitivity, were evaluated as one category.

The CSA involves finding a technically defensible, definitive study (i.e., the critical study) in which a toxicity threshold is bracketed by experimental doses, expressed as a NOAEL or LOAEL (Blankenship et al., 2008; EPA, 2003). As appropriate, uncertainty factors (UFs) were then applied to the LOAEL or NOAEL from the critical study to derive generic or receptor-specific TRVs. The UFs may account for three potential sources of uncertainty:

- Differences in species sensitivity between the test species and the species to be protected,
- Sub-chronic to chronic extrapolations
- LOAEL-to-NOAEL extrapolations

UFs range between 1 and 10, based on available information and professional judgment (EPA, 1995b). In studies where only a LOAEL dose was reported, the LOAEL was divided by a LOAEL-to-NOAEL UF of 3.25 to estimate a NOAEL dose. The LOAEL-to-NOAEL UF was estimated based on the mean ratio of LOAEL to NOAEL doses reported for avian studies with survival, growth, and reproduction endpoints (see Table C-3; French et al., 2010; Heinz and Lock, 1976; Heinz et al., 2010; Scheuhammer, 1988). This UF is comparable to or more conservative than LOAEL-NOAEL UFs applied in the derivation of water quality criteria for the protection of wildlife, which ranged from 2 to 3 (EPA, 1995a; EPA, 1995b; EPA, 1997; NJDEP, 2001).

4.1.1 Methylmercury

As described above, TRVs for piscivores and waterfowl were selected based on the relative sensitivities of avian species to embryonic exposure to MeHg (Heinz et al., 2009). Potential effects associated with exposure to small-bodied passerine birds were evaluated independent of toxicity data for piscivores and waterfowl. The following sections detail the selection of TRVs for MeHg based on high and low sensitivity avian piscivores/waterfowl and passerine birds.

Piscivores/Waterfowl: High Sensitivity

Dietary studies evaluating survival, growth, and reproduction endpoints for species or related taxa with high sensitivity to MeHg were available for American kestrel (*Falco sparverius*) and great egret (*Ardea alba*). Albers et al. (2007) exposed one-year old breeding pairs of American kestrel to dietary methylmercuric chloride concentrations of 0.3, 0.7, 1.2, 1.7, and 2.2 mg MeHg/kg ww for 13 weeks (see Table C-3). The number of fledglings and percent of nestlings fledged were reduced in the 0.3 mg MeHg/kg ww treatment, and total fledgling failure was observed at 1.7 mg MeHg/kg ww in the diet. Based on the reproductive effects observed in the 0.3 mg MeHg/kg ww treatment, a LOAEL of 0.055 mg MeHg/kg bw-day was calculated for American kestrel reproduction assuming a body weight of 0.119 kg and a FIR of 0.022 kg ww/day (Zhang et. al., 2013). However, another study of American kestrel exposure to MeHg, did not find a reduction in clutch size in the treatment group fed an estimated dose of 0.085 mg MeHg/kg bw-day (French et al., 2010; see Table C-3).

Spalding et al. (2000) exposed nestlings of great egret, another highly sensitive species, to dietary methylmercuric chloride concentrations of 0.5 mg MeHg/kg ww and 5.0 mg

MeHg/kg ww for 12 weeks (see Table C-3). Appetite and resultant growth metrics were reduced in nestlings exposed to the 0.5 mg/kg ww treatment, which was estimated as a growth LOAEL of 0.091 mg/kg bw-day based on an assumed body weight of 1.0 kg for great egret nestlings and a FIR of 0.181 kg ww/day (Zhang et al., 2013).

In another dietary study with a similarly sensitive species, behavioral, physiological, and potential reproductive effects associated with dietary MeHg exposure were observed in captive white ibis (*Eudocimus albus*); however, there is uncertainty regarding the implications of these observed effects on wild bird populations. Frederick and Jayasena (2010) observed an increase in male-male pairing and modifications to key male courtship behaviors in captive white ibis nestlings-adults fed dietary methylmercuric chloride concentrations of 0.05, 0.1, and 0.3 mg MeHg/kg ww over three years. While the modified mating behavior was associated with a significant decrease in nestling production, the total numbers fledged per female did not differ statistically from the control even though some reduction in the total numbers fledged was observed (Frederick and Jayasena, 2010). In a related study, Jayasena et al., (2011) reported endocrine disruption in the form altered estradiol and testosterone concentrations in adult breeding kestrels of both sexes; however, the changes in hormone concentrations were not consistent over both years, and a clear-dose response relationship was not always present.

It is highly uncertain how the behavioral and physiological effects observed in the captive white ibis studies may be manifest in wild bird populations. In their study, Frederick and Jayasena (2010) indicated that male-male pairing was not observed in 134 breeding pairs of white ibis studied over four breeding seasons (greater than 15,000 pair-hours of observation) in a wild colony on Pumpkinseed Island located within Winyah Bay, South Carolina (Frederick, 1987). The wild colony observed in this study likely foraged in Winyah Bay and surrounding areas on dietary items containing concentrations equal to or greater than the 0.05 mg MeHg/kg effect concentration observed in the captivity studies (Frederick and Jayasena, 2010; Jayasena et al., 2011). Major tributaries to Winyah Bay[4] are subject to South Carolina Department of Health and Environmental Control (SCDHEC) fish consumption advisories for mercury, which are based on adult fish filet concentrations of 0.25 mg MeHg/kg (SCDHEC, 2013; Glover et al., 2010). Limited tissue data available for Winyah Bay obtained from the National Listing of Fish Advisories (NLFA) Fish Tissue Search[5] indicate that mercury concentrations in fish and crab samples, potential components of the white ibis diet, range from 0.09 to 0.25 mg THg/kg. These findings indicate that although dietary mercury concentrations in Winyah Bay were likely at least equivalent to or exceeded 0.05 mg MeHg/kg, male-male pairing and its potential reproductive effects were not observed over four breeding seasons in the wild colony of white ibis from Pumpkinseed Island. As a result of the uncertainty regarding the implications of the captivity study findings to wild bird populations, the dietary effects concentrations for mating behavior and potential reproductive success reported in Frederick and Jayasena (2010) were not considered in the selection of TRVs for piscivores and waterfowl with high sensitivity to MeHg.

[4] Major tributaries with fish consumption advisories for mercury include the Pocotaligo River, Black River, Black Mingo Creek, Lynches River, Pee Dee River, Little Pee Dee River, Lumber River, and Waccamaw River.
[5] Accessed on January 14, 2014 at: http://map1.epa.gov/FishTissue.aspx

Based on the review of dietary studies evaluating survival, growth, and reproduction endpoints for avian species with high sensitivity to MeHg (see Table C-3), the LOAEL of 0.055 mg MeHg/kg-day estimated based on the Albers et al. (2007) American kestrel study was used to evaluate MeHg exposure to piscivores and waterfowl with high sensitivity to MeHg. Applying the LOAEL-to-NOAEL UF of 3.25, a NOAEL of 0.017 mg MeHg/kg-day was estimated as the basis for a no observed adverse effect exposure to high sensitivity piscivores and waterfowl.

Piscivores/Waterfowl: Low-Moderate Sensitivity

Dietary studies evaluating survival, growth, and reproduction endpoints for species or related taxa with low-moderate sensitivity to MeHg, as classified by Heinz et al. (2009) were available for mallard, ring-necked pheasant (*Phasianus colchicus*), white leghorn chicken (*Gallus gallus*), common loon (*Gavia immer*), and Japanese quail (*Coturnix japonica*). Table C-3 presents a summary of the TRVs associated with dietary studies for birds with low-moderate sensitivity to MeHg; key studies are discussed in detail below.

Heinz (1974, 1976a, 1976b, and 1979) exposed mallard duck to MeHg dicyandiamide at dietary concentrations ranging from 0.5 to 3.0 mg MeHg/kg dw for two generations, with the third generation exposed to 0.5 mg MeHg/kg dw. No behavioral or reproductive effects were observed in the initial (P1) test birds. A 30 percent reduction in 1-week survival rates was observed in the first generation (F1) at 0.5 mg/kg dw; however, the second generation birds (F2) showed no effects at 0.5 mg MeHg/kg dw. Based on the 0.5 mg MeHg/kg dietary treatment, a LOAEL of 0.078 mg MeHg/kg BW-day was estimated based on a food ingestion rate (FIR) of 0.156 kg dw/kg BW/day for the P1 female.

LOAELs estimated from other dietary studies with taxa with low-moderate sensitivity to MeHg were greater than the LOAEL of 0.078 mg MeHg/kg BW-day derived from Heinz (1974, 1976a, 1976b, and 1979). As summarized in Table C-3, LOAEL doses estimated for survival, growth, and reproduction endpoints from other studies ranged from 0.093 to 0.75 mg MeHg/kg BW-day.

Based on the review of dietary studies evaluating survival, growth, and reproduction endpoints for avian species with low-moderate sensitivity to MeHg, the LOAEL of 0.078 mg MeHg/kg BW-day was estimated from studies by Heinz (1974, 1976a, 1976b, and 1979). The LOAEL is intended to be protective of avian receptor categories represented by mallard and double-crested cormorant, which are less sensitive to MeHg exposure based on Heinz et al. (2009). Applying the LOAEL-to-NOAEL UF of 3.25, a NOAEL of 0.024 mg MeHg/kg-day was estimated as the basis for a no observed adverse effect exposure to low-moderate sensitivity piscivores and waterfowl.

Passerine Birds

Available toxicity literature evaluating mercury exposure to passerine birds was reviewed independent of toxicity literature for piscivores and waterfowl. Taxa studied to evaluate mercury exposure to piscivores and waterfowl are relatively large bodied (e.g., mallard and loon) with lower mass-specific metabolic rates and lower mass-specific food ingestion rates in comparison with passerine birds (Bennett and Harvey, 1987). As a result, TRVs based on larger birds (and of different feeding guild) may not be sufficiently conservative for the protection of passerine species. To address the uncertainty in identifying adequately protective dietary TRVs for comparison with modeled doses for tree swallow and Carolina wren, studies specifically evaluating the toxicity to passerines were evaluated.

A review of avian toxicological literature identified only one laboratory dosing study evaluating the effects of mercury exposure on passerine birds. Scheuhammer (1988) reported no effects on a captive breeding colony of zebra finch (*Taeniopygia guttata*) exposed to chloromethylmercury in the diet for 76 days at a concentration of 0.5 mg MeHg/kg; however, behavioral signs of intoxication and increased mortality were observed in zebra finch exposed to 5.0 mg MeHg/kg for the same period. Based on these endpoints, Scheuhammer (1988) estimated a NOAEL dose of 0.88 mg MeHg/kg BW-day and a LOAEL dose of 1.75 mg MeHg/kg BW-day for zebra finch based on the low and high dose treatment groups, respectively. No other dietary studies evaluating the potential effects of mercury on passerine birds were identified.

In the absence of additional laboratory dosing studies to evaluate potential sublethal responses (e.g., growth and reproduction) of passerine birds exposed to dietary MeHg, available field studies were identified that concurrently measured dietary MeHg concentrations (e.g., bolus measurements) and sublethal endpoints (e.g., reproductive success metrics). Based on the field-measured endpoints and associated dietary MeHg concentrations, dietary TRVs were estimated using assumptions of representative body weights and FIRs estimated based on allometric relationships developed for passerine birds (Nagy, 2001). As summarized below, several field studies were identified that provide a basis for estimating dietary TRVs for passerine birds exposed to MeHg (see Table C-3).

Gerrard and St. Louis (2001) conducted a six-year study to evaluate the impact of reservoir flooding and MeHg bioaccumulation on the reproductive success and growth of tree swallow nestlings. Measures of reproductive success included clutch initiation date, egg size, eggs per clutch, total volume in the clutch, incubation length, hatching success, growth rate of fledglings, and fledgling success; growth metrics included wing, tail, bill, and tarsus lengths, bill width, and weight. In addition to measuring reproductive success and growth metrics, MeHg concentrations in emergent dipterans, the primary dietary component of tree swallow, were measured three times per week. A fundamental assumption of the study design was that the dietary intake and resultant MeHg exposure for tree swallow nestlings would be delivered to nestlings by adults foraging on emergent insects (primarily dipterans) within localized areas surrounding the nesting sites. The average pre-flood concentration of MeHg in emergent dipterans was 0.0438±0.0158 mg/kg dw. Following flooding of the reservoir, MeHg concentration measured in dipterans increased to an average concentration of 0.111±0.0024 mg MeHg/kg dw (range 0.063 to 0.202 mg MeHg/kg dw). The average MeHg concentration in emergent dipterans remained consistently elevated at 0.119±0.0216 mg/kg dw six years after the initial flood. Despite the increase in dietary MeHg exposure associated with reservoir flooding, measures of reproductive success in tree swallow nestlings evaluated over the six-year period following flooding were no different than reproductive success metrics measured prior to flooding. In addition, there were no differences in growth metrics measured during the post-flood conditions relative to the same metrics measured in a tree swallow population at reference lakes. Based on this long-term field investigation, a no effect dietary concentration of 0.111 mg MeHg/kg dw was estimated for tree swallow growth and reproductive success.

Longcore et al. (2007) monitored tree swallow nest boxes at six study areas in Acadia National Park, Maine and an EPA Superfund Site in Ayer, Massachusetts. Mean hatchability of tree swallow eggs was 88.6 to 94.3 percent and mean fledging success was 88.9 to 100 percent. Mean THg concentrations in boli obtained from nestlings monitored within the study areas ranged from 0.128 to 0.291 mg THg/kg ww. Reproductive metrics did not differ statistically between sites with varying exposure concentrations in boli. Furthermore, mean hatchability and mean fledgling success in the study were greater than estimates for the eastern part of the tree swallow breeding range. The findings of this field study indicate that mercury concentrations reported in boli sampled from monitored nestlings were not associated with adverse reproductive effects. Based on these findings, a dietary no effect concentration of 0.128 mg THg/kg ww was estimated based on the lowest average boli concentrations. A dietary no effect concentration of 0.0448 mg MeHg/kg ww, was estimated based on the THg concentration measured in boli and an assumed MeHg:THg ratio of 0.35 for bolus samples based on a conservative estimate of the range of MeHg proportions reported for emergent insects (Tremblay et al., 1996).

Several field studies have been conducted to evaluate potential sublethal effects (e.g., reproductive, physiological, etc.) in tree swallow populations exposed to mercury in the vicinity of an impacted river in Virginia (Brasso and Cristol, 2008; Hawley et al., 2009; Wada et al., 2009). In these studies, measurements of sublethal endpoints in tree swallow from impacted river reaches were compared to sub-lethal endpoints measured in non-impacted reference areas to evaluate potential adverse effects. As part of a study evaluating potential reproductive effects of mercury exposure on tree swallow, Brasso and Cristol (2008) measured mercury concentrations in boli sampled from tree swallow nestlings in reference and potentially impacted reaches. The average THg concentration measured in boli delivered to tree swallow nestlings from reference areas was 0.04 ± 0.004 mg THg/kg dw; boli sampled from tree swallow nestlings in impacted areas contained an average THg concentration of 0.97 ± 1.11 mg THg/kg dw. Assuming that mercury concentrations in the reference areas are not associated with adverse sublethal effects to tree swallow, a dietary no effect concentration of 0.04 mg THg/kg dw was estimated based on boli concentrations reported by Brasso and Cristol (2008). A dietary no effect concentration for MeHg of 0.014 mg MeHg/kg was estimated based on the THg concentration measured in boli from reference areas and an assumed MeHg:THg ratio of 0.35 for bolus samples (Tremblay et al., 1996).

Custer et al. (2008) studied the effects of mercury exposure on reproductive success and survival in tree swallows eggs and nestlings at Lostwood National Wildlife Refuge in North Dakota. As a part of the study, boli were collected from the throats of 8 to 12-day-old nestlings to determine dietary composition and THg concentrations. The geometric mean concentration of THg in boli was 0.047 mg/kg dw, with concentrations ranging from below detection to 0.091 mg/kg dw. Tree swallow hatching success was 77 to 99 percent and was comparable to the nationwide average of 87 percent, indicating that mercury exposure did not adversely affect hatching success. Mean nestling survival to 12 days-of-age ranged from 94 to 100 percent, indicating that nestling survival was not depressed. Based on the lack of reproductive or survival effects on tree swallow nestlings, a dietary no effect concentration of 0.047 mg THg/kg dw was estimated based on the geometric mean concentration measured in boli. A dietary no effect concentration for MeHg of 0.016 mg MeHg/kg dw, was estimated based on the THg concentration measured in boli from reference areas and an assumed MeHg:THg ratio of 0.35 for bolus samples (Tremblay et al., 1996).

Using the dietary no effect concentrations derived from the tree swallow field studies described above, NOAEL doses were estimated based on a mean BW of 0.0202 kg and FIRs of 0.0116 kg dw/day or 0.0352 kg ww/day derived by Nagy (2001) for passerine birds. As summarized in Table C-3, the greatest NOAEL for tree swallow was estimated at 0.078 mg/kg BW/day based on Longcore et al. (2007). This NOAEL was very similar to the NOAEL of 0.067 mg/kg BW-day estimated based on Gerrard and St. Louis (2001), which provides the most comprehensive evaluation of exposure. Although the NOAEL derived from Gerrard and St. Louis (2001) has a robust basis and corresponds well with the NOAEL derived based on Longcore et al. (2007), a geometric mean of 0.025 mg/kg BW-day calculated from the four NOAELs derived from the field studies described above was used as the basis to evaluate modeled exposure to passerines. The geometric mean of the NOAELs from these studies was conservatively used to account for potential uncertainty in deriving TRVs from field studies. Although corresponding LOAELs were not derived based on these field studies, the maximum NOAEL from the field studies (0.078 mg/kg BW-day) was conservatively identified to represent a potential upper bound of the no effect dataset.

4.1.2 Inorganic Mercury

Relatively fewer studies were available to evaluate chronic avian toxicity to IHg. Hill and Schaffner (1976) exposed Japanese quail chicks to dietary mercuric chloride at concentrations of 2, 4, 8, 16, or 32 mg THg/kg dw. No effects were observed on growth, maintenance, hatchability, and egg shell thickness at any dietary treatment; however, egg fertilization was suppressed at 4 mg THg/kg dw. A study by Scott et al. (1975) found no effects on egg production, hatchability, shell quality, morbidity, and mortality in Japanese quail or chicken at dietary concentrations of mercury sulfate or mercury chloride up to 200 mg/kg.

Avian TRVs for IHg were estimated based on the more conservative endpoints presented in Hill and Schaffner (1976). Based on the suppression of egg fertilization at 4 mg THg/kg dw, a LOAEL was estimated as 0.9 mg IHg/kg BW-day assuming a body weight of 0.15 kg and a FIR of 0.0169 kg dw/day (Sample et al., 1996). A NOAEL for IHg was estimated based on the no effect treatment of 2 mg THg/kg dw from Hill and Schaffner (1976), which is equivalent to 0.45 mg IHg/kg BW-day based on the above assumptions for body weight and FIR. TRVs derived for IHg were used for comparisons to IHg doses calculated for each representative avian receptor.

4.1.3 Summary of Avian Toxicity Reference Values

A summary of the TRVs used to evaluate potential risks associated with modeled dietary doses of IHg and MeHg to avian receptors within the PLSA is provided in the table below.

Receptors	NOAEL (mg/kg BW/day)	LOAEL (mg/kg BW/day)	Basis
Methylmercury			
Piscivores/Waterfowl High Sensitivity	0.017	0.055	Reproductive effects on American kestrel (Albers et al., 2007)
Piscivores/Waterfowl Low-Moderate Sensitivity	0.024	0.078	Reproductive effects on mallard duck (Heinz, 1974; 1975; 1976a; 1976b; and 1979)
Passerines	0.025/0.078[a]	ND	Based on geometric mean of NOAELs derived from field studies (Gerrard and St. Louis, 2001; Longcore et al., 2007; Brasso and Cristol, 2008; Custer et al., 2008)
Inorganic Mercury	0.45	0.90	Reproductive effects on Japanese quail (Hill and Schaffner, 1976)

Notes:
a - Dose represents a potential upper bound of the NOAEL dataset.
ND - A dose was not derived due to limited dietary studies indicating adverse ecological effects.

4.2 Mammalian Toxicity Reference Values

Mammalian TRVs for MeHg and IHg were identified using a similar CSA process as described in the preceding section for birds. The following sections describe the derivation of TRVs for MeHg and IHg.

4.2.1 Methylmercury

EPA (1995b) derived MeHg TRVs for mammals based on a compilation of mammalian toxicity studies. These data were reviewed, and additional mammalian effects data from studies conducted since 1995 were also included in the review. Table C-4 summarizes mammalian studies and associated TRVs and the underlying assumptions regarding their derivation. Two of the studies [Verschuuren et al. (1976) and Dansereau et al. (1999)] that were not included in the EPA (1995b) evaluations are briefly discussed below.

Verschuuren et al. (1976) conducted a growth, physiological, and reproduction study over three generations of rats exposed to dietary methylmercuric chloride (MeHgCl). Study endpoints included growth, food intake, hematology, serum and urinalysis, organ weights and reproductive performance. The most sensitive endpoint was relative weights of internal organs (kidneys, heart, spleen, brain, and thyroid), which increased at 0.08 mg/kg MeHgCl. Other notable effects thresholds included 0.4 mg MeHg/kg for increase in neutrophils and a decrease in lymphocytes and 2.0 mg MeHg/kg for impairment in viability index, reductions in weight gain and leucocyte counts. Because of unclear population level implications of these physiological effects, this study was not selected as the basis for the mammalian TRVs.

Dansereau et al. (1999) fed semi-domesticated minks for two generations with a diet consisting of 20 percent mink feed, 40 percent eviscerated chicken carcasses (contaminant free), and 40 percent field-collected fish. Estimated dietary doses included 0.1, 0.5, and 1.0 mg THg/kg ww; however, it was assumed that THg concentrations of fish were in the form of MeHg. Whelping percentages of female mink were significantly lower in the 0.5 and 1.0 mg THg/kg treatment groups when compared to the 0.1 mg THg/kg group. In addition, survival of female mink from both generations was negatively affected in the 1.0 mg THg/kg ww treatment group. Effects concentrations reported in Dansereau et al. (1999) involved some uncertainty because the field-collected fish contained other organic chemicals that may have contributed to the reported reproductive toxicity. Therefore, this study was not considered suitable for the derivation of mercury-specific TRVs. However, it is summarized to support the selected TRVs as discussed further below.

Based on the available data summarized in Table C-4, mammalian TRVs were derived for two groups of the mammalian receptors: piscivores (mink and river otter) and aerial insectivores (little brown bat).

Piscivores

As part of the Great Lakes Initiative (EPA, 1995b), EPA based its derivation of water quality criteria for the protection of piscivorous mammals on two subchronic studies of mink conducted by Wobeser et al. (1976a and 1976b). Wobeser et al. (1976a) exposed ranch mink for 145 days at dietary methylmercuric chloride concentrations of 0.22 and 0.33 mg MeHg/kg ww. No clinical or pathological evidence of intoxication was observed in either treatment. As a result, a no effect dietary concentration of 0.33 mg/kg ww was identified for mink.

Wobeser et al. (1976b) fed adult female mink diets containing methylmercuric chloride at concentrations of 1.1, 1.8, 4.8, 8.3, and 15.0 mg MeHg/kg ww for up to 93 days. Female mink exposed to dietary concentrations of 1.8 mg/kg ww and greater developed clinical signs of mercury intoxication, including anorexia and ataxia; two of the five female mink exposed at 1.8 mg/kg ww died. Based on the combined results of these studies, a dietary effect concentration for anorexia, ataxia, and mortality in mink fed MeHg is identified as 1.8 mg/kg ww, and a corresponding no effect concentration is identified as 1.1 mg/kg. Assuming a mink BW of 1.0 kg and FIR of 0.015 kg/day ww (EPA, 1995b), the subchronic LOAEL and NOAEL doses associated with these studies are 0.27 mg/kg BW/day and 0.16 mg/kg BW/day, respectively (see Table C-4).

Wobeser et al. (1976b) was used as the basis for the derivation of MeHg TRVs for piscivorous mammals. This study was selected as the critical study for deriving TRVs for piscivorous mammals because it was a controlled, 93-day study of MeHg exposure to a site-specific receptor that identifies no effect and effect endpoints that are relevant for population-level implications. Because the study was considered to be subchronic, UFs were applied to the estimated NOAEL and LOAEL doses to represent a chronic exposure. The subchronic NOAEL (0.16 mg/kg-day) and LOAEL (0.27 mg/kg-day) doses derived from Wobeser et al. (1976b) were divided by a UF of three based on EPA (1997) to estimate chronic TRVs. The resulting chronic NOAEL for mammalian piscivores was estimated as 0.053 mg/kg BW/day and the chronic LOAEL was estimated as 0.09 mg/kg BW/day. The estimated NOAEL corresponds well with a NOAEL of 0.050 mg/kg BW/day[6] estimated from the 145-day exposure to ranch mink reported by

[6] Assuming a dietary concentration of 0.33 mg MeHg/kg ww, a mink body weight of 1.0 kg, and an FIR of 0.015 kg/day ww

Wobeser et al. (1976a). Because mink and river otter are in the same family (Mustelidae), the chronic NOAEL and LOAEL derived based on Wobeser et al. (1976b) were used to evaluate potential risks to both receptors.

Aerial Insectivores

Available data are limited to evaluate the effects of mercury exposure to aerial insectivorous mammals (e.g., bats). A review of available literature did not identify dietary dosing studies or field studies (similar to those used for passerines) that could be used to derive a receptor-specific NOAEL or LOAEL to evaluate potential risks associated with dietary exposure to bats.

In the absence of available dietary studies, the relative toxicity of mercury to mammals was evaluated to support the development of an uncertainty factor that may applied to the TRVs derived for mink to evaluate potential risks to bats. Bats feed on emergent insects and have relatively high metabolic rates associated with flight and small size. As a result, bats have greater relative FIRs than mammals that are less active or larger. Due to these factors and general differences in species sensitivities to MeHg exposure, bats may have different sensitivities to MeHg exposure relative to other mammals. Studies of rat exposures to MeHg indicate that mink are generally more sensitive to dietary exposure than other mammals (see Table C-4). In the absence of mercury toxicity information for bats, an interspecies UF of 2 was applied to the MeHg TRVs for derived from mink studies (Wobeser et al., 1976b), as described in the preceding section. The application of a UF may be conservative given that rat studies indicate less sensitive endpoints relative to mink studies; however, given the lack of toxicity data for taxa directly related to bats, the application of a UF is warranted. Applying a UF of 2 to the TRVs derived for mammalian piscivores, the chronic NOAEL and LOAEL for aerial insectivores were estimated as 0.027 mg/kg BW/day and 0.045 mg/kg BW/day, respectively.

As previously stated, the evaluation of mercury exposure to mammalian aerial insectivores within the PLSA was also evaluated based on comparisons of modeled doses to literature-derived TRVs and reference area doses. The dietary doses estimated for bats foraging in reference areas will represent a site-independent dose that may be used to assess the relative exposure to bats in the PLSA, as well as to evaluate the uncertainty associated with the literature-derived TRVs described above.

4.2.2 Inorganic Mercury

TRVs for mammalian exposure to IHg were selected based on a compilation of dietary exposure studies (see Table C-5). A NOAEL TRV for IHg was selected based on a chronic no effect dietary concentration for reproductive effects of mercuric chloride on mink (Aulerich et al., 1974). In this study, the adult minks were fed diets at 10 mg/kg dw mercuric chloride (at 73.9% purity) for five months. No effects were observed on growth, mortality, and reproductive success relative to controls. Based on a dietary IHg concentration of 10 mg/kg dw, a BW of 1.0 kg and FIR of 0.137 kg dw/day, Sample et al. (1996b) derived a NOAEL of 1.01 mg/kg BW/day for IHg. This NOAEL is selected to evaluate IHg risks associated with dietary exposure to IHg in Pompton Lake study areas. No LOAELs were identified for mammalian exposure to IHg; however, Table C-5 provides a summary of LOAEL values reported in various studies.

4.2.3 Summary of Mammalian Toxicity Reference Values

A summary of the TRVs used to evaluate potential risks associated with modeled doses of IHg and MeHg to mammalian receptors within the PLSA is provided in the table below.

Receptors	NOAEL (mg/kg BW/day)	LOAEL (mg/kg BW/day)	Basis
Methylmercury			
Piscivores	0.053	0.09	Based on intoxication and mortality in mink (Wobeser et al., 1976b) and subchronic to chronic extrapolation factor of 2.
Aerial Insectivores	0.027	0.045	Based on an interspecies uncertainty factor of 2 applied to the TRVs for piscivores (above)
Inorganic mercury	1.01	NA	NOAEL derived by Sample et al. 1996 using mink reproductive endpoints reported by Aulerich et al. (1974)

5.0 Strengths, Limitations, and Uncertainties

Strengths, limitations, uncertainties involved in the modeling approach to evaluate exposure and potential toxicity were identified to put the quantitative results in perspective. These strengths, limitations, and uncertainties include, but are not limited to, those discussed in the following sections.

5.1.1 Exposure Estimates

The modeling approach addressed the following sources of variability and uncertainties in estimating dietary exposure of wildlife to mercury:

- Spatial heterogeneity in media concentrations (site-specific media concentrations, including concentrations in representative dietary items) were addressed in the deterministic approach by conservatively using the 95%UCL_{mean} concentrations and in the probabilistic approach by using distribution of concentrations based on site-specific data.
- General variations in physical and common characteristics used as exposure parameters (e.g., body weight, feeding behavior) among adult male and female receptors were captured in the probabilistic estimates (e.g., using a combined BW distribution and BW-based FIRs).
- Daily variability in dietary composition/preference was addressed explicitly in the probabilistic approach by via the dietary matrix algorithm (see *Dietary Composition* in Section 3.2.1).

- Relative contribution to total exposure by different areas (PLSA and the reference area) was accounted for by using AUFs for receptors with home ranges larger than the PLSA.

The proposed approach did explicitly account for the following sources of uncertainty in estimating exposure to wildlife:

- Differences in sex and life-stage characteristics (e.g., male versus female species and juveniles versus adults). However, as indicated above, variability in male and female BWs and BW-associated variables (e.g., FIR, SIR, and WIR) was captured in the models. Differences in exposure at various life-stages were indirectly accounted for in the derivation of multi-generational TRVs for some receptors.
- Temporal variability or seasonal differences were not explicitly incorporated in the exposure estimates. For example, seasonal differences in MeHg concentrations in surface water and sediments and/or dietary preferences may result in higher average exposures during certain periods. The timing of exposure media sampling for the 2013 Ecological Investigation was intended to account for potentially greater mercury methylation in abiotic and biotic media based on seasonality. Although the peak methylation period in Pompton Lake study areas is uncertain, sampling of site-specific media was conducted in late summer based on greater MeHg concentrations in exposure media observed at this general time period during in previous investigations. The results of the Phase 2 Ecological Investigation indicated greater concentrations of MeHg in abiotic media sampled in the late summer relative to MeHg concentrations in samples collected in late spring (Exponent and ANSP, 2003). Probabilistic exposure modeling also addressed potential seasonal variability in the potential distributions of the DMIR and ADMIR that were calculated based on the range of measured concentrations.
- Bioavailability (and metabolism/elimination) of mercury from field diet compared to laboratory diet was assumed to be the same, i.e., a relative bioavailability of 100 percent was assumed, with respect to mercury intake in exposure estimates as compared to laboratory toxicity studies.

5.1.2 Toxicity Evaluations

The following factors may influence the potential uncertainties in toxicity evaluations:

- TRVs based on reproductive, mortality, and growth endpoints were consistent with EPA guidance and risk management principles (EPA, 1997; EPA, 1999) to identify population-level impacts to ecological receptors; however, studies indicate potential sublethal effects of mercury on the physiology and behavior of birds (e.g., Bouton et al. 1999; Hoffman et al., 2005; Frederick and Jayasena, 2010; Fallacra et al., 2011; Jayasena et al., 2011) and mammals (Dansereau et al., 1999; Verschuuren et al., 1976). The potential direct and indirect implications of these physiological and behavioral endpoints on the long-term viability of receptor populations are uncertain. This uncertainty of population-level implications associated with physiological and behavioral endpoints precludes their use in risk assessment and management.

- EPA guidance on ecological risk assessments requires the use of LOAELs and NOAELs. However, these "thresholds" are a result of experimental designs and not necessarily true effects benchmarks. Therefore, their use in risk assessments as thresholds has been questioned (e.g., Landis and Chapman, 2011).

5.1.3 Summary

The evaluation of wildlife exposures to mercury in the PLSA were generally based on conservative assumptions and exposure estimates. Because conservative estimates or assumptions were used for most factors considered in the assessment, there is confidence that the findings of the exposure modeling are adequately conservative to identify potential adverse effects to wildlife populations.

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Tables

Table C-1
List of Exposure Factors and Variables for Dietary Exposure Modeling
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Variable		Units	Values for Deterministic Estimates	Distributions for Probabilistic Estimates[c]
$DMIR_{Receptor}$	Daily Mercury Ingestion Rate for a Receptor	mg Hg/kg BW/day[d]	Calculated (OUTPUT)	Simulated (OUTPUT)
BW	Receptor's Body Weight	g	Based on literature, Mean BW	Assumed distribution based on literature data on BW
FIR	Daily Food Ingestion Rate for a Receptor	g food (ww)/day	Calculated using Allometric Relationship with Receptor Mean BW	Assumed distribution based on Receptor BW
f_j	Fraction of Diet Item *j* in a Receptor's Dietary Composition	unitless	Literature-based typical dietary composition[a]	Simulated daily dietary composition based on literature derived preference matrix
Cj	Mercury Concentration in the Diet Item *j*	ng Hg/g diet item (ww)	Site-specific 95% UCL_{mean}	Site-specific distribution
SIR	Incidental Sediment Ingestion Rate for a Receptor	g sediment (dw)/day	Literature-based values or estimations	Assumed distribution based on Receptor BW
C_{SD}	Mercury Concentration in the Sediment	ng Hg/g sediment (dw)	Site-specific 95% UCL_{mean}	Site-specific distribution
WIR	Daily Water Ingestion Rate for a Receptor	L water/day	Literature-based values or estimations	Assumed distribution based on Receptor Body Weights
C_{SW}	Mercury Concentration in the Surface Water	pg Hg/L surface water (unfiltered)[e]	Site-specific 95% UCL_{mean}	Site-specific distribution
N	Number of days per year that a receptor resides at the exposure area.	days/year	Literature-based values or estimations	Literature-based values (Deterministic Estimate)
AUF	Area Use Factor	unitless	Based on literature data on Receptor-Specific Home Range[b]	Based on literature data on Receptor-Specific Home Range[b]

Notes:
a. A single important diet item with the maximum contamination may be assumed for initial evaluations.
b. AUF, 1 may be assumed for initial evaluations.
c. Depending on their importance (with respect to output sensitivity) and observed variability, point estimates may be sufficient as inputs.
d. A conversion factor of 0.001 is used to convert model outputs in ng Hg/g BW/day to mg Hg/kg BW/day to be consistent with the TRVs.
e. A conversion factor of 1000 is used to convert measured surface water concentrations in ng/L to required model input in pg/L
Hg, mercury
BW, body weight
ww, wet weight
dw, dry weight

Table C-2a
Summary of Exposure Factors For Deterministic Dietary Exposure Modeling
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Representative Receptors		Area Use Factor (AUF)[a]	Mean Body Weight (BW, g ww)[b]	Dietary Composition (%)[c]								Ingestion Rates (IRs)			
												FIRs[d]	WIRs[e]	SIRs[f]	
Name	Receptor Category			Midge Adult	Midge Larvae	Crayfish	Lycosidae	Tetraghnidae	Bullfrogs	Fish (<130 mm TL)	Fish (>130 mm TL)	g ww/day	L/day	Percent of FIR_{dw}	g dw/day
Avian Receptors															
Great blue heron (*Ardea herodias*)	Semi-aquatic piscivorous birds	1.0	2229	--	--	5%	--	--	5%	40%	50%	513.5	0.101	2.0%	2.82
Belted kingfisher (*Megaceryle alcyon*)	Semi-aquatic piscivorous birds	1.0	148	--	--	5%	--	--	5%	90%	--	84.6	0.016	1.0%	0.23
Double-crested cormorant (*Phalacrocorax auritus*)	Semi-aquatic piscivorous birds	1.0	2429	--	--	5%	--	--	5%	40%	50%	543.7	0.107	0.0%	0.00
Mallard duck (*Anas platyrhynchos*)	Semi-aquatic invertivorous/ omnivorous birds	1.0	1171	--	48%	48%	--	--	--	4%	--	175.8	0.066	3.3%	1.86
Carolina wren (*Thryothorus ludovicianus*)	Terrestrial invertivorous songbirds	1.0	21	70%	--	--	15%	15%	--	--	--	15.47	0.004	0.0%	0.00
Tree swallow (*Tachycineta bicolor*)	Semi-aquatic aerial insectivorous birds	1.0	20.1	100%	--	--	--	--	--	--	--	15.1	0.004	0.0%	0.00
Mammalian Receptors															
Little brown bat (*Myotis lucifugus*)	Aerial insectivorous mammals	1.0	7.72	100%	--	--	--	--	--	--	--	4.6	0.001	0%	0.00
River otter (*Lontra canadensis*)	Piscivorous mammals	1.0	7430	--	--	5%	--	--	5%	45%	45%	899.0	0.602	1.0%	2.59
Mink (*Mustela vison*)	Piscivorous mammals	1.0	1000	--	--	10%	--	--	10%	70%	10%	164.1	0.099	1.0%	0.49

Notes:
BW = body weight; TL = total length; -- = not applicable; ww = wet weight; dw = dry weight
a. Conservatively assumed to be 1 (i.e., the receptors reside/forage within PLSA 100% of the time).
b. See Table C-2b for details and references.
c. See Receptor Profiles (Appendix C-1) for the basis of the estimates; only those dietary items with site-specific tissue mercury data are shown.
d. Food Ingestion Rates (FIRs; in g ww/day), calculated for mean BW using the respective fresh food intake rates equations from Nagy (2001); see Table C-2b.
e. Water Ingestion Rates (WIRs; in L/day), calculated using equations for birds and mammals in Calder and Braun (1983, as cited in the the Handbook).
f. Sediment Ingestion Rates (SIRs; g dry wt/day), calculated using the assumed SIRs [as % of FIR dw (g dry wt/day)] and the respective dry food intake rate equations from Nagy (2001); See Table C-2b.

Table C-2b
Summary of Exposure Factors For Probabilistic Dietary Exposure Modeling
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Representative Receptors		Home Range (HR)	Reference	Area Use Factor (AUF)[a]	Body Weight Distributions[e] (BW, g ww)	Reference	Dietary Preference Range (%)[e]								Ingestion Rates (IRs)						
															FIRs[f]		WIRs[f,g]	SIRs[f,h]			
Name	Receptor Category						Midge Adult	Midge Larvae	Crayfish	Lycosidae	Tetraghnidae	Bullfrogs	Fish (<130 mm TL)	Fish (> 130 mm TL)	g ww/day	Reference	Liters / day	As % of FIR_{dw}	Reference/Notes[e]	g dw/day[h]	Reference
Avian Receptors																					
Great blue heron (*Ardea herodias*)	Semi-aquatic piscivorous birds	1.5-20.8 ac	EPA (2003)	1.0	Normal Mean = 2229 ± 762 SD Range = 1940-2970	Quinney (1982) and Bayer (1981)[c]	--	--	2-10%	--	--	0-15%	35-45%	45-55%	$FIR=3.048 \times BW^{0.665}$	Eqn #64 for Carnivorous birds (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	2.0%	Conservative assumption (see text)	SIR $=0.02 \times 0.849 \times BW^{0.663}$	Eqn #63 for Carnivorous birds (Nagy, 2001)
Belted kingfisher (*Megaceryle alcyon*)	Semi-aquatic piscivorous birds	1.5-20.8 ac[b]	EPA (2003)	1.0	Normal Mean = 148 ± 21 SD Range =125-215	Powdermill Nature Center[c]	--	--	2-25%	--	--	0-25%	75-95%	--	$FIR=3.048 \times BW^{0.665}$	Eqn #64 for Carnivorous birds (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	1.0%	Conservative assumption (see text)	SIR $=0.02 \times 0.849 \times BW^{0.663}$	Eqn #63 for Carnivorous birds (Nagy, 2001)
Double-crested cormorant (*Phalacrocorax auritus*)	Semi-aquatic piscivorous birds	0.6-38.5 mi	Esimated	1.0	Normal Mean = 2429 ± 278 SD Range = 1650-3000	Glahn et al. (1995)[d]	--	--	1-10%	--	--	0-10%	35-45%	45-55%	$FIR=3.048 \times BW^{0.665}$	Eqn #64 for Carnivorous birds (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	0.0%	Assumed to be negligible (see text)	--	--
Mallard duck (*Anas platyrhynchos*)	Semi-aquatic invertivorous/ omnivorous birds	94-3560 ac	EPA (2003)	1.0	Normal Mean = 1171 ± 153 SD Range = 528-1814	Delnicki & Reinecke (1986) and Nelson & Martin (1953)	--	20-50%	20-50%	--	--	--	0-10%	--	$FIR=2.094 \times BW^{0.627}$	Eqn #62 for Omnivores (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	3.3%	Beyer et al. (1994)	SIR $=0.033 \times 0.67 \times BW^{0.627}$	Eqn #61 for Omnivores (Nagy, 2001)
Carolina wren (*Thryothorus ludovicianus*)	Terrestrial invertivorous songbirds	1.73 ac	Haggerty and Morton (1995)	1.0	Normal Mean = 21.0 ± 1.15 SD Range = 17-23	Dunning (1984) and Haggerty and Morton (1995)	60-90%	--	--	1-15%	1-15%	--	--	--	$FIR=2.438 \times BW^{0.607}$	Eqn #38 for Passerines (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	0.0%	Assumed to be negligible (see text)	--	--
Tree swallow (*Tachycineta bicolor*)	Semi-aquatic aerial insectivorous birds	5-148 ac	EPA (2003)	1.0	Normal Mean = 20.1 ± 1.58 SD Range = 15.6-25.4	Dunning (1993) [as cited in USACHPPM (2004)]	90-100%	--	--	0-2.5%	0-2.5%	--	--	--	$FIR=2.438 \times BW^{0.607}$	Eqn #38 for Passerines (Nagy, 2001)	$WIR = 0.059 \times BW^{0.67}$	0.0%	Assumed to be negligible (see text)	--	--
Mammalian Receptors																					
Little brown bat (*Myotis lucifugus*)	Aerial insectivorous mammals	0.63 ac	EPA (2003)	1.0	Normal Mean = 7.72 ± 1.87 SD Range = 6.57-9.43	Dunning (1993) [as cited in USACHPPM (2004)]	100%	--	--	--	--	--	--	--	$FIR=1.219 \times BW^{0.652}$	Equation #8 for Bats (Nagy, 2001)	$WIR = 0.099 \times BW^{0.90}$	0%	Assumed to be negligible (see text)	--	--
River otter (*Lontra canadensis*)	Piscivorous mammals	> 729 ac	EPA (2003)	1.0	Normal Mean = 7430 ± 1524 SD Range = 4740-10400	Lauhachinda (1978)[c]	--	--	1-6%	--	--	1-10%	35-50%	35-50%	$FIR=0.469 \times BW^{0.848}$	Eqn #26 for Carnivores (Nagy, 2001)	$WIR = 0.099 \times BW^{0.90}$	1.0%	Conservative assumption (see text)	SIR $=0.01 \times 0.153 \times BW^{0.834}$	Eqn #25 for Carnivores (Nagy, 2001)
Mink (*Mustela vison*)	Piscivorous mammals	> 19.3 ac	EPA (2003)	1.0	Normal Mean = 1000 ± 298 SD Range = 700-1600	Linscombe et al. (1982) and Hornshaw et al. (1983)[c]	--	--	2-20%	--	--	2-20%	60-80%	10-20%	$FIR=0.469 \times BW^{0.848}$	Eqn #26 for Carnivores (Nagy, 2001)	$WIR = 0.099 \times BW^{0.90}$	1.0%	Conservative assumption (see text)	SIR $=0.01 \times 0.153 \times BW^{0.834}$	Eqn #25 for Carnivores (Nagy, 2001)

Notes:
-- = not applicable; ac = acres; mi = miles; Normal = Normal Distribution; Mean = Arithmetic Mean; SD = Standard Deviation; FIR = Food Ingestion Rate; WIR = Water Ingestion Rate; SIR = Sediment Ingestion Rate; BW = body weight; TL = total length; ww = wet weight; dw = dry
a. AUF may be refined based on the ratio of the home range to the areas under consideration; an AUF = 1.0 is used in initial modeling.
b. Based on great blue heron data.
c. As cited in the Handbook (EPA, 1993).
d. As cited in Cal/Ecotox Profile: http://www.oehha.org/cal_ecotox/species_reports.htm
e. See Receptor Profiles (Appendix C-1) for the basis of the estimates and assumptions.
f. Food Ingestion Rates (FIRs, in g ww/day), calculated using respective equations from Nagy (2001); BWs are in g.
g. Water Ingestion Rates (WIRs, in L/day), calculated using respective equations for birds and mammals from Calder and Braun (1983, as cited in the the Handbook); BWs are in kg.
h. Sediment Ingestion Rates (SIRs, in g dry wt/day), calculated using assumptions regarding SIRs (as % of SIR_{Dry}) and corresponding equations fro SIR_{Dry} from Nagy (2001); BWs are in g.

Table C-3
Summary of Avian Toxicity Reference Values (TRVs) for Methylmercury
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Species	Order	Exposure Duration	Test Compound	Life Stage	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Study References
Piscivores/Waterfowl - High Sensitivity										
American kestrel	***Falconiformes***	***13 weeks***	***Methylmercuric chloride***	***Adult (1 year old breeding pairs)***	***Reproduction***	***0.017***	***Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.***	***0.055***	***Based on dietary LOEC of 0.30 mg Hg/kg ww (0.7 mg/kg dw), average body weight of 0.119 kg and FIR 0.022 kg ww/day using assumptions by Zhang et al. (2013)***	***Albers et al. (2007)***
Great egret	Pelecaniformes	12 weeks	Methylmercuric chloride	Juvenile	Growth	0.028	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.091	Based on LOEC of 0.5 mg Hg/kg food ww in daily diet, average body weight of 1.0 kg, food intake rate 0.181 kg ww/day (Zhang et al., 2013)	Spalding et al. (2000)
American kestrel	Falconiformes	12-14 weeks	Methylmercuric chloride	Adult (1 year old breeding pairs)	Reproduction	0.081	Based on dietary NOEC of 1.04 mg Hg/kg ww (2.8 mg/kg dw) for clutch size, average body weight of 0.119 kg and FIR 0.022 kg ww/day using assumptions by Zhang et al. (2013)	0.264	Based on dietary LOEC of 1.43 mg Hg/kg ww (3.9 mg/kg dw) for reduced clutch size, average body weight of 0.119 kg and FIR 0.022 kg ww/day using assumptions by Zhang et al. (2013)	French et al. (2010)
White ibis	Pelecaniformes	3 years	Methylmercuric chloride	Juvenile	Mating behavior, endocrine function, and possible reproductive effects	0.003	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.010	Based on LOEC of 0.05 mg MeHg/kg food ww in daily diet, average body weight of 0.869 kg (geometric mean), and food intake rate 0.182 kg ww/day based on Kushlan (1977) (Zhang et al., 2013)	Frederick and Jayasena (2010); Jayasena et al. (2011)
Piscivores/Waterfowl - Low Sensitivity										
Mallard	***Anseriformes***	***3 years***	***Methylmercury dicyandiamide***	***3 generations***	***Reproduction***	***0.024***	***Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.***	***0.078***	***Based on LOEC of 0.5 mg Hg/kg food dw in daily diet and a food ingestion rate of 0.156 kg dw/kg BW/day for the dosing group (EPA, 1995)***	***Heinz (1974, 1975, 1976a,b, 1979)***
Mallard	Anseriformes	1.5 years	Methylmercury dicyandiamide	Adult	Offspring Neurotoxicity	0.029	Based on NOEC of 0.5 mg Hg/kg food dw in daily diet and a food ingestion rate of 0.057 kg dw/kg BW (assuming 1 kg BW, 0.051 kg food dw/kg BW, and 10% moisture in food) (Zhang et al., 2013)	0.171	Based on LOEC of 3.0 mg Hg/kg food dw in daily diet and a food ingestion rate of 0.057 kg dw/kg BW/day (assuming 1 kg BW, 0.051 kg food dw/kg BW, and 10% moisture in food) (Zhang et al., 2013)	Heinz and Lock (1976)
Ring-necked pheasant	Galliformes	12 weeks	Methylmercury dicyandiamide	Adult	Reproduction	0.029	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.093	Actual dose	Fimreite (1971)

Table C-3
Summary of Avian Toxicity Reference Values (TRVs) for Methylmercury
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Species	Order	Exposure Duration	Test Compound	Life Stage	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Study References
Piscivores/Waterfowl - Low Sensitivity (continued)										
Ring-necked pheasant	Galliformes	350 days	Mthylmercury p-toluene sulfonanilide	Adult	Reproduction	0.077	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.250	Based on LOEC of 4.2 mg Hg/kg, average BW of 1.1 kg, food ingestion rate of 0.053 kg dw/kg BW/day, and 10% water in food.	Spann et al. (1972)
White leghorn chicken	Galliformes	21 days	Methylmercury dicyandiamide	Juvenile	Growth	0.089	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.289	Based on LOEC of 6 mg Hg/kg food ww in daily diet; Average body weight of 0.28 kg, mercury intake rate 0.081 mg Hg/chick/day (EPA, 1995)	Fimreite (1970)
Mallard	Anseriformes	26 days	Methylmercury chloride	Adult	Reproduction/ Duckling Survival	0.114	Based on NOEC of 2 mg Hg/kg food dw in daily diet and a food ingestion rate of 0.057 kg dw/kg BW (Zhang et al., 2013)	0.228	Based on LOEC of 4 mg Hg/kg food dw in daily diet and a food ingestion rate of 0.057 kg dw/kg BW/day (Zhang et al., 2013)	Heinz et al. (2010)
Piscivores/Waterfowl - Low/Moderate Sensitivity										
White leghorn chicken	Galliformes	21 days	Methylmercury chloride	Adult	Reproduction	0.206	Applied LOAEL-to-NOAEL uncertainty factor of 3.25 based on the mean LOAEL:NOAEL ratios for avian studies included in the review.	0.67	Based on LOEC of 10 mg Hg/kg food in daily diet and food ingestion rate 0.067 kg food/kg BW/day (EPA, 1995)	Scott (1977)
Ring-necked pheasant	Galliformes	350 days	Mthylmercury p-toluene sulfonanilide	Adult	Mortality	0.25	Based on NOEC of 4.2 mg Hg/kg, average BW of 1.1 kg, food ingestion rate of 0.053 kg dw/kg BW/day, and 10% water in food.	0.75	Based on LOEC of 12.5 mg Hg/kg, average BW of 1.1 kg, food ingestion rate of 0.053 kg dw/kg BW/day, and 10% water in food.	Spann et al. (1972)
Japanese quail	Galliformes	6 weeks	Methylmercuric chloride	Multigenerational	Offspring Mortality	0.26	Based on NOEC of 2 mg Hg/kg and food ingestion rate of 0.13 kg/kg BW/day.	0.52	Based on LOEC of 4 mg Hg/kg and food ingestion rate of 0.13 kg/kg BW/day.	Eskeland and Nafstad (1978)
Common loon	Gaviiformes	15 weeks	Methylmercury chloride	Juvenile	Growth	0.27	Based on NOEC of 1.5 mg MeHg/kg food ww in daily diet, average body weight of 4.67 kg common loon adults, and food intake rate 0.839 kg ww/day (Zhang et al., 2013)	NA	No effect was observed on growth or food consumption in the study.	Kenow et al. (2003)
White leghorn chicken	Galliformes	21 days	Methylmercury dicyandiamide	Juvenile	Mortality	0.57	Based on NOEC of 6 mg Hg/kg food ww in daily diet; Average body weight of 0.28 kg, mercury intake rate 0.081 mg Hg/chick/day (EPA, 1995)	0.857	Based on LOEC of 18 mg Hg/kg food ww in daily diet; Average body weight of 0.28 kg, mercury intake rate 0.24 mg Hg/chick/day (EPA, 1995)	Fimreite (1970)

Table C-3
Summary of Avian Toxicity Reference Values (TRVs) for Methylmercury
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Species	Order	Exposure Duration	Test Compound	Life Stage	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Study References
Passerines										
Tree swallow	***Passeriformes***	***Multi-Year (2 seasons)***	***Total mercury measured in diet***	***Juvenile***	***Reproduction***	***0.078***	***Based on NOEC of 0.128 mg THg/kg ww measured in boli (concentration range 0.128 -0.291 mg THg/kg ww) and the minimum assumed MeHg:THg ratio of 0.35; average body weight of 0.0202 kg, and FIR of 0.0352 kg dw/day (Nagy, 2001)***	***NA***	***An effect dose was not estimated for the study.***	***Longcore et al. (2007)***
Tree swallow	***Passeriformes***	***Multi-Year (6 seasons)***	***Methylmercury measured in diet***	***Juvenile***	***Growth Reproduction***	***0.067***	***Based on NOEC of 0.111 mg MeHg/kg dw field-measured in diet, average body weight of 0.0202 kg, and FIR of 0.0116 kg dw/day (Nagy, 2001)***	***NA***	***An effect dose was not estimated for the study.***	***Gerrard and St. Louis (2001)***
Tree swallow	***Passeriformes***	***Multi-Year (2 seasons)***	***Total mercury measured in diet***	***Juvenile***	***Reproduction***	***0.009***	***Based on NOEC of 0.047 mg THg/kg dw measured in boli (maximum concentration 0.091 mg THg/kg) and an assumed MeHg:THg ratio of 0.35; average body weight of 0.0202 kg, and FIR of 0.0116 kg dw/day (Nagy, 2001)***	***NA***	***An effect dose was not estimated for the study.***	***Custer et al. (2008)***
Tree swallow	***Passeriformes***	***Multi-Year (2 seasons)***	***Total mercury measured in diet***	***Juvenile***	***Reproduction***	***0.008***	***Based on reference bolus concentration of 0.040 mg THg/kg dw and an assumed MeHg:THg ratio of 0.35; average body weight of 0.0202 kg, and FIR of 0.0116 kg dw/day (Nagy, 2001)***	***NA***	***An effect dose was not estimated for the study.***	***Brasso and Cristol (2008)***
Zebra finch	Passeriformes	76 days	Methylmercury chloride	Adult	Neurotoxicity and mortality	0.880	Based on NOEC of 0.5 mg/kg Hg [Scheuhammer (1988) as cited in EPA (1995)]	1.750	Based on LOEC of 5 mg/kg [Scheuhammer (1988) as cited in EPA (1995)]	Scheuhammer (1988)

Notes:
Bolded and Italicized study represents the critical study used for the derivation of the TRVs
NA, Not available either because not reported, not calculated, or not necessary
NOEC, No observed effect concentration
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effect level
LOAEL, Lowest observed adverse effect level
dw, dry weight
ww, wet weight
Hg, mercury
MeHg, methylmercury
BW, body weight

Table C-4
Summary of Mammalian Toxicity Reference Values (TRVs) for Methylmercury
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Species	Life Stage	Exposure Duration	Test Compound	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Reference
Piscivorous Mammals									
Mink	Adult	145 days	Assumed Methymercury (in fish)[a]	Reproduction, Development	0.05	Based on NOEC of 0.33 mg/kg, food ingestion rate of 0.15 kg/day and a BW of 1 kg (EPA, 1995)	NA	No effect was observed on reproduction or development at the highest dietary treatment in the study	Wobeser et al., 1976a
Mink	***Adult***	***93 days***	***Organic (methylmercuric chloride)***	***Intoxication (anorexia and ataxia) and mortality***	***0.16***	***Based on NOEC of 1.1 mg/kg, food ingestion rate of 0.15 kg/day and a BW of 1 kg (EPA, 1995)***	***0.27***	***Based on NOEC of 1.8 mg/kg, food ingestion rate of 0.15 kg/day and a BW of 1 kg (EPA, 1995)***	***Wobeser et al., 1976b***
Mink	Multiple generations	400 days	Assumed to be methylmercury (in contaminated fish)	Reproduction	0.02[b]	Based on NOEC of 0.12 mg/kg ww; a BW of 1.35 kg (EPA, 1993) and food ingestion rate of 0.21 kg ww/day [Equation 1 from Nagy (2001)]	0.09[b]	Based on LOEC of 0.56 mg/kg ww; a BW of 1.35 kg (EPA, 1993) and food ingestion rate of 0.21 kg ww/day [Equation 1 from Nagy (2001)]	Dansereau et al. (1999)
Mink	Multiple generations	400 days	Assumed to be methylmercury (in contaminated fish)	Survival	0.09[b]	Based on NOEC of 0.56 mg/kg ww; a BW of 1.35 kg (EPA, 1993) and food ingestion rate of 0.21 kg ww/day [Equation 1 from Nagy (2001)]	0.14[b]	Based on LOEC of 0.9 mg/kg ww; a BW of 1.35 kg (EPA, 1993) and food ingestion rate of 0.21 kg ww/day [Equation 1 from Nagy (2001)]	Dansereau et al. (1999)
Mink	Adult	2 Months	Organic (methylmercuric chloride)	Growth and Survival	NA	Effects were observed on growth and survival at the lowest dietary treatment in the study	0.64	Based on LOEC of 5 mg/kg; food ingestion rate of 0.15 kg/day and a BW of 1.2 kg	Aulerich et al. (1974)
Non-piscivorous Mammals									
Rat	Three generations	> 1 year	Organic (methyl mercury chloride; 79.9% Hg)	Growth (Internal Organs)	NA	Effects were observed on growth of internal organs at the lowest dietary treatment in the study	0.02	Based on LOEC of 0.08 mg/kg ww; a BW of 0.35 kg (from Sample et al., 1996) and a food ingestion rate of 0.074 kg ww/day (based on Equation 2 in Nagy, 2001)	Verschuuren et al., 1976
Rat	Three generations	> 1 year	Organic (methyl mercury chloride; 79.9% Hg)	Survival and Reproduction	0.09	Based on NOEC of 0.5 (0.399 mg Hg/kg); food ingestion rate of 0.074 kg/day (Nagy, 2001) and a BW of 0.35 kg (Sample et al., 1996)	0.42	Based on LOEC of 2.5 mg/kg (1.997 mg Hg/kg); food ingestion rate of 0.074 kg/day (Nagy, 2001) and a BW of 0.35 kg (Sample et al., 1996)	Verschuuren et al., 1976
Rat	Weanling	2 years	Organic (phenyl mercuric acetate)	Growth	0.56	Based on NOEC of 10 mg Hg/kg; Intake rate of 0.15 mg Hg/day and average BW of 0.275 kg for the control group (EPA, 1995)	2.2	Based on LOEC of 40 mg Hg/kg; Intake rate of 0.6 mg Hg/day and average BW of 0.275 kg for the control group (EPA, 1995)	Fitzhugh et al., 1950
Rat	Weanling	2 years	Organic (phenyl mercuric acetate)	Mortality	2.2	Based on NOEC of 40 mg Hg/kg; Intake rate of 0.6 mg Hg/day and average BW of 0.275 kg for the control group (EPA, 1995)	14	Based on LOEC of 160 mg Hg/kg; Intake rate of 2.4 mg Hg/day and average BW of 0.175 kg for the expsed group (EPA, 1995)	Fitzhugh et al., 1950
Rat	Weanling	122 days	Organic (methylmercuric chloride)	Reproduction and Development	0.25	Actual dose	1	Applied conservative NOAEL to LOAEL factor of 4.0 based on growth data for organic mercury from Fitzhugh et al. (1950) (URS)	Khera and Tabacova, 1973
Rat	Gestation	Days 7-14	Organic (methylmercuric chloride)	Growth and Neurotoxicity	4	Actual dose	6	Actual dose	Fuyuta et al., 1978

Table C-4
Summary of Mammalian Toxicity Reference Values (TRVs) for Methylmercury
2013 Pompton Lake Ecological Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Species	Life Stage	Exposure Duration	Test Compound	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Reference
Non-piscivorous Mammals (continued)									
Rat (Wistar)	Gestation	Days 7-14	Organic (methylmercuric chloride)	Development	2	Actual dose	4	Actual dose	Fuyuta et al., 1978
Rat (Sprague-Dawley albino)	Gestation	Days 6-15	Organic (methylmercuric chloride)	Development	1	Actual dose	2	Actual dose	Geyer et al., 1985
Rat (Sprague-Dawley)	Gestation	Days 6-9	Organic (methylmercuric chloride)	Offspring Mortality and Development	1.6	Actual dose	4.8	Actual dose	Vorhees, 1985
Rat (HAN-Wistar)	Adult	8 weeks	Organic (methylmercuric chloride)	Development	*NA*	Effects were observed on development at the lowest dose tested in the study	0.21	Actual dose	Suter and Schon, 1986

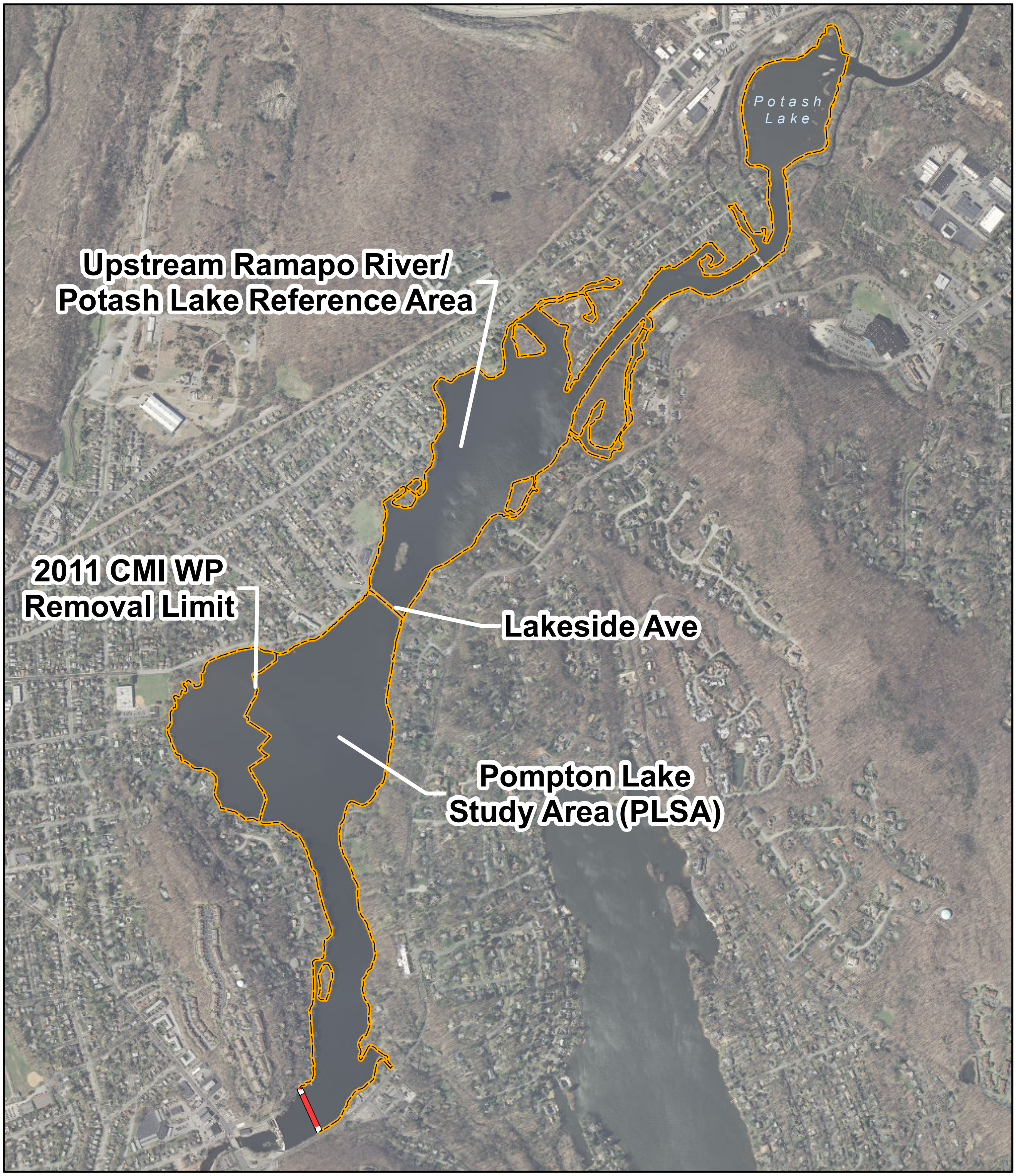
Notes:
Bolded and Italicized study represents the critical study used for the derivation of the TRVs
NA-Not available either because not reported, not calculated, or not necessary
NOEC, No observed effect concentration
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effect level
LOAEL, Lowest observed adverse effect level
a. Assumes Hg form in fish is MeHg
b. There is uncertainty associated with these TRVs because the field-collected fish (making up 40% of the prepared diet) may have contained other, uncharacterized organic chemicals that could have contributed to the reproductive toxicity reported in mink.
dw, dry weight
ww, wet weight
Hg, mercury
MeHg, methylmercury
BW, body weight

Table C-5
Summary of Toxicity Reference Values (TRVs) For Inorganic Mercury
2013 Pompton Lake Ecological Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Species	Life Stage	Exposure Duration	Test Compound	Effects Endpoints	NOAEL (mg/kg BW/day)	Basis	LOAEL (mg/kg BW/day)	Basis	Reference
Birds									
Japanese quail	***Adult during reproduction***	***1 year***	***Inorganic (mercuric chloride)***	***Reproduction***	***0.45***	***Based on NOEC of 4 mg Hg/kg, BW of 0.15, and food ingestion rate of 0.0169 kg/day (Sample et al., 1996)***	***0.9***	***Based on LOEC of 8 mg Hg/kg, BW of 0.15, and food ingestion rate of 0.0169 kg/day (Sample et al., 1996)***	***Hill and Schaffner (1976)***
Mammals									
Mink	***Adult (critical life stage)***	***6 Months***	***Inorganic (mercuric chloride, 73.9% Hg)***	***Reproduction, Growth, Survival***	***1.01***	***Based on NOEC = 10 mg Hg/kg (73.9% purity), BW = 1 kg and food ingestion rate of 0.137 kg food/day (Sample et al. 1996)***	***NA***	***No effect was observed on reproduction, growth, or survival at the highest dietary treatment in the study***	***Aulerich et al. (1974)***
Rat	Weanling	2 years	Inorganic	Growth	14	Based on NOEC of 160 mg Hg/kg; Intake rate of 2.4 mg Hg/day and average BW of 0.175 kg for the expsed group (EPA, 1995)	56	Applied conservative NOAEL to LOAEL factor of 4.0 based on growth data for organic mercury from the same study (URS)	Fitzhugh et al., 1950
Rat	Gestation	Days 5, 12, 19	Inorganic (HgO)	Development	*NA*	Effects were observed on development at the lowest oral ingestion treatment in the study	7	2 mg Hg oral ingestion and a BW of 0.29 kg (Unit here is mg/kg)	Rizzo and Furst, 1972 (as cited in EPA, 1995)
Mouse	Adult	20 Months	Inorganic (Mercuric sulfide)	Mortality, Histology, Reproduction	13.2	Actual dose	NA	No effect was observed on mortality, histology, and reproduction at the highest tested dose in the study	Revis et al. (1989)

Notes:
Bolded and italicized study represents the critical study used for the derivation of the TRVs
NA, Not Available either because not reported, not calculated, or not necessary
NOEC, No observed effect concentration
LOEC, Lowest observed effect concentration
NOAEL, No observed adverse effect level
LOAEL, Lowest observed adverse effect level
Hg, mercury
MeHg, methyl mercury
BW, body weight

Figures



Legend

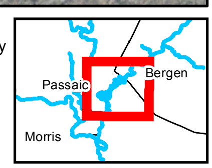
Study Area

Dam Safety Stop

N

0 250 500 1,000 1,500 2,000 Feet

Reference:
NJDEP 2012 Aerial Imagery



URS

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Figure C-1
Study Area Map
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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Appendix C-1

Wildlife Receptor Profiles

Appendix C-1
Receptor Profiles - Great Blue Heron
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	**Great blue heron (*Ardea herodias*)**
Body Weight (BW)	Quinney (1982) reported a mean BW of 2.229 ± 0.762 kg SD for breeding adults (both male and female) in eastern North America. CLO (2013) reported a range of 2.1 to 2.5 kg for mean BW. Bayer (1981) reported a mean BW of 2.34 ± 0.49 kg SD (a range of 1.94 -2.97 kg) for yearlings from central Oregon. Great blue heron BW is assumed to be normally distributed with a mean of 2.229 ± 0.762 kg SD (based on data from Quinney, 1982) and truncated within the range of 1.94-2.97 kg based on data for yearlings (Bayer, 1981).
Food Ingestion Rate (FIR)	Kushlan (1978) reported a mean FIR of 0.18 g dw/g BW/day for adult Great blue herons (both male and female). Used Equation #64 for carnivorous birds (Nagy, 2001): FIR (g ww/day) = $3.048 \times BW^{0.665}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	An estimated mean WIR of 0.045 g dry wt/g BW/day for adult Great blue herons (both male and female) is reported in the Handbook. Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Great blue herons mainly use two foraging techniques when fishing: standing still and waiting for fish to swim within striking distance or slow wading to catch more sedentary prey. To do so requires shallow waters with a firm substrate (the Handbook). In addition, herons may also capture other prey in shallow waters, including crustaceans (e.g., crayfish) and amphibians. Sediment ingestion by piscivores is typically considered to be negligible (Sample and Suter, 1994), but incidental SIR is conservatively assumed to be 2% of the FIR (in dw) to account for potential incidental ingestion resulting from foraging on fish, crayfish, or amphibians while wading in shallow waters.
Population Densities (PD)	Dowd and Flake (1985) reported mean densities of 2.3 to 3.6 birds/km shoreline along rivers and streams. Maximum colonial nesting numbers as high as 475 nests/ha was reported in coastal islands (Werschkul et al., 1977).
Fecundity/Clutch Size etc.	Clutch sizes ranged from 1 to 6 with one clutch per year (the Handbook).
Home Range (HR)	Feeding territories for Great blue herons range from 0.6 to 8.4 ha (daily averages without indication of site fidelity). They forage typically within 3.1 km from the colony, but as far as 24.4 km (Dowd and Flake, 1985); EPA (2003) estimated a HR of 6,000-84,000 m^2 (with a mean of 45,000 m^2), equivalent to 1.483 to 20.8 acres.
Seasonality/Migration in and out of New Jersey	The Great blue heron does not winter in NJ, but migrates to the eastern seaboard, Gulf Coast, and southern Mississippi Valley. Typically, great blue herons arrive in the PLSA in mid-March and return to their wintering grounds by late October (based on the Handbook). Therefore, a residency time in the PLSA is approximately 230 days/year.
Dietary Composition	Great blue herons subsist primarily on pelagic and bottom-dwelling fishes that it supplements with benthic invertebrates such as crabs, shrimp, and crayfish (Peifer, 1979 as cited in the Handbook). Great blue herons consumed (based on % of stomach contents) trout (85%), non-trout fish (5%), crustaceans (1%), amphibians (4%), and small birds and mammals (1%) in a river in lower MI (Alexander, 1977, as cited in the Handbook). Several sources (Kushlan 1978, Collazo 1985, Hoffman 1978, as cited in Sample and Suter, (1994) indicate that Great blue heron's diet consisted of predominantly fish but may include crustaceans, insects, snails, amphibians, reptiles, birds, and mammals. EPA (2003) estimated the following dietary preference for the Great blue herons in water/wetland setting: 2-9% - other invertebrates, 3-23% - small mammals, 0-2% - small birds, 0-9% - benthic filter feeders, 5-98% - trophic level 3 fish, 5-98% - trophic level 4 fish, 1-33% - aquatic plants, 1-33% - forage, and 0-23% - small herpetofauna. Dietary preference for great blue herons at the PLSA is assumed to be: 35-45% fish (<130 mm TL), 45-55% fish (>130 mm TL), 2-10% crayfish (invertebrates), and 0-15% bullfrogs. Size preference for fish is based on Pompton Lake EI (Exponent, 2003) and the information on prey size (below).
Prey size	Great blue herons eat primarily fish between 5 and 33 cm in length (the Handbook); fish 20 cm or less in length dominated the diet of Great blue herons foraging in southwestern Lake Erie (Hoffman, 1978 as cited in the Handbook), and 95% of fish consumed by great blue herons in a Wisconsin population were less than 25 cm (Kirkpatrick, 1940 as cited in the Handbook). Great blue herons in a coastal island in Vancouver, BC, caught 63.4% small fishes (< 1/3 the size of beak), 19.2% medium (~1/2 beak length) and 7.4% large (longer than the beak) (Krebs, 1974, as cited in the Handbook).

Notes:
The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).
SD, standard deviation
dw, dry weight
ww, wet weight
TL, total length
PLSA, Pompton Lakes Study Area

Receptor	**Belted kingfisher (*Megaceryle alcyon*)**
Body Weight (BW)	Adult Belted kingfishers (both male and female) weighed 136 ± 15.6 g SE in PA and 158 ± 11.5 g SE in OH [Brooks & Davis (1987) as cited in the Handbook]; Powdermill Nature Center (unpubl., as cited in the Handbook) reported a range of 125-215 g and mean of 148± 20.8 g SD for adult males and females in PA. Belted kingfisher BW is assumed to be normally distributed with a mean of 148 ± 21 g SD and truncated within the range of 125-215 g [Powdermill Nature Center (unpubl., as cited in the Handbook)].
Food Ingestion Rate (FIR)	Alexander (1977) estimated a FIR = 0.5 g/g/day for adults in north central lower MI. Used Equation #64 for Carnivorous birds (Nagy, 2001): FIR (g ww/day) = $3.048 \times BW^{0.665}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Belted kingfishers feed almost exclusively in the pelagic zone of the water column (the Handbook). Consequently, they are unlikely to ingest any appreciable amount of sediment incidentally while foraging or indirectly through their prey. An incidental SIR of 1% of FIR (dw) is assumed as a result of foraging on crayfish and amphibians.
Population Densities (PD)	Brooks & Davis (1987, as cited in the Handbook) reported population densitities of 2 to 6 pairs/10 km of shoreline.
Fecundity/Clutch Size etc.	Clutch size is reported to be 5.8 ± 0.7 SE to 6.8 ± 0.4 SE (the Handbook).
Home Range (HR)	Brooks and Davis (1987) and Davis (1980) (both cited in the Handbook) reported home ranges of 0.39 ± 0.093 km SE for breeding pairs and 2.19 ± 0.56 km SE for non-breeding individuals in PA and OH. EPA (2003) estimated a home range of 6,000-84,000 m2 (with a mean of 45,000 m^2) based on great blue herons, equilavent to 1.483 to 20.8 acres.
Seasonality/Migration in and out of New Jersey	Belted kingfishers that breed in NJ are migratory and winter in the southeastern US. Bent (1940) reported that Belted kingfishers arrive in the NJ area in mid-March and leave in mid-November, based on which a residency time of 230 days in the PLSA is assumed.
Dietary Composition	Belted kingfishers feed predominantly on fish. When fish are scarce, they supplement fish diet with aquatic macroinvertebrates, terrestrial prey, and/or plant material (Bent, 1940). Davis [1982, as cited in Sample & Suter (1994)] reported a dietary composition of 76.4% cyprinids, 10.2% other fish, and 13.3% crayfish. EPA (2003) estimated the following dietary preference for the Belted kingfishers in water/wetland setting: 2-41% - other invertebrates, 0-10% - small mammals, 0-10% - benthic filter feeders, 5-100% - trophic level 3 fish, 0-10% - forage, and 0-27% - small herpetofauna. Aquatic dietary preference of Belted kingfishers at the PLSA is assumed to be: 70-95% fish (< 130 mm TL), 2-25% cray fish (invertebrates), and 0-25% bullfrogs (amphibians). Fish size preference is based on the information on prey size (below) and what was sampled at the PLSA.
Prey size	Fish caught by belted kingfishers ranged from 2.5 to 17.8 cm (with an average < 7.6 cm) in a Michigan study [Salyer and Lagler (1946) as cited in the Handbook]. In OH streams, Belted kingfishers caught fish ranging from 4 to 14 cm [Davis (1982) as cited in the Handbook].

Notes:

The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).

SD, standard deviation

SE, standard error

TL, total length

dw, dry weight

ww, wet weight

PLSA, Pompton Lake Study Area

Appendix C-1
Receptor Profiles - Double-crested Cormorant
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	Double-crested cormorant (*Phalacrocorax auritus*)
Body Weight (BW)	Dunning (1993) reported mean BWs of 1.8 kg for males and 1.5 kg for females. Glahn et al. (1995) reported a range of 1.65-2.6 kg (mean = 2.162 kg ± 0.0298 SE, N= 41) for adult females and 2.0-3.0 kg (mean = 2.498 kg ± 0.016 SE, N = 160) for adult males in LA. Double-crested cormorant BW is assumed to be normally distributed with a mean of 2.429 kg ± 0.278 SD and truncated within the range of 1.65-3.0 kg (based on data from Glan et al., 1995).
Food Ingestion Rate (FIR)	Campo et al. (1993) suggested a typical daily prey intake of 0.048 kg dw/kg BW/day. Used Equation #64 for Carnivorous birds (Nagy, 2001): FIR (g ww/day) = $3.048 \times BW^{0.665}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	Campo et al. (1993) suggested a typical WIR of 0.053 L/kg BW/day. Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Double crested cormorants feed almost exclusively in the pelagic zone of the water column (Johnsgard, 1993). Because fish are captured from within the water column there is negligible contact with sediments that would result in incidental ingestion. Furthermore, any potential sediment that may be ingested indirectly from the gut tract of prey would be included in the mercury concentrations reported from whole body analyses of non-depurated tissue samples. Therefore, the SIR for double-crested cormorant is assumed to be negligible.
Population Densities (PD)	Double-crested cormorants tend to nest in colonies with 2 to 3,500 pairs/colony (Vermeer 1973; Lock and Ross, 1973). Andrews (1990) reported a range of 1-1,077 (mean of 241) nests/colony in Maine.
Fecundity/Clutch Size etc.	Clutch size ranged from 2-6 eggs (usually 4) as reported by Bull and Farrand (1977); a clutch size of 2-6 eggs/nest in UT and 1-2 clutches/year was reported by Mitchell (1977).
Home Range (HR)	Nesting colonies have been reported as far as 20 km from foraging sites (Johnsgard, 1993). Custer and Bunk (1992) reported a foraging range of <1-40 km (average < 3 km) in WI. King et al. (1995) reported foraging distances ranging 3.5-61.8 km (mean = 15.7 km) for Double-crested cormorants in Mississippi River Delta. The home range of the double-crested cormorant was estimated to be 0.6 to 38.5 miles, based on a range of < 1 km to 62 km (Custer and Bunk, 1992; King et al., 1995).
Seasonality/Migration in and out of New Jersey	Cormorants breeding inland and north of Chesapeake Bay are migratory, wintering along the Atlantic and Gulf seaboards. No reliable information on migration is available for inland cormorants. Therefore, they are assumed to reside in PLSA between mid-March and late October (similar to great blue herons) and spend 230 days/year at the PLSA.
Dietary Composition	Double-crested cormorants are almost exclusively piscivorous, with small amounts of mollusks, crustaceans, aquatic invertebrates, amphibians, and reptiles also contributing to their diet (Johnsgard, 1993). Anderson et al. (2004) reported a 100% fish diet. Proportion of prey species in adult and juvenile diet (by % volume) in St. Lawrence Estuary and Gulf of Canada was reported to be: gunnels (5%), sculpins (1%), sand lance (44%), capelin (34%), flatfishes (11%), clupeids (4%), other (1%) (Rail and Chapdelaine,1998). Dietary preference for Double-crested cormorants at the PLSA is assumed to be: 35-45% Fish (<130 mm TL), 45-55% Fish (> 130 mm TL), 1-10% Crayfish, and 0-10% Bullfrogs. Size preference for fish was based on Pompton Lake EI (Exponent, 2003) and the following information on prey size.
Prey size	Fish taken by double-crested cormorants range 2.5-27.5 cm in length (Campo et al., 1993). Palmer (1962) reported fish lengths ranging from 3-40 cm (commonly < 15 cm) in double-crested cormorants diets.

Notes:
SD, standard deviation
SE, standard error
TL, total length
PLSA, Pompton Lakes Study Area
dw, dry weight
ww, wet weight

Receptor	**Mallard (*Anas platyrhynchos*)**
Body Weight (BW)	Nelson & Martin (1953) reported mean BWs of 1.225 kg (up to 1.814 kg) for adult males and 1.043 kg (up to 1.633 kg) for adult females throughout North America. Adults from western Mississippi weighed 1.246 ± 0.1108 kg SD (male) and 1.095 ± 0.106kg SD (female) (Delnicki & Reinecke, 1986). Adults from Texas weighed 1.237 ± 0.118 kg SD (male) and 1.088 ± 0.105 kg SD (female) [Whyte and Bolen, (1984) as cited in the Handbook]. Mallard BW is assumed to be normally distributed with a mean of 1.171 ± 0.153 kg SD (based on data from Delnicki & Reinecke, 1986) and truncated within the range of 0.528-1.814 kg [represents mean ± 4.2 x SD to coincide with the upper range for males reported in Nelson & Martin (1953)].
Food Ingestion Rate (FIR)	Used Equation #64 for Omnivorous birds (Nagy, 2001): FIR (kg ww/day) = $2.094 \times BW^{0.627}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Mallards feed on benthic macroinvertebrates for part of the year. In Beyer et al. (1994), samples from most mallards contained little or no sediment (mean = 3.3% of diet), but 10% of the Mallards (out of 88), with the highest sediment content consumed an estimated 26% sediment in their diet. Therefore, SIR for Mallards was conservatively assumed to be 3.5% of FIR(dw) based on the mean value presented in Beyer et al. (1994).
Population Densities (PD)	Lokemoen et al. (1990) reported mean densities of 0.036-0.047 pairs/ha. Average densities of breeding Mallards in the prairie pothole region range from 0.006 to 0.67 pairs/hectare (the Handbook). Titman (1983) reported breeding density of 4-7.5 pairs/km^2 in prairie pothole habitat.
Fecundity/Clutch Size etc.	Clutch size ranges from 1-18 (mean = 9) with up to 4.5 clutches/year (if not successful) [the Handbook].
Home Range (HR)	Kirby et al. (1985, as cited in the Handbook) reported a HR of 40 - 1,440 ha (mean = 540 ha) for female and 70 -1,140 ha (mean = 620 ha) for male in Minnesota/wetlands and river. EPA (2003) estimated a HR of 380,000-14,400,000 m2, equivalent to 94 to 3,558 acres.
Seasonality/Migration in and out of New Jersey	Although Mallards winter in all four waterfowl flyways of North America (i.e., Pacific, Central, Mississippi, and Atlantic), the Mississippi flyway contains the highest numbers (Bellrose, 1976). Ducks winter farther north than in the past (Jorde et al., 1983). Mallards tend to arrive at their wintering grounds in the Mississippi Valley in mid-September through early November and depart for their northerly breeding grounds again in March (Fredrickson and Heitmeyer, 1988). [All references cited in the Handbook]. Mallards are assumed to be residents in the PLSA throughout the year.
Dietary Composition	Based on esophagus contents (% wet volume), Mallard's diets in south central ND prairie potholes consisted of 67-89% animals (gastropods 0-25%, insects 13-48%, crustacea 8-15%, annelids 0.2-38%, misc. 0-9%) and 11-33% plants (seeds 11-29%, tubers 0-4%, and stems 0-1%) (Swanson et al., 1985). EPA (2003) estimated the following dietary preference for the mallard in water/wetland setting: 10-60% - Other Invertebrates, 0-10% - benthic filter feeders, 0-10% - trophic level 3 fish, 0-10% - aquatic plants, 0-10% - forage, 0-24% exposed fruits, 50-100% -grains, 0-10% -roots, and 0-25% -silage. Aquatic dietary preference for Mallards at the PLSA is assumed to be: 20-50% midge larvae, 20-50% crayfish, and 0-10% fish (<130 mm TL). Their dietary preference is conservatively assumed to include exclusively animal tissue, which is typical of the shift that occurs from a largely herbivorous diet in winter to a high protein of mainly animal tissue during spring molt and spring/summer egg production [Swanson and Meyer, 1973; Swanson et al., 1979; Swanson et al., 1985; Heitmeyer, 1988a). This dietary preference for mallards likely represents the most sensitive dietary exposure to mercury during a likely period of high foraging activity within the study area.
Prey size	Mallards diet predominantly contains chrionomidae, diptera, gastropods, crustaceans, and terrestrial annelids (Swanson et al., 1979).

Notes:

The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).

SD, standard deviation

TL, total length

PLSA, Pompton Lakes Study Area

dw, dry weight

ww, wet weight

Receptor	**Carolina wren (*Thryothorus ludovicianus*)**
Body Weight (BW)	Mean BW for Carolina wren ranges from 17-23 g, 21.5±1.9 g SD for male and 18.6±1.1 g SD for female (Haggerty and Morton, 1995). Cornell Lab of Ornithology (CLO, 2013) reports a range of 18-22g. Dunning (1984) reported a mean of 21±1.15 g SD. Carolina wren BW is assumed to be normally distributed with a mean of 21±1.15 g SD based on Dunning (1984) and truncated within the range of 17-23 g based on Haggerty and Morton (1995).
Food Ingestion Rate (FIR)	Based on songbirds weighing 10-90 g, Carolina wrens eat 10-30% of theirBW daily (Lack, 1954). Used Equation #38 for Passerine birds (Nagy, 2001): FIR (g ww/day) = $2.438 \times BW^{0.607}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Mayoh and Zach (1986) reported that grit particles in house wren constitutes less than 0.1% of the FIR (based on mean of 6.2 mg and assuming a mean BW of 0.020 kg). Furthermore, any potential ingestion of substrate by Carolina wren would not be associated with sediment particles because there is no complete pathway to subaqueous sediments. Any potential substrate that may be ingested indirectly from the gut tract of prey (e.g., spiders) would be included in the mercury concentrations reported from whole body analyses of non-depurated tissue samples. Therefore, SIR for Carolina wren is assumed to be negligible (i.e., SIR = 0).
Population Densities (PD)	Average individual count in breeding season is estimated to be 19.7/ 40 ha (the Handbook).
Fecundity/Clutch Size etc.	CLO (2013) reports a clutch size of 3-7 eggs, with 1-3 broods.
Home Range (HR)	Haggerty and Morton (1995) reports a home range of 0.7 ha (1.73 acres).
Seasonality/Migration in and out of New Jersey	Carolina wrens are not migratory, but they wander (Taylor et al., 1983).
Dietary Composition	Based on composite estimates from six expert elicitations (Figure S5-A in Wang and Newman, 2013), Carolina wren diet consists of: seed - 2.8, fruit - 2.8, mayfly-5.5, caddisfly-3.1%, caterpillar-28.5%, crayfish-0%, deer mouse-0%, earthworm-2.1%, fruits-2.8%, isopod-5.6%, ladybug-9.5%, mayfly-5.5%, midge-4.3%, seeds-2.8%, slug-0.2%, spider-35.6%, small birds-0%. Based on Haggerty and Morton (1995), Carolina wren diets contained 94% animal matter and 6% vegetable matter: Lepidopterans (caterpillars and a few moths) - 22%, hemipterans (stick, soldier, leaf-legged, chinch bugs, and leafhoppers) - 19%, coleopterans (green, cucumber, bean leaf, and flea beetles, and weevils) - 14%, orthopterans (grasshoppers, crickets, and cockroaches) - 13%, arachnids - 11%, hymenopterans (ants, bees, wasps) - 5%, dipterans (craneflies) - 3%, and other small food items (millipedes, sowbugs, and snails). Cristol et al. (2008) reported that araneae (spiders), lepidoptera (moths or caterpillars), and orthopterae (grasshoppers) together comprised of > 80% diet in three species of songbirds and that they ate diets of ~20 to 30% spider biomass. Spiders consisted of 6.2-15.1% (by volume) of marsh wren's diet in Georgia salt marsh (Kale, 1965). Dietary preference for Carolina wrens at the PLSA is assumed to be:, 60-90% adult midge (emerging inverts) and 1-15% Lycosidae (ground dwelling spiders) and 1-15% Tetraghnidae (orb-weaving spiders).
Prey size	Specific information on Carolina wren prey size preferences not available in literature.

Notes:

The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).

SD, standard deviation

ww, wet weight

PLSA, Pompton Lake Study Area

dw, dry weight

Appendix C-1
Receptor Profiles - Tree Swallow
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	**Tree swallow (*Tachycineta bicolor*)**
Body Weight (BW)	Nagy (2001) reports a BW of 20.2 g for Tree swallow. CLO (2013) reports a range of 16-25 g. According to Robertson et al. (1992) and Dunning (1993), male adults > 2 years weighed 20.4±1.5g (N =86, range of 17-24g) and female adult > 2 years weighed 21.5±1.7g (N=134, range of 18-25.5g) and all adults (male and female) weighed 20.1±1.58g (N=82, range of 15.6-25.4g). Tree swallow BW is assumed to be normally distributed with a mean of 20.1±1.58 g SD and truncated within the range of 15.6-25.4 g (based on Robertson et al., 1992 and Dunning, 1993).
Food Ingestion Rate (FIR)	Nagy (2001) reports FIRs of 11.6 g dw/day or 35.2 g ww/day for tree swallows. Used Equation #38 for Passerine birds (Nagy, 2001): FIR (g ww/day) = $2.438 \times BW^{0.607}$, where BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.059 \times BW^{0.67}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Tree swallows forage almost exclusively on flying insects captured during flight. As a result of this feeding behavior, there is no complete pathway with sediments; therefore, SIR for tree swallows is assumed to be negligible (i.e., SIR = 0).
Population Densities (PD)	Sauer et al. [2008, as cited in CLO (2013)] reports population densities of 3-30 adults/route.
Fecundity/Clutch Size etc.	CLO (2013)reports clutch sizes of 4-7 eggs and 1-2 broods.
Home Range (HR)	Tree swallows typically forage within 400 m of their nests [McCarty (2001) and Mengelkoch et al. (2004), both as cited in Brasso and Cristol (2008)]. Tree swallows foraging range is typically 300-500 m of their nests (Quinney and Ankney, 1985; Dunn and Hannon, 1992). EPA (2003) estimated a HR of 20,000-600,000 m^2, approximately equivalent to 5 to 148 acres.
Seasonality/Migration in and out of New Jersey	Migration of Tree swallows to winter grounds begins shortly after breeding season, Jul-Aug (Burleigh, 1958).
Dietary Composition	CLO (2013) reports that Tree swallows live on a diet of insects, with occasional small animals and plant foods when prey is scarce. They eat all kinds of flying insects: dragonflies, damselflies, flies, mayflies, caddisflies, true bugs, sawflies, bees, ants, wasps, beetles, stoneflies, butterflies, and moths, as well as spiders, mollusks, and roundworms. During the breeding season, tree swallows eat high-calcium items like fish bones, crayfish exoskeletons, clamshells, and eggshells of gulls or loons. Tree swallow diet consisted of 65.2± 10.5% (dw) chironomidae (midges) and 3.7% spiders (Beck et al., 2013). EPA (2003) estimated the following dietary preference for the tree swallows as: 50-78% - other invertebrates, 0-25% - forage, and 0-25% exposed fruits. Beal (1918) reported that spiders consisted less than 4.64% (volume) of the diet in 343 Tree swallows from 22 states and Canada (as cited in USACHMP, 2004). Dietary preference for Tree swallows at the PLSA is assumed to be: 90-100% adult midges (Emergent Invertebrates) and 0-5% spiders [terrestrial invertebrates: 0-2.5% Lycosidae (ground dwelling spiders) and 0-2.5% Tetraghnidae (orb-weaving spiders)].
Prey size	Quinney and Ankney (1985) report that 99 percent of the insects consumed by tree swallows are 10 mm in length. Blancher and McNicol (1991) observed that ~90% of prey were 25 mm in length. CLO (2013) indicate that tree swallow prey may be smaller than a grain of sand or up to two inches long.

Notes:
SD, standard deviation
ww, wet weight
dw, dry weight
PLSA, Pompton Lake Study Area

Appendix C-1
Receptor Profiles - Little Brown Bat
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	**Little brown bat (*Myotis lucifugus*)**
Body Weight (BW)	Little brown bats weigh from 7-13 g (mean = 10 g) (LeConte, 1831). Adult Little brown bats weigh 7-10 g (0.3-0.4 oz.) with females weighing slightly more than males (Saunders, 1988). Sample and Suter (1994) used a mean weight of 0.0075 kg from Gould (1955). From USACHPPM (2004): 7.5±1.1 g (N=4) in MA (Gould, 1955), adult female 8.47±0.81 g (N=5, range 7.25-9.43 g) and adult male 6.96±0.27 g (N=3, range 6.57-7.20 g) in New Mexico (Ewing et al., 1970). Little brown bat's BW is assumed to follow a normal distribution with a mean of 7.72±1.87 g SD and truncated within the range of 6.57-9.43 g [based on Ewing et al. (1970)].
Food Ingestion Rate (FIR)	Saunders (1988) reported that a colony of 100 little brown bats may eat 19.2 kg (42 lb) of insects in four months; Sample and Suter (1994) used FIRs of 0.0018 to 0.0037 kg ww/day for pregnant and lactating females and juveniles from Anthony and Kunz (1977). Used Equation #8 for bats (Nagy, 2001): FIR (g ww/day) = $1.219 \times BW^{0.652}$, BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.099 \times BW^{0.9}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Little brown bats forage almost exclusively on flying insects captured during flight. As a result of this feeding behavior, there is no complete pathway with sediments; therefore, SIR for little brown bats is assumed to be negligible (i.e., SIR = 0).
Population Densities (PD)	Saunders (1988) estimated population densities of 1 bat per 10 ha (1 per 25 acres) in the northeastern U.S.
Fecundity/Clutch Size etc.	Saunders (1988) reported one bat per clutch.
Home Range (HR)	EPA (2003) estimated a HR of 2,549 m^2, equivalent to 0.63 acres.
Seasonality/Migration in and out of New Jersey	Little brown bats are year round residents in New Jersey and are active throughout the late spring, summer, and early fall. In cold winter months, little brown bats go into dormancy hibernating in caves and abandoned mines (Braun and Grace, 2008).
Dietary Composition	Little brown bats often forage near or just over the water surface and a large portion of their diet constitutes adult midges and other aquatic insects such as stone flies and mayflies (Saunders, 1988). Based on %v olume in diet in Ontario, Nova Scotia, and New York, Belwood and Fenton (1976 as cited in Sample and Suter, 1994) reported that the little brown bats diet consisted of: chironomidae 39.5%, trichoptera 31.5%, lepidoptera 11.0%, misc. insects 9.4%, coleoptera 5.5%, and neuroptera 3.1%. EPA (2003) estimated the little brown bats' dietary preference to be 95-100% other invertebrates. Little brown bats at the PLSA is assumed to forage exclusively on adult midges (i.e., dietary preference is 100% adult midges).
Prey size	Little brown bats target on insects in the 3-10 mm (0.1-0.4 in) size range (Saunders, 1988).

Notes:
SD, standard deviation
PLSA, Pompton Lake Study Area
ww, wet weight

Appendix C-1
Receptor Profiles - River Otter
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	**River otter (*Lontra canadensis*)**
Body Weight (BW)	The Handbook reports that adult river otters (both male and female) weigh 5-15 kg (Melquist & Dronkert, 1987). Lauhachinda (1978) reported that in Alabama and Geogia adult males (mean BW = 8.13±1.15 kg SD, range 5.84 -10.4 kg) are larger than females (mean BW 6.73±1.00 kg SD, range 4.74 -8.72 kg). Similarly, Melquist & Hornocker (1983) reported that in Idaho, males weight 9.20 ± 0.6 kg SE and females weighed 7.90 ± 0.2 kg SE. River otters BW is assumed to be normally distributed with a mean of 7.43±1.524 kg SD and truncated within the range of 4.74-10.4 kg [based on Lauhchinda (1978)].
Food Ingestion Rate (FIR)	Otters in captivity required 700-900 g of food daily (the Handbook). Used Equation #26 for Carnivorous mammals (Nagy, 2001): FIR (g ww/day) = $0.469 \times BW^{0.848}$, BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983). WIR (L/day) = $0.099 \times BW^{0.9}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	River otters may ingest a small amount of sediment incidentally while foraging and indirectly through their prey. Therefore, a conservatively estimated SIR of 1% of the dry diet may be assumed, based on Liers (1951, as cited in the Handbook). SIR for River otters is conservatively assumed to be 1% of FIR (in dw) to account for foraging on amphibians and crayfish.
Population Densities (PD)	Population densities of 1 to 10 otters/km of river or shoreline are typical (the Handbook).
Fecundity/Clutch Size etc.	Adult females appeared to reproduce yearly in Oregon, but they were reported to breed every other year in Alabama and Georgia. Litters usually consist of 2 to 3 pups, although litters as large as 6 pups occur (the Handbook).
Home Range (HR)	The Handbook indicates a wide ranging home range: 400-1,900 ha in marsh and streams in Michigan [Erickson et al., (1984, as cited in the Handbook)] and 2,900-5,700 ha in Colorado [Mack, (1985, as cited in the Handbook)]. EPA (2003) estimated a HR of 2,950,000-19,113,450,000 m^2 (i.e., typically greater than 730 acres).
Seasonality/Migration (in and out of New Jersey)	River otters are non-migratory, but will travel between different foraging locations throughout the course of the year. Melquist and Hornocker (1983, as cited in the Handbook) conservatively estimated the average daily distance traveled by otters (including family groups) to range from 0.4 to 3.1 miles in Idaho.
Dietary Composition	Various fish species form the bulk of the River otters diet; however, they are opportunistic feeders and will prey on a variety of food items depending on availability and ease of capture (the Handbook). Other than fish, River otters may consume crustaceans (especially crayfish), aquatic insects (e.g., stonefly nymphs, aquatic beetles), amphibians, insects, birds (e.g., ducks), mammals (e.g., young beavers), turtles, an also waterfowls. Based on % frequency of occurrence in scats in Idaho, Missouri, Illinois, and Mississippi (Melquist & Hornocker, 1983; Greer, 1955; Anderson & Woolf, 1987; all as cited in the Handbook), River otters diet consisted of 69-100% fish, 1-13% birds, 2-12% invertebrates (of which 7-50% was crayfish in an Illinois River), 3-16% amphibians, and 1-8 % mammals. EPA (2003) estimated the following dietary preference for the river otters in water/wetland setting: 0-5% - other invertebrates, 0-25% - small birds, 0-25% - small mammals, 0-10% - benthic filter feeders, 25-94% - trophic level 3 fish, 25-94% - trophic level 4 fish, and 0-25% - small herpetofauna. Dietary preference for River otters at the PLSA is assumed to be predominantly fish, supplemented with crayfish and bullfrogs: Fish <130 mm TL and >130 mm TL, each at 35-50%, 1-10% bullfrogs, and 1-6% crayfish.
Prey size	Most fish consumed by River otters were < 30 cm (Melquist & Hornocker, 1983; as cited in the Handbook). Sheldon and Toll (1964) reported a fish size range of 2-50 cm in River otters diet (as cited in the Handbook).

Notes:

The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).
SD, standard deviation
SE, standard error
TL, total length
ww, wet weight
dw, dry weight
PLSA, Pompton Lake Study Area

Appendix C-1
Receptor Profiles - Mink
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptor	**Mink (*Mustela vison*)**
Body Weight (BW)	Linscombe et al. (1982) reported a mink BW range of 0.7-1.6 kg (mean = 1.0 kg). Mean BWs were 1.734 ± 0.35 kg SD (male) and 0.974 ± 0.202 kg SD (female) among farm-raised minks in MI (Hornsaw et al., 1983). Mink BW was assumed to follow a normal distribution a mean of 1.00±0.298 kg SD and truncated within the range of 0.7-1.6 kg [based on mean and range from Linscombe et al. (1982) and SD data from Hornsaw et al. (1983)].
Food Ingestion Rate (FIR)	A mean FIR for Minks (male and female) is reported to be 0.137 kg ww/d [Bleavins and Aulerich (1981) as cited in Sample and Suter (1994)]. Used Equation #26 for Carnivorous mammals (Nagy, 2001): FIR (g ww/day) = $0.469 \times BW^{0.848}$, BW is in g.
Drinking Water Ingestion Rate (WIR)	Estimated based on Calder and Braun (1983): WIR (L/day) = $0.099 \times BW^{0.9}$, where BW is in kg.
Sediment Ingestion Rate (SIR)	Hamilton [1940, as cited in Sample and Suter (1994)] observed sand in 1.3% of Mink scats, the amount of which did not account for any measurable scat volume. Therefore, similar to Sample and Suter (1994) who estimated negligible soil ingestion by Minks, Minks are not expected to incidentally ingest any appreciable amount of sediments. However, SIR for Minks is conservatively assumed to be 1% of FIR (in dw) to account for foraging on amphibians and crayfish.
Population Densities (PD)	Densities range 0.03 - 0.085 /ha based on a river in MT (Mitchell 1961, as cited in Sample and Suter (1994)].
Fecundity/Clutch Size etc.	Litter size ranges 2-8 (mean 4.2) in a river in MT (Mitchell 1961, as cited in the Handbook) and 4-10 in in North America (Hall & Kelson, 1959 as cited in the Handbook), with 1 litter/year.
Home Range (HR)	Minks home range size and shape depends on habitat - linear along streams and circular in marshes (the Handbook). Gerell [1970, as cited in Sample and Suter (1994)] reported home ranges of 2.63 km (males) and 1.85 km (females) along streams in Sweden and Arnold and Fritzell [1987, as cited in Sample and Suter (1994)] reported home range of 770 ha in prairie potholes in Manitoba, Canada. EPA (2003) estimated a HR of 78,000-78,540,000 m^2 (i.e., approximately 19 to 19,400 acres).
Seasonality/Migration in and out of New Jersey	Minks are non-migratory (Whitaker and Hamilton 1998; Lariviere, 1999).
Dietary Composition	Minks are carnivorous opportunistic feeders based on prey abundance. Mammals (muskrats, meadow voles) form the most important prey year-round in many parts of their range, but they also hunt aquatic prey such as fish, amphibians, and crustaceans and other terrestrial prey such as bird, reptiles, and insects, depending on the season. In marshy habitats, crayfish may also constitute a significant portion of a Mink's diet (the Handbook). Sample an Suter (1994) estimated a composition of 46%-mammals, 16%-fish, 15%-aquatic invertebrates, 13%-amphibians, and 8%-birds in a Mink's diet. EPA (2003) estimated a dietary preference of: 0-63% - other invertebrates, 10-43% - small mammals, 10-43% - herbivorous vertebrates, 0-33% - small birds, 0-90% - trophic level 3 fish, 0-90% - trophic level 4 fish, and 2-39% - small herpetofauna. Dietary preference for minks at the PLSA is assumed to be: 60-80% fish (<130 mm TL), 10-20% fish (>130 mm TL), 2-20% crayfish, and 2-20% bullfrogs.
Prey size	Allen (1986) reported unidentified cyprinids (Cyprinidae), ranging in length from 7 to 12 cm as a major group of prey fish. Larger fish, represented by salmonids (Salmonidae), accounted for 9% of the diet. These larger fish were believed too large for mink to prey on and were probably scavenged .

Notes:

The Handbook refers to Wildlife Exposure Factors Handbook, Volumes I and II (EPA, 1993).

SD, standard deviation

dw, dry weight

ww, wet weight

PLSA, Pompton Lake Study Area

Appendix D

Summary of Analytical Data

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Field Sample ID Location Sample Date Matrix Sample Purpose Sample Type Filtered	EI13-ABD-SW11S-SW SW11 09/04/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW11S-SW-Z SW11 09/04/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW13S-SW SW13 09/04/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW13S-SW-Z SW13 09/04/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW15S-SW SW15 09/04/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW15S-SW-Z SW15 9/4/2013 Liquid Regular Sample Surface Water			EI13-ABD-SW22S-SW SW22 09/04/2013 Liquid Regular Sample Surface Water		
				Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N	13.6		J				8.2		J				13.4		J				10.6		J
METHYL MERCURY	NG/L	1630	N	1.8						0.237						0.463		J				0.143		J
METHYL MERCURY	NG/L	1630	Y				0.559						0.065						0.078		J			
MERCURY, LOW LEVEL	NG/L	1631	N	244						224						156						31.5		
MERCURY, LOW LEVEL	NG/L	1631	Y				3.75						6.22						2.48					

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Field Sample ID / Location / Sample Date / Matrix / Sample Purpose / Sample Type / Filtered	EI13-ABD-SW22S-SW-Z / SW22 / 09/04/2013 / Liquid / Regular Sample / Surface Water			EI13-ABD-SW31S-SW / SW31 / 09/04/2013 / Liquid / Regular Sample / Surface Water			EI13-ABD-SW31S-SW-Z / SW31 / 09/04/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW08D-SW / SW8 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW08D-SW-Z / SW8 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW08S-SW / SW8 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW08S-SW-Z / SW8 / 09/03/2013 / Liquid / Regular Sample / Surface Water		
				Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N				16.5		J				6.5		B				17.7		J			
METHYL MERCURY	NG/L	1630	N				0.135						0.05		J				0.04		J			
METHYL MERCURY	NG/L	1630	Y	0.056		J				0.263						0.071		J					0.02	UJ
MERCURY, LOW LEVEL	NG/L	1631	N				1140						3.95						4.99					
MERCURY, LOW LEVEL	NG/L	1631	Y	6.7						2.63						0.97						1.46		

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
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Parameter Name	Units	Analytical Method	Field Sample ID / Location / Sample Date / Matrix / Sample Purpose / Sample Type	EI13-PLSA-SW09D-SW / SW9 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW09D-SW-Z / SW9 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW09S-SW / SW9 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW09S-SW-Z / SW9 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW10D-SW / SW10 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW10D-SW-Z / SW10 / 09/03/2013 / Liquid / Regular Sample / Surface Water			EI13-PLSA-SW10S-SW / SW10 / 09/03/2013 / Liquid / Regular Sample / Surface Water		
			Filtered	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N	3.8		B				6.2		B				5.4		B				6.8		B
METHYL MERCURY	NG/L	1630	N	0.041		J				0.04		J					0.02	UJ				0.03		J
METHYL MERCURY	NG/L	1630	Y					0.02	UJ				0.028		J					0.02	UJ			
MERCURY, LOW LEVEL	NG/L	1631	N	3.44						6.02						1.72						1.44		
MERCURY, LOW LEVEL	NG/L	1631	Y				0.59						1.46						0.59					

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
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Parameter Name	Units	Analytical Method	Field Sample ID / Location / Sample Date / Matrix / Sample Purpose / Sample Type	EI13-PLSA-SW10S-SW-Z SW10 09/03/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW26S-SW SW26 09/04/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW26S-SW-Z SW26 09/04/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW33S-SW SW33 9/4/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW33S-SW-Z SW33 9/4/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW33D-SW-Z SW33 9/4/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW33D-SW-Z SW33 9/4/2013 Liquid Regular Sample Surface Water		
			Filtered	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N				6.1		J				2.1		B				2.2		J			
METHYL MERCURY	NG/L	1630	N				0.096		J				0.052		J				0.028					
METHYL MERCURY	NG/L	1630	Y		0.02	UJ				0.026		J				0.027		J				0.027		J
MERCURY, LOW LEVEL	NG/L	1631	N				21.6						6.26		B				2.99					
MERCURY, LOW LEVEL	NG/L	1631	Y	0.68						2.5						0.45						0.4		J

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Field Sample ID	EI13-PLSA-SW34S-SW			EI13-PLSA-SW34S-SW-Z			EI13-PLSA-SW35S-SW			EI13-PLSA-SW35S-SW-Z			EI13-PLSA-SW37S-SW			EI13-PLSA-SW37S-SW-Z			EI13-PLSA-SW38S-SW		
			Location	SW34			SW34			SW35			SW36			SW37			SW37			SW38		
			Sample Date	9/4/2013			9/4/2013			9/4/2013			9/4/2013			9/3/2013			9/3/2013			9/3/2013		
			Matrix	Liquid			Liquid			Liquid			Liquid			Liquid			Liquid			Liquid		
			Sample Purpose	Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample		
			Sample Type	Surface Water			Surface Water			Surface Water			Surface Water			Surface Water			Surface Water			Surface Water		
			Filtered	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N	2.4						4.8						7						6.6		
METHYL MERCURY	NG/L	1630	N		0.02	U				0.056						0.044		J				0.048		J
METHYL MERCURY	NG/L	1630	Y					0.02	U				0.054						0.021		J			
MERCURY, LOW LEVEL	NG/L	1631	N	2.23						13						4.23						2.44		
MERCURY, LOW LEVEL	NG/L	1631	Y				0.49						0.49						0.76					

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Field Sample ID Location Sample Date Matrix Sample Purpose Sample Type	EI13-PLSA-SW38S-SW-Z SW38 9/3/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW39S-SW SW39 9/3/2013 Liquid Regular Sample Surface Water			EI13-PLSA-SW39S-SW-Z SW39 9/3/2013 Liquid Regular Sample Surface Water			EI13-REF-SW01D-SW SW1 09/05/2013 Liquid Regular Sample Surface Water			EI13-REF-SW01D-SW-Z SW1 09/05/2013 Liquid Regular Sample Surface Water			EI13-REF-SW01S-SW SW1 09/05/2013 Liquid Regular Sample Surface Water			EI13-REF-SW01S-SW-Z SW1 09/05/2013 Liquid Regular Sample Surface Water		
			Filtered	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N				4.9						2.4		J				2.5		J			
METHYL MERCURY	NG/L	1630	N				0.022		J				0.028		J				0.032		J			
METHYL MERCURY	NG/L	1630	Y		0.02	U					0.02	U					0.02	U				0.026		J
MERCURY, LOW LEVEL	NG/L	1631	N				1.32						1.33		B				2.53		B			
MERCURY, LOW LEVEL	NG/L	1631	Y	0.84						0.62						0.48		B				0.67		B

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-1
Summary of Analytical Data - Surface Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	Field Sample ID	EI13-REF-SW02S-SW			EI13-REF-SW02S-SW-Z			EI13-REF-SW04S-SW			EI13-REF-SW04S-SW-Z			EI13-REF-SW07S-SW			EI13-REF-SW07S-SW-Z			EI13-REF-SW32S-SW			EI13-REF-SW32S-SW-Z		
			Location	SW2			SW2			SW4			SW4			SW7			SW7			SW32			SW32		
			Sample Date	09/05/2013			09/05/2013			09/05/2013			09/05/2013			09/05/2013			09/05/2013			09/05/2013			09/05/2013		
			Matrix	Liquid			Liquid			Liquid			Liquid			Liquid			Liquid			Liquid			Liquid		
			Sample Purpose	Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample			Regular Sample		
			Sample Type	Surface Water			Surface Water			Surface Water			Surface Water			Surface Water			Surface Water			Surface Water			Surface Water		
			Filtered	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
TOTAL SUSPENDED SOLIDS	MG/L	160.2	N	5.1		J				2.7		J				3.2		J				2.6					
METHYL MERCURY	NG/L	1630	N	0.034		J				0.038		J					0.02	U				0.03		J			
METHYL MERCURY	NG/L	1630	Y				0.03		J					0.02	U					0.02	U				0.021		J
MERCURY, LOW LEVEL	NG/L	1631	N	2.4		B				1.88		B				3.23		B				2.46					
MERCURY, LOW LEVEL	NG/L	1631	Y				0.53		B				0.68		B				0.55		B				0.57		

Notes:
MDL - Method Detection Limit.
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-01-SD-091013 PLSA-C1-01 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-04-SD-091013 PLSA-C1-04 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-10-SD-091113 PLSA-C1-10 09/11/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-10-SD-091113-D PLSA-C1-10 09/11/2013 Solid Field Duplicate Sediment			EI13-PLSA-C1-11-SD-091113 PLSA-C1-11 09/11/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-12-SD-091213 PLSA-C1-12 09/12/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-14-SD-090413 PLSA-C1-14 09/04/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-16-SD-091313 PLSA-C1-16 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-19-SD-090413 PLSA-C1-19 09/04/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY																													
MERCURY, LOW LEVEL	UG/KG	1631	2770			631			2120						1870			5730			5270			1230			6140		
METHYL MERCURY	UG/KG	1630	0.706			0.996			4.7		J				0.344		J	2.9			1.13		J	0.38			0.982		J
METALS																													
ALUMINUM	MG/KG	6010B	23700			19600			13300		J	24200		J	20100			19700			18200			18800			16900		
ANTIMONY	MG/KG	6010B		2.57	U		4.38	U		5.13	U		7.4	U		2.28	U		2.75	UJ		2.83	U		2.3	U		2.41	U
ARSENIC	MG/KG	6010B	6.06		J	8.47		J	7.12		J	9.98		J	5.87		J	7.13		J	4.15		J	2.27		J	3.67		J
BARIUM	MG/KG	6010B	156			203			171			282			137			132			133		J	126			115		J
BERYLLIUM	MG/KG	6010B	1.45		J	1.11		J	0.992		J	1.65		J	1.21		J	1.14		J	1.04		J	1.2		J	1.01		J
CADMIUM	MG/KG	6010B	2.07			1.76		J	1.62		J	2.81		J	1.7			1.88			1.69		J	1.68			1.7		
CHROMIUM	MG/KG	6010B	60			45.7			34.6		J	58.6		J	51			94.1		J	38.6			44.6			42.1		
COBALT	MG/KG	6010B	13.6			13.5			10.3		J	17.4		J	11.6			11.6			10.1			11.7			9.96		
COPPER	MG/KG	6010B	113			139			98		J	170		J	88.7			100			125			83.7			107		
LEAD	MG/KG	6010B	155			115			90.3		J	162		J	120			124			96.2		J	97.4			88.9		J
MANGANESE	MG/KG	6010B	999			1740			1330			2110			884			824		J	824		J	840			570		J
NICKEL	MG/KG	6010B	32.2			30.4			24.3		J	42.2		J	27.4			23.3			21.3			24.9			20.2		
SELENIUM	MG/KG	6010B		2.78	U		4.74	U		5.55	U		8	U		2.47	U		2.98	U		3.06	U		2.48	U		2.61	U
SILVER	MG/KG	6010B	2.31			2.26		J	1.93		J	2.73		J	1.89			1.54		J	1.56		J	1.75			1.39		J
THALLIUM	MG/KG	6010B	2.82		J		3.08	U		3.61	U		5.2	U	2.96		J	2.55		J		1.99	U		1.61	U		1.69	U
VANADIUM	MG/KG	6010B	65.7			63.7			39.5		J	68.6		J	69.8			49.2		J	46.7			49.1			39.3		
ZINC	MG/KG	6010B	319			303			255		J	438		J	259			323				252	J	282			259		J
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE																													
CADMIUM	UMOL/G	6010B	0.00886		J	0.0067		J	0.00975		J	0.0112		J	0.00899		J	0.00599		J	0.00738		J	0.0109			0.00655		J
COPPER	UMOL/G	6010B	0.725		J	1.13		J	0.836		J	1.1		J	0.708		J	0.822		J	0.871		J	0.739		J	0.446		J
LEAD	UMOL/G	6010B	0.447			0.348			0.375			0.47			0.44			0.29			0.333			0.368			0.271		
MERCURY	UMOL/G	7471A	0.00004		B	0.000048		B	0.0000719		J	0.0000991		J		0.000023	R	0.000047		B	0.000041		B	0.000031		J	0.000034		B
NICKEL	UMOL/G	6010B	0.121		J	0.107		J	0.136		J	0.158		J	0.121		J	0.104		J	0.0947		J	0.156			0.0784		J
SILVER	UMOL/G	6010B	0.00186		J		0.0024	R		0.00275	R		0.00381	R	0.00225		J	0.00176		J		0.00148	R	0.00269		J		0.00126	R
ZINC	UMOL/G	6010B	2.61			2.5			3.03			3.61			2.58			2.33			2.38			3.18			2.22		
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--	17.91			19.29			35.39			46.55			14.86			14.45			26.49			13.86			44.72		
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	14			15.2			31			41.2			11			10.9			22.8			9.4		J	41.7		
PESTICIDES																													
4,4'-DDD	UG/KG	8081A	3.6		J		3	U		3.5	U		5.9	U		2.7	U	9.6		J	2.6		J		6	U	4.6		J
4,4'-DDE	UG/KG	8081A	4.6		J	5.3		J		3.5	U		5	U	4.5		J		9.5	U	2.4		J	9.2		J	1.5		J
4,4'-DDT	UG/KG	8081A	3.6		J	3.6		J		3.8	U		5.3	U	3.8		J		10	U	2.2		J	4.4		J	1.4		J
ALDRIN	UG/KG	8081A	2		J		1.6	U	2.6		J	18				0.81	U	8.9		J	3.7				1.1	U	1.6		J
ALPHA CHLORDANE	UG/KG	8081A		0.9	U	7		J		1.8	U		2.6	U	1.7		J		4.9	U	0.99		J	2.8		J	0.96		J
ALPHA-BHC	UG/KG	8081A		0.9	U		1.6	U		1.8	U		2.6	U	1.2		J	14		J	2.7		J		1.1	U		0.56	U
BETA-BHC	UG/KG	8081A		1.6	U		2.7	U		3.2	U		4.5	U		1.4	U		8.6	U		1.2	U		2.1	U		1	U
DELTA-BHC	UG/KG	8081A		2.6	U		4.1	U	5.2 J		J	33		J	3.2		J	38			10				2.8	U	20		
DIELDRIN	UG/KG	8081A		1.8	U		3	U		3.5	U		5	U		1.6	U		9.5	U		1.3	U		2.1	U		1.1	U
ENDOSULFAN I	UG/KG	8081A		1.2	U		2	U		2.4	U		3.3	U		1	U		6.3	U		0.85	U		1.4	U		0.83	U
ENDOSULFAN II	UG/KG	8081A		1.8	U		3	U		3.5	U		5	U		1.6	U		9.5	U		1.3	U		2.1	U	2.3		J
ENDOSULFAN SULFATE	UG/KG	8081A		1.8	U		3	U		3.5	U		5	U		1.6	U		9.5	U		1.3	U		2.1	U		1.1	U
ENDRIN	UG/KG	8081A		1.8	U		3	U		3.5	U		5	U		1.6	U		9.5	U		1.3	U		2.1	U		1.1	U
ENDRIN ALDEHYDE	UG/KG	8081A	2.9		J		3	U		3.5	U		5	U	1.7		J		9.5	U		1.3	U		2.1	U	1.5		J
ENDRIN KETONE	UG/KG	8081A		3.2	U		5.5	U		6.4	U		9.1	U		2.9	U		17	U		2.3	U		3.8	U		2	U
Gamma Chlordane	UG/KG	8081A		1.1	U		2.1	U		2.8	U		2.6	U		1.8	U		4.9	U		0.66	U		2.9	U		0.56	U
HEPTACHLOR	UG/KG	8081A	5.1			1.9		J	3.2		J	23		J	3.2		J	23		J		6.2	U		1.1	U	5.8		
HEPTACHLOR EPOXIDE	UG/KG	8081A		1.1	U		1.6	U		2	U		2.9	U		1.1	R		4.9	U		1.2	U		1.1	U		0.56	U
LINDANE	UG/KG	8081A		2.3	U		2.6	U		3.7	U		35	U		2.9	U		46	U		12	U		6.6	U		14	U
METHOXYCHLOR	UG/KG	8081A		9	U		16	U		18	U		26	U		8.1	U		49	U		6.6	U		11	U		5.6	U
TOXAPHENE	UG/KG	8081A		74	U		130	U		150	U		210	U		67	U		400	U		54	U		88	U		47	U
2,4,5-T	UG/KG	8151A		2.9	U		5	U		5.9	U		8.3	U		2.6	U		3.1	R		3.1	U		2.6	U		2.7	U
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A		43	U		73	U		86	U		120	U		38	U		46	R		46	U		38	U		40	U
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A		22	U		38	U		44	U		63	U		20	U		24	R		24	U		19	U		20	U
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A		2700	U		4600	U		5400	U		7600	U		2400	U		2900	R		2900	U		2400	U		2500	U
DALAPON 85	UG/KG	8151A		160	U		270	U		310	U		440	U		140	U		170	R		170	U		140	U		150	U
DICAMBA	UG/KG	8151A		14	U		24	U		29	U		40	U		13	U		15	R		15	U		13	U		13	U
DICHLOROPROP	UG/KG	8151A		32	U		55	U		64	U		91	U		29	U		34	R		34	U		28	U		30	U
DINOSEB	UG/KG	8151A		32	U		55	U		64	U		91	U		29	U		34	R		34	U		28	R		30	U
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A		2700	U		4600	U		5400	U		7700	U		2400	U		2900	R		2900	U		2400	U			
PENTACHLOROPHENOL	UG/KG	8151A		1.2	U	6.2		J		2.4	U		3.3	U	1.3		J		1.3	R	2.7		J		1	U	5.4		J
SILVEX	UG/KG	8151A		2.7	U		4.6	U	8.7		J	9.6		J		2.4	U		2.9	R		2.9	U		2.4	U	8.3		
SEMI-VOLATILE ORGANIC COMPOUNDS																													
1,2,4-TRICHLOROBENZENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
1,2-DICHLOROBENZENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
1,3-DICHLOROBENZENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
1,4-DICHLOROBENZENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2,4,5-TRICHLOROPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2,4,6-TRICHLOROPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2,4-DICHLOROPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2,4-DIMETHYLPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2,4-DINITROPHENOL	UG/KG	8270C		21000	U		36000	U		41000	U		59000	U		18000	U		22000	U		1100	U		28000	U		990	U
2,4-DINITROTOLUENE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U

Table D-2
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Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-01-SD-091013 PLSA-C1-01 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-04-SD-091013 PLSA-C1-04 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-10-SD-091113 PLSA-C1-10 09/11/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-10-SD-091113-D PLSA-C1-10 09/11/2013 Solid Field Duplicate Sediment			EI13-PLSA-C1-11-SD-091113 PLSA-C1-11 09/11/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-12-SD-091213 PLSA-C1-12 09/12/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-14-SD-090413 PLSA-C1-14 09/04/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-16-SD-091313 PLSA-C1-16 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-19-SD-090413 PLSA-C1-19 09/04/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																													
2,6-DINITROTOLUENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2-CHLORONAPHTHALENE	UG/KG	8270C		490	U		830	U		970	U		1400	U		430	U		520	U		27	U		660	U		23	U
2-CHLOROPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2-METHYLNAPHTHALENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U	14		J		310	U	17		J
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2-NITROANILINE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
2-NITROPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
3,3'-DICHLOROBENZIDINE	UG/KG	8270C		7000	U		12000	U		14000	U		20000	U		6100	U		7400	U		380	U		9400	U		330	U
3-NITROANILINE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C		12000	U		20000	U		23000	U		33000	U		10000	U		12000	U		640	U		16000	U		550	U
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
4-CHLOROANILINE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
4-NITROANILINE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
4-NITROPHENOL	UG/KG	8270C		12000	U		20000	U		23000	U		33000	U		10000	U		12000	U		640	U		16000	U		550	U
ACENAPHTHENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U	19		J		310	U	15 J		J
ACENAPHTHYLENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U	34		J		310	U	35 J		J
ANTHRACENE	UG/KG	8270C	310		J		400	U		460	U		650	U		200	U		250	U	57		J		310	U	46 J		J
BENZO(A)ANTHRACENE	UG/KG	8270C	1100		J	690		J	580		J	660		J	890		J	500		J	240			590		J	210		
BENZO(B)FLUORANTHENE	UG/KG	8270C	2000			1600		J	1000		J	1100		J	1700			940		J	430			1200		J	410		
BENZO(G,H,I)PERYLENE	UG/KG	8270C	1100		J	840		J	750		J	660		J	740		J	650		J	250			530		J	230		
BENZO(K)FLUORANTHENE	UG/KG	8270C	740		J	660		J	480		J	800		J	610		J	740		J	160			420		J	150		
BENZO[A]PYRENE	UG/KG	8270C	1300			990		J	750		J	670		J	940		J	680		J	290			1000		J	280		
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
BUTYL BENZYL PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
CARBAZOLE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
CHRYSENE	UG/KG	8270C	1400			1300		J	870		J	960		J	1200			930		J	270			820		J	270		
DI-N-BUTYL PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C	480		J		400	U		460	U		650	U		200	U		250	U	47		J		310	U	49		J
DIBENZOFURAN	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
DIETHYL PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
DIMETHYL PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
FLUORANTHENE	UG/KG	8270C	2900			2100			1300		J	1300		J	2300			1300			490			1300		J	460		
FLUORENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U	26		J		310	U	22		J
HEXACHLOROBENZENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U		13	U		310	U		11	U
HEXACHLOROBUTADIENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C		12000	U		20000	U		23000	U		33000	U		10000	U		12000	U		640	U		16000	U		550	U
HEXACHLOROETHANE	UG/KG	8270C		2300	U		4000	U		4600	U		6500	U		2000	U		2500	U		130	U		3100	U		110	U
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C	1000		J	630		J	500		J	710		J	600		J	470		J	200			590		J	200		
ISOPHORONE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
N-DIOCTYL PHTHALATE	UG/KG	8270C		4700	U		7900	U		9200	U		13000	U		4100	U		4900	U		250	U		6300	U		220	U
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
N-NITROSODIPHENYLAMINE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
NAPHTHALENE	UG/KG	8270C		230	U		400	U		460	U		650	U		200	U		250	U	27		J		310	U	25		J
NITROBENZENE	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U		1600	U		55	U
PENTACHLOROPHENOL	UG/KG	8270C		2300	U		4000	U		4600	U		6500	U		2000	U		2500	U		130	U		3100	U		110	U
PHENANTHRENE	UG/KG	8270C	1300			710		J	650		J	720		J	960		J	590		J	210			550		J	220		
PHENOL	UG/KG	8270C		1200	U		2000	U		2300	U		3300	U		1000	U		1200	U		64	U	1600	1600	U		55	U
PYRENE	UG/KG	8270C	2500			1800		J	1300		J	1700		J	2100			1200		J	450			1200		J	440		
OTHER SEDIMENT PARAMETERS																													
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	35000			58600			105000			98900			19500			47800			28500			21500			28600		
PERCENT MOISTURE	%	2540 G-1997	71.8			83.6			86			90.1			68.5			73.9		J	74.1			68.1			69.9		
TOTAL SOLIDS	%	2540 G-1997	33.12			23.66			15.81						39.98			27.35			28.39			37.82			28.03		
GRAIN SIZE DISTRIBUTION																													
0.001 MM	% PASSING	D422	3				0.5	U	8.5			8				0.5	U		0.5	U		0.5	U		0.5	U		0.5	U
0.002 MM	% PASSING	D422	11			2			11			11			5			4			3			4.5			1.5		
0.005 MM	% PASSING	D422	23			7			16.5			16			14			10			10			12.5			6.5		
0.02 MM	% PASSING	D422	55			37			42			43			39			32			34			42			38		
0.05 MM	% PASSING	D422	76			70			69			70			56			47			68.5			68.5			57		
0.064 MM	% PASSING	D422	83			79			78			76			64			53			78.5			77.5			61.5		
0.075 MM	% PASSING	D422	84.9			84.2			81.1			78.4			67.1			54.7			83.3			81.8			65.1		
0.15 MM	% PASSING	D422	90.7			94.3			88.6			84.9			77.6			57.1			95.2			93.7			85.5		
0.3 MM	% PASSING	D422	98			96.8			93.6			89.9			97.4			59.5			96.9			98.2			97.2		
0.6 MM	% PASSING	D422	98.9			97.5			95.6			94.7			99.1			64.3			97.4			98.8			98.3		
1.18 MM	% PASSING	D422	99.2			98.1			98.9			96.9			99.3			69.4			97.5			99.4			98.5		
19 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
2.36 MM	% PASSING	D422	99.7			98.6			100			98			99.8			73.8			98.6			99.9			99.6		
3.35 MM	% PASSING	D422	99.8			99.5			100			98.7			99.9			79.5			99.2			100			99.8		
37.5 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
4.75 MM	% PASSING	D422	99.9			100			100			99.7			100			85.8			99.8			100			100		
75 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-20-SD-090613 PLSA-C1-20 09/06/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-22-SD-090513 PLSA-C1-22 09/05/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-24-SD-090913 PLSA-C1-24 09/09/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY											
MERCURY, LOW LEVEL	UG/KG	1631	635			12400			3370		
METHYL MERCURY	UG/KG	1630	0.337		J	1.11		J	0.849		J
METALS											
ALUMINUM	MG/KG	6010B	5610		J	21000			5740		J
ANTIMONY	MG/KG	6010B		0.725	UJ		2.87	U		0.725	UJ
ARSENIC	MG/KG	6010B	1.69		J		2.72	U	1.95		J
BARIUM	MG/KG	6010B	42.9		J	141		J	41.3		J
BERYLLIUM	MG/KG	6010B	0.367		J	1.18		J	0.37		J
CADMIUM	MG/KG	6010B	0.319		J	2.07			0.482		J
CHROMIUM	MG/KG	6010B	11.7		J	47.7			14.6		J
COBALT	MG/KG	6010B	3.25			11.7			3.9		
COPPER	MG/KG	6010B	21		J	190			37.1		J
LEAD	MG/KG	6010B	20.3		J	126		J	31.1		J
MANGANESE	MG/KG	6010B	273			751		J	193		
NICKEL	MG/KG	6010B	6.79			25			8.01		
SELENIUM	MG/KG	6010B		0.784	U		3.11	U		0.784	U
SILVER	MG/KG	6010B	0.31		B	1.67		J	0.396		B
THALLIUM	MG/KG	6010B	0.575		J		2.02	U	0.549		J
VANADIUM	MG/KG	6010B	15.1		J	44.7			12.6		J
ZINC	MG/KG	6010B	69.6			325		J	96.7		
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE											
CADMIUM	UMOL/G	6010B	0.00501		J	0.00978		J	0.0064		J
COPPER	UMOL/G	6010B	0.478		J	1.26		J	0.779		J
LEAD	UMOL/G	6010B	0.203			0.449			0.233		
MERCURY	UMOL/G	7471A	0.000027		B	0.000047		B	0.00003		B
NICKEL	UMOL/G	6010B	0.0873		J	0.0986		J	0.075		J
SILVER	UMOL/G	6010B		0.00135	R		0.00156	R		0.00122	R
ZINC	UMOL/G	6010B	1.79			3.15			2.19		
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--	6.26			23.87			15.18		
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	3.7		J	18.9			11.9		
PESTICIDES											
4,4'-DDD	UG/KG	8081A		1.5	U	19				1.8	U
4,4'-DDE	UG/KG	8081A	1.5		J		2.4	U	1.8		J
4,4'-DDT	UG/KG	8081A	1.2		J	2.9		J	1.1		J
ALDRIN	UG/KG	8081A		0.34	U		9.6	U		2.5	U
ALPHA CHLORDANE	UG/KG	8081A	1.5		J		0.68	U		0.34	U
ALPHA-BHC	UG/KG	8081A		0.34	U		0.68	U		0.42	U
BETA-BHC	UG/KG	8081A	2.7			7.3			3.7		
DELTA-BHC	UG/KG	8081A		0.89	U		10	U		1.7	U
DIELDRIN	UG/KG	8081A		0.65	U		1.3	U		0.66	U
ENDOSULFAN I	UG/KG	8081A		0.45	U	12				0.44	U
ENDOSULFAN II	UG/KG	8081A		0.65	U		1.3	U	0.68		J
ENDOSULFAN SULFATE	UG/KG	8081A		0.65	U		1.3	U		0.66	U
ENDRIN	UG/KG	8081A		0.65	U		1.3	U		0.68	U
ENDRIN ALDEHYDE	UG/KG	8081A	0.65		J		2.6	U		0.66	U
ENDRIN KETONE	UG/KG	8081A		1.2	U		2.4	U		1.2	U
Gamma Chlordane	UG/KG	8081A		0.82	U		0.68	U		1.8	U
HEPTACHLOR	UG/KG	8081A		0.34	U		20	U	2.5		
HEPTACHLOR EPOXIDE	UG/KG	8081A		0.34	U		1.8	U		0.34	U
LINDANE	UG/KG	8081A		1.7	U		37	U	3.3		
METHOXYCHLOR	UG/KG	8081A		3.4	U		18	U		3.4	U
TOXAPHENE	UG/KG	8081A		28	U		180	U		28	U
2,4,5-T	UG/KG	8151A		0.82	U		3.3	U	0.85		J
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A		12	U		48	U		12	U
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A		6.2	U		25	U		6.2	U
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A		750	U		3000	U		750	U
DALAPON 85	UG/KG	8151A		44	U		180	U		44	U
DICAMBA	UG/KG	8151A		4	U		16	U		4	U
DICHLOROPROP	UG/KG	8151A		9	U		36	U		9	U
DINOSEB	UG/KG	8151A		9	U		36	U		9	U
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A		760	U		3000	U		760	U
PENTACHLOROPHENOL	UG/KG	8151A		0.33	U	2.9		J		0.33	U
SILVEX	UG/KG	8151A		0.75	U	3.9		J		0.75	U
SEMI-VOLATILE ORGANIC COMPOUNDS											
1,2,4-TRICHLOROBENZENE	UG/KG	8270C		17	U		66	U		17	U
1,2-DICHLOROBENZENE	UG/KG	8270C		17	U		66	U		17	U
1,3-DICHLOROBENZENE	UG/KG	8270C		17	U		66	U		17	U
1,4-DICHLOROBENZENE	UG/KG	8270C		17	U		66	U		17	U
2,4,5-TRICHLOROPHENOL	UG/KG	8270C		17	U		66	U		17	U
2,4,6-TRICHLOROPHENOL	UG/KG	8270C		17	U		66	U		17	U
2,4-DICHLOROPHENOL	UG/KG	8270C		17	U		66	U		17	U
2,4-DIMETHYLPHENOL	UG/KG	8270C		17	U		66	U		17	U
2,4-DINITROPHENOL	UG/KG	8270C		300	U		1200	U		300	U
2,4-DINITROTOLUENE	UG/KG	8270C		67	U		260	U		66	U

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-25-SD-090513 PLSA-C1-25 09/05/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-28-SD-091713 PLSA-C1-28 09/17/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-30-SD-091713 PLSA-C1-30 09/17/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY											
MERCURY, LOW LEVEL	UG/KG	1631	2970			40.1			1100		
METHYL MERCURY	UG/KG	1630	0.458		J	0.053		J	1.43		J
METALS											
ALUMINUM	MG/KG	6010B	15900			4330			12800		
ANTIMONY	MG/KG	6010B		2.42	U		1.06	UJ		4.71	UJ
ARSENIC	MG/KG	6010B	2.88		J		1	U		4.46	U
BARIUM	MG/KG	6010B	112		J	25.5			130		
BERYLLIUM	MG/KG	6010B	0.915		J	0.229		J	0.821		J
CADMIUM	MG/KG	6010B	1.59		J	0.355		J	1.13		J
CHROMIUM	MG/KG	6010B	40.6			11.6		J	27.2		J
COBALT	MG/KG	6010B	10.6			3.94			7.72		
COPPER	MG/KG	6010B	145			10.3			62.6		
LEAD	MG/KG	6010B	74		J	8.92			66.1		
MANGANESE	MG/KG	6010B	741		J	160			1240		
NICKEL	MG/KG	6010B	19.8			6.51		J	16		J
SELENIUM	MG/KG	6010B		2.61	U		1.14	U		5.09	U
SILVER	MG/KG	6010B	1.3		J	0.305		J	1.88		J
THALLIUM	MG/KG	6010B		1.7	U		0.744	U		3.31	U
VANADIUM	MG/KG	6010B	38.2			19.9			32		
ZINC	MG/KG	6010B	247		J	40.4			206		
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE											
CADMIUM	UMOL/G	6010B	0.00769		J	0.00118		J	0.0128		
COPPER	UMOL/G	6010B	0.824		J	0.0931		J	1.05		J
LEAD	UMOL/G	6010B	0.292			0.0291			0.396		
MERCURY	UMOL/G	7471A	0.000031		B	0.000014		J	0.0000623		J
NICKEL	UMOL/G	6010B	0.0837		J	0.0313			0.19		
SILVER	UMOL/G	6010B		0.00131	R		0.000574	R	0.00433		J
ZINC	UMOL/G	6010B	2.66			0.385			3.88		
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--	21.37			0.54			30.63		
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	17.5				0.93	R	25.1		J
PESTICIDES											
4,4'-DDD	UG/KG	8081A		4	U		0.97	U		4.4	U
4,4'-DDE	UG/KG	8081A		5	U	3.1		J	5.6		J
4,4'-DDT	UG/KG	8081A	6.7				5.2	U		4.6	U
ALDRIN	UG/KG	8081A	2.1		J		0.5	U		2.3	U
ALPHA CHLORDANE	UG/KG	8081A	1.3		J	0.56		J	4.1		J
ALPHA-BHC	UG/KG	8081A	1.2		J		0.5	U	3.4		J
BETA-BHC	UG/KG	8081A		1.6	U		0.88	U		4	U
DELTA-BHC	UG/KG	8081A		21	U		1.3	U		6	U
DIELDRIN	UG/KG	8081A		2.3	U		0.97	U		4.4	U
ENDOSULFAN I	UG/KG	8081A	1.2		J		0.65	U		2.9	U
ENDOSULFAN II	UG/KG	8081A		1.2	U		0.97	U		4.4	U
ENDOSULFAN SULFATE	UG/KG	8081A		1.1	U		0.97	U		4.4	U
ENDRIN	UG/KG	8081A		1.3	U		0.97	U		4.4	U
ENDRIN ALDEHYDE	UG/KG	8081A	2.3		J		0.97	U		4.4	U
ENDRIN KETONE	UG/KG	8081A		2	U		1.8	U		7.9	U
Gamma Chlordane	UG/KG	8081A		1.7	U		0.65	U		3.4	U
HEPTACHLOR	UG/KG	8081A	8.3				0.5	U	5.2		J
HEPTACHLOR EPOXIDE	UG/KG	8081A		1.2	U		0.68	U		2.3	U
LINDANE	UG/KG	8081A		19	U		0.5	U		9.3	U
METHOXYCHLOR	UG/KG	8081A		5.7	U		5	U		23	U
TOXAPHENE	UG/KG	8081A		47	U		41	U		190	U
2,4,5-T	UG/KG	8151A		2.7	U		1.2	U		5.4	U
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A		40	U		18	U		79	U
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A		21	U		9.1	U		41	U
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A		2500	U		1100	U		5000	U
DALAPON 85	UG/KG	8151A		150	U		65	U		290	U
DICAMBA	UG/KG	8151A		13	U		5.9	U		26	U
DICHLOROPROP	UG/KG	8151A		30	U		13	U		60	U
DINOSEB	UG/KG	8151A		30	U		13	R		60	R
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A		2500	U		1100	U		5000	U
PENTACHLOROPHENOL	UG/KG	8151A	4.9		J		0.49	U		2.2	U
SILVEX	UG/KG	8151A		2.5	U		1.1	U		5	U
SEMI-VOLATILE ORGANIC COMPOUNDS											
1,2,4-TRICHLOROBENZENE	UG/KG	8270C		55	U		25	U		110	U
1,2-DICHLOROBENZENE	UG/KG	8270C		55	U		25	U		110	U
1,3-DICHLOROBENZENE	UG/KG	8270C		55	U		25	U		110	U
1,4-DICHLOROBENZENE	UG/KG	8270C		55	U		25	U		110	U
2,4,5-TRICHLOROPHENOL	UG/KG	8270C		55	U		25	U		110	U
2,4,6-TRICHLOROPHENOL	UG/KG	8270C		55	U		25	U		110	U
2,4-DICHLOROPHENOL	UG/KG	8270C		55	U		25	U		110	U
2,4-DIMETHYLPHENOL	UG/KG	8270C		55	U		25	U		110	U
2,4-DINITROPHENOL	UG/KG	8270C		990	U		440	U		2000	U
2,4-DINITROTOLUENE	UG/KG	8270C		220	U		98	U		440	U

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-33-SD-091613 PLSA-C1-33 09/16/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-39-SD-092413 PLSA-C1-39 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-40-SD-092513 PLSA-C1-40 09/25/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY											
MERCURY, LOW LEVEL	UG/KG	1631	1070			2640			23500		
METHYL MERCURY	UG/KG	1630	0.867			0.845		J	1.43		J
METALS											
ALUMINUM	MG/KG	6010B	16500			25500			25700		
ANTIMONY	MG/KG	6010B		3.85	U	2.63		J		3.39	U
ARSENIC	MG/KG	6010B		3.65	U	9.63			7.81		J
BARIUM	MG/KG	6010B	150			168			174		
BERYLLIUM	MG/KG	6010B	1.05		J	1.52		J	1.55		J
CADMIUM	MG/KG	6010B	1.52		J	1.77			2.43		
CHROMIUM	MG/KG	6010B	35.1			58			65.7		
COBALT	MG/KG	6010B	9.42			13.2			14.8		
COPPER	MG/KG	6010B	72.4			117			407		
LEAD	MG/KG	6010B	81.5			184			263		
MANGANESE	MG/KG	6010B	1280			902			831		
NICKEL	MG/KG	6010B	21.4			34.7			34.4		
SELENIUM	MG/KG	6010B		4.17	U		2.45	U		3.67	U
SILVER	MG/KG	6010B	1.87		J	1.75			1.12		J
THALLIUM	MG/KG	6010B		2.71	U		1.59	U		2.38	U
VANADIUM	MG/KG	6010B	43.7			62.9			52.6		
ZINC	MG/KG	6010B	245			330			439		
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE											
CADMIUM	UMOL/G	6010B	0.0115			0.00881			0.0142		J
COPPER	UMOL/G	6010B	0.795		J	0.73		J	1.82		
LEAD	UMOL/G	6010B	0.385			0.412			0.737		
MERCURY	UMOL/G	7471A	0.00004		J	0.000026		J	0.000036		B
NICKEL	UMOL/G	6010B	0.173			0.169			0.121		
SILVER	UMOL/G	6010B	0.00257		J	0.00242		J	0.00206		J
ZINC	UMOL/G	6010B	3.45			2.51			3.92		
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--	21.82			11.83			29.01		
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	17		J	8		J	22.4		
PESTICIDES											
4,4'-DDD	UG/KG	8081A		5.7	U		1.5	U		1.5	U
4,4'-DDE	UG/KG	8081A	7.5		J	3.1		J		1.5	U
4,4'-DDT	UG/KG	8081A	4.8		J	1.5		J		1.6	U
ALDRIN	UG/KG	8081A		1.8	U		0.52	U		0.79	U
ALPHA CHLORDANE	UG/KG	8081A		3	U	0.91		J		0.79	U
ALPHA-BHC	UG/KG	8081A	2.8		J		0.52	U		0.79	U
BETA-BHC	UG/KG	8081A		4.6	U		0.93	U		1.4	U
DELTA-BHC	UG/KG	8081A	8.2		J		1.4	U		2.1	U
DIELDRIN	UG/KG	8081A		3.4	U		1	U		1.5	U
ENDOSULFAN I	UG/KG	8081A		2.3	U		0.68	U		1	U
ENDOSULFAN II	UG/KG	8081A		3.4	U		1	U		1.5	U
ENDOSULFAN SULFATE	UG/KG	8081A		3.4	U		1	U		1.5	U
ENDRIN	UG/KG	8081A		3.4	U		1	U		1.5	U
ENDRIN ALDEHYDE	UG/KG	8081A		3.4	U		1	U		1.5	U
ENDRIN KETONE	UG/KG	8081A		6.3	U		1.9	U		2.8	U
Gamma Chlordane	UG/KG	8081A		3.3	U		0.91	U		0.79	U
HEPTACHLOR	UG/KG	8081A		6.3	U		0.52	U		0.79	U
HEPTACHLOR EPOXIDE	UG/KG	8081A		1.8	U		0.59	U		0.79	U
LINDANE	UG/KG	8081A		13	U		0.52	U		0.79	U
METHOXYCHLOR	UG/KG	8081A		18	U		5.2	U		7.9	U
TOXAPHENE	UG/KG	8081A		150	U		43	U		65	U
2,4,5-T	UG/KG	8151A		4.3	U		2.5	U		3.8	U
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A		62	U		37	U		56	U
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A		32	U		19	U		29	U
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A		3900	U		2300	U		3500	U
DALAPON 85	UG/KG	8151A		230	U		140	U		210	U
DICAMBA	UG/KG	8151A		21	U		12	U		19	U
DICHLOROPROP	UG/KG	8151A		47	U		28	U		42	U
DINOSEB	UG/KG	8151A		47	R		28	U		42	U
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A		4000	U		2400	U		3600	U
PENTACHLOROPHENOL	UG/KG	8151A		1.7	U	4.8		J		2	U
SILVEX	UG/KG	8151A		3.9	U		2.3	U	8.7		
SEMI-VOLATILE ORGANIC COMPOUNDS											
1,2,4-TRICHLOROBENZENE	UG/KG	8270C		2600	U		260	U		77	U
1,2-DICHLOROBENZENE	UG/KG	8270C		2600	U		260	U		77	U
1,3-DICHLOROBENZENE	UG/KG	8270C		2600	U		260	U		77	U
1,4-DICHLOROBENZENE	UG/KG	8270C		2600	U		260	U		77	U
2,4,5-TRICHLOROPHENOL	UG/KG	8270C		2600	U		260	U		77	U
2,4,6-TRICHLOROPHENOL	UG/KG	8270C		2600	U		260	U		77	U
2,4-DICHLOROPHENOL	UG/KG	8270C		2600	U		260	U		77	U
2,4-DIMETHYLPHENOL	UG/KG	8270C		2600	U		260	U		77	U
2,4-DINITROPHENOL	UG/KG	8270C		47000	U		4700	U		1400	U
2,4-DINITROTOLUENE	UG/KG	8270C		10000	U		1000	U		310	U

Table D-2
Summary of Analytical Data - Sediment Samples
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DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-20-SD-090613 PLSA-C1-20 09/06/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-22-SD-090513 PLSA-C1-22 09/05/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-24-SD-090913 PLSA-C1-24 09/09/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-25-SD-090513 PLSA-C1-25 09/05/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-28-SD-091713 PLSA-C1-28 09/17/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-30-SD-091713 PLSA-C1-30 09/17/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-33-SD-091613 PLSA-C1-33 09/16/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-39-SD-092413 PLSA-C1-39 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C1-40-SD-092513 PLSA-C1-40 09/25/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																													
2,6-DINITROTOLUENE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
2-CHLORONAPHTHALENE	UG/KG	8270C		7	U		28	U		7	U		23	U		10	U		46	U		1100	U		110	U		32	U
2-CHLOROPHENOL	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		440	U		2600	U		260	U		77	U
2-METHYLNAPHTHALENE	UG/KG	8270C		3	U	24		J	7		J	17		J	5		J		22	U		520	U		52	U		15	U
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
2-NITROANILINE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
2-NITROPHENOL	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
3,3'-DICHLOROBENZIDINE	UG/KG	8270C		100	U		400	U		99	U		330	U		150	U		660	U		16000	U		1600	U		460	U
3-NITROANILINE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		1000	U		1000	U		310	U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C		170	U		660	U		170	U		550	U		250	U		1100	U		26000	U		2600	U		770	U
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
4-CHLOROANILINE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C		17	U		66	U	19		J		55	U		25	U		110	U		2600	U		260	U		77	U
4-NITROANILINE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
4-NITROPHENOL	UG/KG	8270C		170	U		660	U		170	U		550	U		250	U		1100	U		26000	U		2600	U		770	U
ACENAPHTHENE	UG/KG	8270C	4		J	23		J	6		J	18		J	8		J	22		J		520	U	87		J	27		J
ACENAPHTHYLENE	UG/KG	8270C	6		J	71			16		J	41		J	16		J	36		J		520	U	140		J	63		J
ANTHRACENE	UG/KG	8270C	10		J	80			21			57			27			50		J	620		J	230		J	82		
BENZO(A)ANTHRACENE	UG/KG	8270C	35			320			83			240			110			220			1800		J	810			320		
BENZO(B)FLUORANTHENE	UG/KG	8270C	73			550			150			470			210			420			3200			1400			500		
BENZO(G,H,I)PERYLENE	UG/KG	8270C	36			330			84			260			110			260			2200		J	770			300		
BENZO(K)FLUORANTHENE	UG/KG	8270C	26			220			57			190			75			160			1800		J	560			220		
BENZO[A]PYRENE	UG/KG	8270C	48			410			110			340			140			290			2400		J	970			390		
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C		67	U		260	U		66	U	310		J		98	U		440	U		10000	U		1000	U		310	U
BUTYL BENZYL PHTHALATE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
CARBAZOLE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
CHRYSENE	UG/KG	8270C	48			390			110			310			140			290			2400		J	960			430		
DI-N-BUTYL PHTHALATE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C	9		J	81			19			61			26			52		J		520	U	170		J	59		J
DIBENZOFURAN	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
DIETHYL PHTHALATE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
DIMETHYL PHTHALATE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
FLUORANTHENE	UG/KG	8270C	80			640			180			520			260			510			3800			1900			630		
FLUORENE	UG/KG	8270C	4		J	38		J	7		J	28		J	13		J	24		J		520	U	120		J	34		J
HEXACHLOROBENZENE	UG/KG	8270C		3	U		13	U		3	U		11	U		5	U		22	U		520	U		52	U		15	U
HEXACHLOROBUTADIENE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C		170	U		660	U		170	U		550	U		250	U		1100	U		26000	U		2600	U		770	U
HEXACHLOROETHANE	UG/KG	8270C		33	U		130	U		33	U		110	U		49	U		220	U		5200	U		520	U		150	U
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C	32			300			67			230			100			180			1800		J	590			230		
ISOPHORONE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
N-DIOCTYL PHTHALATE	UG/KG	8270C		67	U		260	U		66	U		220	U		98	U		440	U		10000	U		1000	U		310	U
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
N-NITROSODIPHENYLAMINE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
NAPHTHALENE	UG/KG	8270C	4		J	38		J	12		J	26		J	7		J	23		J		520	U	59		J	23		J
NITROBENZENE	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
PENTACHLOROPHENOL	UG/KG	8270C		33	U		130	U		33	U		110	U		49	U		220	U		5200	U		520	U		150	U
PHENANTHRENE	UG/KG	8270C	40			310			89			270			110			230			1500		J	980			310		
PHENOL	UG/KG	8270C		17	U		66	U		17	U		55	U		25	U		110	U		2600	U		260	U		77	U
PYRENE	UG/KG	8270C	76			660			180			530			250			490			3700			1800			660		
OTHER SEDIMENT PARAMETERS																													
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	6320			34300			9490			33300			3100			95700			56400			44700			35700		
PERCENT MOISTURE	%	2540 G-1997	71.1		J	75			69		J	70			32.1			84.9			80.8			68			78.6		
TOTAL SOLIDS	%	2540 G-1997	32.9			25.78			30.28			31.37			72.32			17.67			21.23			32.46		J	25.42		J
GRAIN SIZE DISTRIBUTION																													
0.001 MM	% PASSING	D422		0.5	U	1			1			1				0.5	U	1.5				0.5	U	7			2.5		
0.002 MM	% PASSING	D422		0.5	U	3			3.5			3				0.5	U	2			4.5			13			11		
0.005 MM	% PASSING	D422	4			9			8.5			8				0.5	U	7			16			25			22		
0.02 MM	% PASSING	D422	22			40			29			28.5			1			29.5			43			70.5			55		
0.05 MM	% PASSING	D422	68			78			69			34			2.5			58.5			68			87.5			82		
0.064 MM	% PASSING	D422	77			88			81			21			7			79			80			87.5			86		
0.075 MM	% PASSING	D422	83.1			92.6			87.1			15.8			8.5			86.7			84.6			88.2			88.7		
0.15 MM	% PASSING	D422	94.2			96.9			94.8			17.4			24.7			91.9			90.9			94			91.3		
0.3 MM	% PASSING	D422	97.2			97.7			97.3			21.3			94			94.1			94.3			96.6			98.3		
0.6 MM	% PASSING	D422	98.6			98.3			98.1			28.8			99.4			95.2			95.9			98.2			98.7		
1.18 MM	% PASSING	D422	99.1			98.4			98.4			45.6			99.6			97			97.2			99.2			98.9		
19 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
2.36 MM	% PASSING	D422	99.7			99			99.2			99.4			99.7			98.4			98.6			99.6			99.4		
3.35 MM	% PASSING	D422	99.9			99.7			99.7			99.7			99.8			99.3			99.5			99.9			99.7		
37.5 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
4.75 MM	% PASSING	D422	100			100			99.9			100			99.8			100			100			100			99.9		
75 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
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DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C2-03-SD-092313 PLSA-C2-03 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-06-SD-092413 PLSA-C2-06 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-09-SD-092413 PLSA-C2-09 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-32-SD-092513 PLSA-C2-32 09/25/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-35-SD-091713 PLSA-C2-35 09/17/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-02-SD-092313 PLSA-C3-02 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-05-SD-092313 PLSA-C3-05 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-07-SD-091013 PLSA-C3-07 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-08-SD-091113 PLSA-C3-08 09/11/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY																													
MERCURY, LOW LEVEL	UG/KG	1631	2550			19.1			2570			25.9			621			4290			13100			2750			4610		
METHYL MERCURY	UG/KG	1630	0.485		J	0.082		J	2.02		J	0.148		J	0.458		J	1.08		J	2.7		J	1.86			1.46		J
METALS																													
ALUMINUM	MG/KG	6010B																											
ANTIMONY	MG/KG	6010B																											
ARSENIC	MG/KG	6010B																											
BARIUM	MG/KG	6010B																											
BERYLLIUM	MG/KG	6010B																											
CADMIUM	MG/KG	6010B																											
CHROMIUM	MG/KG	6010B																											
COBALT	MG/KG	6010B																											
COPPER	MG/KG	6010B																											
LEAD	MG/KG	6010B																											
MANGANESE	MG/KG	6010B																											
NICKEL	MG/KG	6010B																											
SELENIUM	MG/KG	6010B																											
SILVER	MG/KG	6010B																											
THALLIUM	MG/KG	6010B																											
VANADIUM	MG/KG	6010B																											
ZINC	MG/KG	6010B																											
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE																													
CADMIUM	UMOL/G	6010B																											
COPPER	UMOL/G	6010B																											
LEAD	UMOL/G	6010B																											
MERCURY	UMOL/G	7471A																											
NICKEL	UMOL/G	6010B																											
SILVER	UMOL/G	6010B																											
ZINC	UMOL/G	6010B																											
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--																											
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100																											
PESTICIDES																													
4,4'-DDD	UG/KG	8081A																											
4,4'-DDE	UG/KG	8081A																											
4,4'-DDT	UG/KG	8081A																											
ALDRIN	UG/KG	8081A																											
ALPHA CHLORDANE	UG/KG	8081A																											
ALPHA-BHC	UG/KG	8081A																											
BETA-BHC	UG/KG	8081A																											
DELTA-BHC	UG/KG	8081A																											
DIELDRIN	UG/KG	8081A																											
ENDOSULFAN I	UG/KG	8081A																											
ENDOSULFAN II	UG/KG	8081A																											
ENDOSULFAN SULFATE	UG/KG	8081A																											
ENDRIN	UG/KG	8081A																											
ENDRIN ALDEHYDE	UG/KG	8081A																											
ENDRIN KETONE	UG/KG	8081A																											
Gamma Chlordane	UG/KG	8081A																											
HEPTACHLOR	UG/KG	8081A																											
HEPTACHLOR EPOXIDE	UG/KG	8081A																											
LINDANE	UG/KG	8081A																											
METHOXYCHLOR	UG/KG	8081A																											
TOXAPHENE	UG/KG	8081A																											
2,4,5-T	UG/KG	8151A																											
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A																											
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A																											
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A																											
DALAPON 85	UG/KG	8151A																											
DICAMBA	UG/KG	8151A																											
DICHLOROPROP	UG/KG	8151A																											
DINOSEB	UG/KG	8151A																											
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A																											
PENTACHLOROPHENOL	UG/KG	8151A																											
SILVEX	UG/KG	8151A																											
SEMI-VOLATILE ORGANIC COMPOUNDS																													
1,2,4-TRICHLOROBENZENE	UG/KG	8270C																											
1,2-DICHLOROBENZENE	UG/KG	8270C																											
1,3-DICHLOROBENZENE	UG/KG	8270C																											
1,4-DICHLOROBENZENE	UG/KG	8270C																											
2,4,5-TRICHLOROPHENOL	UG/KG	8270C																											
2,4,6-TRICHLOROPHENOL	UG/KG	8270C																											
2,4-DICHLOROPHENOL	UG/KG	8270C																											
2,4-DIMETHYLPHENOL	UG/KG	8270C																											
2,4-DINITROPHENOL	UG/KG	8270C																											
2,4-DINITROTOLUENE	UG/KG	8270C																											

Table D-2
Summary of Analytical Data - Sediment Samples
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Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C2-03-SD-092313 PLSA-C2-03 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-06-SD-092413 PLSA-C2-06 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-09-SD-092413 PLSA-C2-09 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-32-SD-092513 PLSA-C2-32 09/25/2013 Solid Regular Sample Sediment			EI13-PLSA-C2-35-SD-091713 PLSA-C2-35 09/17/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-02-SD-092313 PLSA-C3-02 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-05-SD-092313 PLSA-C3-05 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-07-SD-091013 PLSA-C3-07 09/10/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-08-SD-091113 PLSA-C3-08 09/11/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																													
2,6-DINITROTOLUENE	UG/KG	8270C																											
2-CHLORONAPHTHALENE	UG/KG	8270C																											
2-CHLOROPHENOL	UG/KG	8270C																											
2-METHYLNAPHTHALENE	UG/KG	8270C																											
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C																											
2-NITROANILINE	UG/KG	8270C																											
2-NITROPHENOL	UG/KG	8270C																											
3,3'-DICHLOROBENZIDINE	UG/KG	8270C																											
3-NITROANILINE	UG/KG	8270C																											
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C																											
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C																											
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C																											
4-CHLOROANILINE	UG/KG	8270C																											
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C																											
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C																											
4-NITROANILINE	UG/KG	8270C																											
4-NITROPHENOL	UG/KG	8270C																											
ACENAPHTHENE	UG/KG	8270C																											
ACENAPHTHYLENE	UG/KG	8270C																											
ANTHRACENE	UG/KG	8270C																											
BENZO(A)ANTHRACENE	UG/KG	8270C																											
BENZO(B)FLUORANTHENE	UG/KG	8270C																											
BENZO(G,H,I)PERYLENE	UG/KG	8270C																											
BENZO(K)FLUORANTHENE	UG/KG	8270C																											
BENZO[A]PYRENE	UG/KG	8270C																											
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C																											
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C																											
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C																											
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C																											
BUTYL BENZYL PHTHALATE	UG/KG	8270C																											
CARBAZOLE	UG/KG	8270C																											
CHRYSENE	UG/KG	8270C																											
DI-N-BUTYL PHTHALATE	UG/KG	8270C																											
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C																											
DIBENZOFURAN	UG/KG	8270C																											
DIETHYL PHTHALATE	UG/KG	8270C																											
DIMETHYL PHTHALATE	UG/KG	8270C																											
FLUORANTHENE	UG/KG	8270C																											
FLUORENE	UG/KG	8270C																											
HEXACHLOROBENZENE	UG/KG	8270C																											
HEXACHLOROBUTADIENE	UG/KG	8270C																											
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C																											
HEXACHLOROETHANE	UG/KG	8270C																											
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C																											
ISOPHORONE	UG/KG	8270C																											
N-DIOCTYL PHTHALATE	UG/KG	8270C																											
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C																											
N-NITROSODIPHENYLAMINE	UG/KG	8270C																											
NAPHTHALENE	UG/KG	8270C																											
NITROBENZENE	UG/KG	8270C																											
PENTACHLOROPHENOL	UG/KG	8270C																											
PHENANTHRENE	UG/KG	8270C																											
PHENOL	UG/KG	8270C																											
PYRENE	UG/KG	8270C																											
OTHER SEDIMENT PARAMETERS																													
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	26200			7600			16500			2390			41900			30300			22800			54500			41700		
PERCENT MOISTURE	%	2540 G-1997	76.5			28.1			47.3			32.7			80.4			65.4			72.8			87.8			76.6		
TOTAL SOLIDS	%	2540 G-1997	28.55			73		J	35.97		J	62.36		J	29.57			37.23			37.42			18.04			26.08		
GRAIN SIZE DISTRIBUTION																													
0.001 MM	% PASSING	D422	6			2.5			1.5				0.5	U				4			6.5			5			1		
0.002 MM	% PASSING	D422	18			2.5			6.5			0.5						13			14			10			6.5		
0.005 MM	% PASSING	D422	35			3			11			1.5						23			26			23			16.5		
0.02 MM	% PASSING	D422	72.5			10			24			2.5						36			54			57			48		
0.05 MM	% PASSING	D422	85.5			16			49			4						49			71.5			76			68.5		
0.064 MM	% PASSING	D422	91.5			22			64			5.5						58			78.5			84			77.5		
0.075 MM	% PASSING	D422	93.6			25.4			71.1			7.9						61			82			87.6			80.9		
0.15 MM	% PASSING	D422	96.3			36.4			77.3			23.8						75.5			93.5			93.7			92.3		
0.3 MM	% PASSING	D422	97.7			54.5			77.9			82.3						89.8			97.2			97			98.7		
0.6 MM	% PASSING	D422	97.9			67.8			78			89.7						96.1			98.2			98			99.4		
1.18 MM	% PASSING	D422	98.3			77			78.1			90.4						97			98.2			98.8			99.7		
19 MM	% PASSING	D422	100			100			90.7			98.1						100			100			100			100		
2.36 MM	% PASSING	D422	98.6			84.7			78.2			90.7						97.3			98.6			99.1			99.8		
3.35 MM	% PASSING	D422	99.5			87.7			83.1			92.1						98.6			99.3			100			100		
37.5 MM	% PASSING	D422	100			100			100			100						100			100			100			100		
4.75 MM	% PASSING	D422	100			90.3			86.5			94.1						99.1			99.8			100			100		
75 MM	% PASSING	D422	100			100			100			100						100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-13-SD-091213 PLSA-C3-13 09/12/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-15-SD-092313 PLSA-C3-15 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-17-SD-092313 PLSA-C3-17 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-18-SD-092413 PLSA-C3-18 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-21-SD-092513 PLSA-C3-21 09/25/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-23-SD-092413 PLSA-C3-23 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-26-SD-091313 PLSA-C3-26 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-27-SD-091313 PLSA-C3-27 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-29-SD-091613 PLSA-C3-29 09/16/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY																													
MERCURY, LOW LEVEL	UG/KG	1631	276			2570			1220			4770			3690			1410			4390			1320			39.1		
METHYL MERCURY	UG/KG	1630	0.242			0.519		J	0.653		J	0.753		J	0.454		J	0.497		J	0.806			0.432			0.129		
METALS																													
ALUMINUM	MG/KG	6010B																											
ANTIMONY	MG/KG	6010B																											
ARSENIC	MG/KG	6010B																											
BARIUM	MG/KG	6010B																											
BERYLLIUM	MG/KG	6010B																											
CADMIUM	MG/KG	6010B																											
CHROMIUM	MG/KG	6010B																											
COBALT	MG/KG	6010B																											
COPPER	MG/KG	6010B																											
LEAD	MG/KG	6010B																											
MANGANESE	MG/KG	6010B																											
NICKEL	MG/KG	6010B																											
SELENIUM	MG/KG	6010B																											
SILVER	MG/KG	6010B																											
THALLIUM	MG/KG	6010B																											
VANADIUM	MG/KG	6010B																											
ZINC	MG/KG	6010B																											
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE																													
CADMIUM	UMOL/G	6010B																											
COPPER	UMOL/G	6010B																											
LEAD	UMOL/G	6010B																											
MERCURY	UMOL/G	7471A																											
NICKEL	UMOL/G	6010B																											
SILVER	UMOL/G	6010B																											
ZINC	UMOL/G	6010B																											
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--																											
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100																											
PESTICIDES																													
4,4'-DDD	UG/KG	8081A																											
4,4'-DDE	UG/KG	8081A																											
4,4'-DDT	UG/KG	8081A																											
ALDRIN	UG/KG	8081A																											
ALPHA CHLORDANE	UG/KG	8081A																											
ALPHA-BHC	UG/KG	8081A																											
BETA-BHC	UG/KG	8081A																											
DELTA-BHC	UG/KG	8081A																											
DIELDRIN	UG/KG	8081A																											
ENDOSULFAN I	UG/KG	8081A																											
ENDOSULFAN II	UG/KG	8081A																											
ENDOSULFAN SULFATE	UG/KG	8081A																											
ENDRIN	UG/KG	8081A																											
ENDRIN ALDEHYDE	UG/KG	8081A																											
ENDRIN KETONE	UG/KG	8081A																											
Gamma Chlordane	UG/KG	8081A																											
HEPTACHLOR	UG/KG	8081A																											
HEPTACHLOR EPOXIDE	UG/KG	8081A																											
LINDANE	UG/KG	8081A																											
METHOXYCHLOR	UG/KG	8081A																											
TOXAPHENE	UG/KG	8081A																											
2,4,5-T	UG/KG	8151A																											
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A																											
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A																											
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A																											
DALAPON 85	UG/KG	8151A																											
DICAMBA	UG/KG	8151A																											
DICHLOROPROP	UG/KG	8151A																											
DINOSEB	UG/KG	8151A																											
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A																											
PENTACHLOROPHENOL	UG/KG	8151A																											
SILVEX	UG/KG	8151A																											
SEMI-VOLATILE ORGANIC COMPOUNDS																													
1,2,4-TRICHLOROBENZENE	UG/KG	8270C																											
1,2-DICHLOROBENZENE	UG/KG	8270C																											
1,3-DICHLOROBENZENE	UG/KG	8270C																											
1,4-DICHLOROBENZENE	UG/KG	8270C																											
2,4,5-TRICHLOROPHENOL	UG/KG	8270C																											
2,4,6-TRICHLOROPHENOL	UG/KG	8270C																											
2,4-DICHLOROPHENOL	UG/KG	8270C																											
2,4-DIMETHYLPHENOL	UG/KG	8270C																											
2,4-DINITROPHENOL	UG/KG	8270C																											
2,4-DINITROTOLUENE	UG/KG	8270C																											

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-13-SD-091213 PLSA-C3-13 09/12/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-15-SD-092313 PLSA-C3-15 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-17-SD-092313 PLSA-C3-17 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-18-SD-092413 PLSA-C3-18 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-21-SD-092513 PLSA-C3-21 09/25/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-23-SD-092413 PLSA-C3-23 09/24/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-26-SD-091313 PLSA-C3-26 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-27-SD-091313 PLSA-C3-27 09/13/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-29-SD-091613 PLSA-C3-29 09/16/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																													
2,6-DINITROTOLUENE	UG/KG	8270C																											
2-CHLORONAPHTHALENE	UG/KG	8270C																											
2-CHLOROPHENOL	UG/KG	8270C																											
2-METHYLNAPHTHALENE	UG/KG	8270C																											
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C																											
2-NITROANILINE	UG/KG	8270C																											
2-NITROPHENOL	UG/KG	8270C																											
3,3'-DICHLOROBENZIDINE	UG/KG	8270C																											
3-NITROANILINE	UG/KG	8270C																											
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C																											
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C																											
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C																											
4-CHLOROANILINE	UG/KG	8270C																											
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C																											
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C																											
4-NITROANILINE	UG/KG	8270C																											
4-NITROPHENOL	UG/KG	8270C																											
ACENAPHTHENE	UG/KG	8270C																											
ACENAPHTHYLENE	UG/KG	8270C																											
ANTHRACENE	UG/KG	8270C																											
BENZO(A)ANTHRACENE	UG/KG	8270C																											
BENZO(B)FLUORANTHENE	UG/KG	8270C																											
BENZO(G,H,I)PERYLENE	UG/KG	8270C																											
BENZO(K)FLUORANTHENE	UG/KG	8270C																											
BENZO[A]PYRENE	UG/KG	8270C																											
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C																											
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C																											
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C																											
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C																											
BUTYL BENZYL PHTHALATE	UG/KG	8270C																											
CARBAZOLE	UG/KG	8270C																											
CHRYSENE	UG/KG	8270C																											
DI-N-BUTYL PHTHALATE	UG/KG	8270C																											
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C																											
DIBENZOFURAN	UG/KG	8270C																											
DIETHYL PHTHALATE	UG/KG	8270C																											
DIMETHYL PHTHALATE	UG/KG	8270C																											
FLUORANTHENE	UG/KG	8270C																											
FLUORENE	UG/KG	8270C																											
HEXACHLOROBENZENE	UG/KG	8270C																											
HEXACHLOROBUTADIENE	UG/KG	8270C																											
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C																											
HEXACHLOROETHANE	UG/KG	8270C																											
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C																											
ISOPHORONE	UG/KG	8270C																											
N-DIOCTYL PHTHALATE	UG/KG	8270C																											
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C																											
N-NITROSODIPHENYLAMINE	UG/KG	8270C																											
NAPHTHALENE	UG/KG	8270C																											
NITROBENZENE	UG/KG	8270C																											
PENTACHLOROPHENOL	UG/KG	8270C																											
PHENANTHRENE	UG/KG	8270C																											
PHENOL	UG/KG	8270C																											
PYRENE	UG/KG	8270C																											
OTHER SEDIMENT PARAMETERS																													
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	17200			33000			89300			34200			42300			35500			59000			32600			7220		
PERCENT MOISTURE	%	2540 G-1997	54		J	75.3			85			75			76.2			74			75.1			75.6			33.3		
TOTAL SOLIDS	%	2540 G-1997	57.92			29.73			16.37			29.8		J	23.55		J	35.32		J	29.95			25.55			72.57		
GRAIN SIZE DISTRIBUTION																													
0.001 MM	% PASSING	D422		0.5	U	4			4			3			1			3			1			1				0.5	U
0.002 MM	% PASSING	D422		0.5	U	9.5			12.5			7.5			6			8			3			3				0.5	U
0.005 MM	% PASSING	D422		0.5	U	20.5			24			15			12			14			9			8.5				0.5	U
0.02 MM	% PASSING	D422	2			57.5			63			47			32			50			28.5			33				0.5	U
0.05 MM	% PASSING	D422	7			68.5			81			74			62.5			80			62			66.5			1		
0.064 MM	% PASSING	D422	13			69.5			77			83			80			86			74			80			3		
0.075 MM	% PASSING	D422	16.1			70.6			76.7			87.2			88.3			88.6			78.3			87.3			4.8		
0.15 MM	% PASSING	D422	31.5			78.9			82.1			95			94.5			95.2			91.7			95.5			31.4		
0.3 MM	% PASSING	D422	82.6			90.5			88.7			96.8			97.4			96.7			96.6			97.6			94.2		
0.6 MM	% PASSING	D422	96.4			95.2			94.8			97.4			97.8			97.2			98.2			98.3			99.2		
1.18 MM	% PASSING	D422	98.7			98.1			98.4			97.8			98.5			97.7			98.9			98.7			100		
19 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
2.36 MM	% PASSING	D422	99.7			98.3			99.8			98.6			98.9			98.3			99.5			99.4			100		
3.35 MM	% PASSING	D422	99.9			99.5			99.9			99.7			99.6			99.4			99.8			99.8			100		
37.5 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		
4.75 MM	% PASSING	D422	100			99.9			100			100			99.9			99.9			100			100			100		
75 MM	% PASSING	D422	100			100			100			100			100			100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-31-SD-092013 PLSA-C3-31 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-34-SD-092013 PLSA-C3-34 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-36-SD-092313 PLSA-C3-36 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-37-SD-092013 PLSA-C3-37 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-38-SD-092413 PLSA-C3-38 09/24/2013 Solid Regular Sample Sediment			EI13-REF-C1-01-SD-092013 REF-C1-01 09/20/2013 Solid Regular Sample Sediment			EI13-REF-C1-02-SD-091913 REF-C1-02 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C1-02-SD-091913-D REF-C1-02 09/19/2013 Solid Field Duplicate Sediment			EI13-REF-C1-03-SD-091813 REF-C1-03 09/18/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY																													
MERCURY, LOW LEVEL	UG/KG	1631	921			1080			3300			60.9			9470			138			18.8						29.5		
METHYL MERCURY	UG/KG	1630	0.389		J	0.475		J	0.246		J	0.311		J	0.987		J	0.631			0.146		J				0.21		J
METALS																													
ALUMINUM	MG/KG	6010B																10400			7470			9110			4580		
ANTIMONY	MG/KG	6010B																	1.71	U		1.35	U		1.62	U		1.05	UJ
ARSENIC	MG/KG	6010B																4.41		J	1.57		J	2.77		J		0.989	U
BARIUM	MG/KG	6010B																70.6			53.7			65			25.8		
BERYLLIUM	MG/KG	6010B																0.609		J	0.434		J	0.535		J	0.237		J
CADMIUM	MG/KG	6010B																0.927		J	0.264		J	0.334		J	0.256		J
CHROMIUM	MG/KG	6010B																28.3			15.8			19.9			8.3		J
COBALT	MG/KG	6010B																7.71			5.58			6.38			3.89		
COPPER	MG/KG	6010B																26.5			20.1			24.8			10.9		
LEAD	MG/KG	6010B																42.7		J	18			22.2			6.11		
MANGANESE	MG/KG	6010B																252		J	332			406			167		
NICKEL	MG/KG	6010B																14.1			10.5			13			6.41		J
SELENIUM	MG/KG	6010B																	1.84	U		1.46	U		1.75	U		1.13	U
SILVER	MG/KG	6010B																	0.392	U		0.31	U		0.371	U	0.253		J
THALLIUM	MG/KG	6010B																	1.2	U		0.948	U		1.14	U		0.735	U
VANADIUM	MG/KG	6010B																36.2			24.4			29.4			15.3		
ZINC	MG/KG	6010B																109			83.3			101			33.5		
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE																													
CADMIUM	UMOL/G	6010B													0.00917			0.00357			0.00239			0.00273			0.00179		
COPPER	UMOL/G	6010B													1.1		J	0.286		J	0.198		J	0.223		J	0.167		J
LEAD	UMOL/G	6010B													0.438			0.119			0.0723			0.0835			0.0525		
MERCURY	UMOL/G	7471A													0.000025		J		0.00017	R		0.000014	R		0.000011	R	0.000012		J
NICKEL	UMOL/G	6010B													0.116			0.0688			0.0679			0.0587			0.0448		
SILVER	UMOL/G	6010B														0.000915	R		0.000899	R		0.000713	R		0.000602	R		0.000555	R
ZINC	UMOL/G	6010B													3.03			1.21			0.871			0.974			0.629		
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--													11.19			11.99			5.41			6.24			2.50		
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100													6.5		J	10.3		J	4.2		J	4.9		J	1.6		J
PESTICIDES																													
4,4'-DDD	UG/KG	8081A																	0.78	U		1.2	U		2.6	U		0.95	U
4,4'-DDE	UG/KG	8081A																	0.78	U	2.1		J	2		J		0.95	U
4,4'-DDT	UG/KG	8081A																	0.83	U		1.3	U		1.5	U		1	U
ALDRIN	UG/KG	8081A																	0.4	U		0.63	U		0.74	U		0.49	U
ALPHA CHLORDANE	UG/KG	8081A																	1.1	U	2.8		J		3.3	U	0.98		J
ALPHA-BHC	UG/KG	8081A																1.1		J		0.63	U		0.74	U		0.49	U
BETA-BHC	UG/KG	8081A																	0.71	U		1.1	U		1.3	U		0.86	U
DELTA-BHC	UG/KG	8081A																	2.2	U		1.7	U		2	U		1.3	U
DIELDRIN	UG/KG	8081A																	0.78	U		1.2	U		1.4	U		0.95	U
ENDOSULFAN I	UG/KG	8081A																0.74		J		0.81	U		0.96	U		0.63	U
ENDOSULFAN II	UG/KG	8081A																	0.78	U		1.2	U		1.4	U		0.95	U
ENDOSULFAN SULFATE	UG/KG	8081A																	0.78	U		1.2	U		1.4	U		0.95	U
ENDRIN	UG/KG	8081A																	0.78	U		1.2	U		1.4	U		0.95	U
ENDRIN ALDEHYDE	UG/KG	8081A																	0.78	U		1.2	U		1.4	U		0.95	U
ENDRIN KETONE	UG/KG	8081A																	1.4	U		2.2	U		2.6	U		1.7	U
Gamma Chlordane	UG/KG	8081A																	1	U		2.2	U		3.1	U		0.79	U
HEPTACHLOR	UG/KG	8081A																3.6				0.63	U		0.74	U		0.49	U
HEPTACHLOR EPOXIDE	UG/KG	8081A																	0.4	U		0.63	U		0.74	U		0.49	U
LINDANE	UG/KG	8081A																	0.4	U		2.8	U		3.3	U		0.49	U
METHOXYCHLOR	UG/KG	8081A																	4	U		6.3	U		7.4	U		4.9	U
TOXAPHENE	UG/KG	8081A																	33	U		52	U		61	U		40	U
2,4,5-T	UG/KG	8151A																	1.9	U		1.5	U		1.8	U		1.2	U
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A																	28	U		22	U		26	U		17	U
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A																	15	U		11	U		14	U		8.9	U
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A																	1800	U		1400	U		1600	U		1100	U
DALAPON 85	UG/KG	8151A																	100	U		81	U		96	U		63	U
DICAMBA	UG/KG	8151A																	9.4	U		7.4	U		8.7	U		5.8	U
DICHLOROPROP	UG/KG	8151A																	21	U		17	U		20	U		13	U
DINOSEB	UG/KG	8151A																	21	U		17	R		20	R		13	R
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A																	1800	U		1400	U		1700	U		1100	U
PENTACHLOROPHENOL	UG/KG	8151A																1.5		J	0.74		J		0.72	U		0.48	U
SILVEX	UG/KG	8151A																	1.8	U		1.4	U		1.6	U		1.1	U
SEMI-VOLATILE ORGANIC COMPOUNDS																													
1,2,4-TRICHLOROBENZENE	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
1,2-DICHLOROBENZENE	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
1,3-DICHLOROBENZENE	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
1,4-DICHLOROBENZENE	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
2,4,5-TRICHLOROPHENOL	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
2,4,6-TRICHLOROPHENOL	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
2,4-DICHLOROPHENOL	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
2,4-DIMETHYLPHENOL	UG/KG	8270C																	790	U	ND (150)	150	U		180	U		24	U
2,4-DINITROPHENOL	UG/KG	8270C																	14000	U	ND (2700)	2700	U		3200	U		430	U
2,4-DINITROTOLUENE	UG/KG	8270C																	3200	U	ND (610)	610	U		720	U		96	U

Table D-2
Summary of Analytical Data - Sediment Samples
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DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-31-SD-092013 PLSA-C3-31 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-34-SD-092013 PLSA-C3-34 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-36-SD-092313 PLSA-C3-36 09/23/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-37-SD-092013 PLSA-C3-37 09/20/2013 Solid Regular Sample Sediment			EI13-PLSA-C3-38-SD-092413 PLSA-C3-38 09/24/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																	
2,6-DINITROTOLUENE	UG/KG	8270C															
2-CHLORONAPHTHALENE	UG/KG	8270C															
2-CHLOROPHENOL	UG/KG	8270C															
2-METHYLNAPHTHALENE	UG/KG	8270C															
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C															
2-NITROANILINE	UG/KG	8270C															
2-NITROPHENOL	UG/KG	8270C															
3,3'-DICHLOROBENZIDINE	UG/KG	8270C															
3-NITROANILINE	UG/KG	8270C															
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C															
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C															
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C															
4-CHLOROANILINE	UG/KG	8270C															
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C															
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C															
4-NITROANILINE	UG/KG	8270C															
4-NITROPHENOL	UG/KG	8270C															
ACENAPHTHENE	UG/KG	8270C															
ACENAPHTHYLENE	UG/KG	8270C															
ANTHRACENE	UG/KG	8270C															
BENZO(A)ANTHRACENE	UG/KG	8270C															
BENZO(B)FLUORANTHENE	UG/KG	8270C															
BENZO(G,H,I)PERYLENE	UG/KG	8270C															
BENZO(K)FLUORANTHENE	UG/KG	8270C															
BENZO[A]PYRENE	UG/KG	8270C															
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C															
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C															
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C															
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C															
BUTYL BENZYL PHTHALATE	UG/KG	8270C															
CARBAZOLE	UG/KG	8270C															
CHRYSENE	UG/KG	8270C															
DI-N-BUTYL PHTHALATE	UG/KG	8270C															
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C															
DIBENZOFURAN	UG/KG	8270C															
DIETHYL PHTHALATE	UG/KG	8270C															
DIMETHYL PHTHALATE	UG/KG	8270C															
FLUORANTHENE	UG/KG	8270C															
FLUORENE	UG/KG	8270C															
HEXACHLOROBENZENE	UG/KG	8270C															
HEXACHLOROBUTADIENE	UG/KG	8270C															
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C															
HEXACHLOROETHANE	UG/KG	8270C															
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C															
ISOPHORONE	UG/KG	8270C															
N-DIOCTYL PHTHALATE	UG/KG	8270C															
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C															
N-NITROSODIPHENYLAMINE	UG/KG	8270C															
NAPHTHALENE	UG/KG	8270C															
NITROBENZENE	UG/KG	8270C															
PENTACHLOROPHENOL	UG/KG	8270C															
PHENANTHRENE	UG/KG	8270C															
PHENOL	UG/KG	8270C															
PYRENE	UG/KG	8270C															
OTHER SEDIMENT PARAMETERS																	
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	53400			148000			31900			6450					
PERCENT MOISTURE	%	2540 G-1997	84.3			81.1			71.5			41.4			57.9		
TOTAL SOLIDS	%	2540 G-1997	21.06			26.04			32.64			57.6			40.13		J
GRAIN SIZE DISTRIBUTION																	
0.001 MM	% PASSING	D422	7.5			7			6.5				0.5	U	2		
0.002 MM	% PASSING	D422	15.5			15			14				0.5	U	8		
0.005 MM	% PASSING	D422	24			26.5			30			1.5			16		
0.02 MM	% PASSING	D422	47			61			57			3			28		
0.05 MM	% PASSING	D422	70			75			79			11			42		
0.064 MM	% PASSING	D422	77			81			87			19			51.5		
0.075 MM	% PASSING	D422	79.4			83.2			90.9			24.8			56.2		
0.15 MM	% PASSING	D422	88			91.3			96.8			70.2			74.5		
0.3 MM	% PASSING	D422	92.8			94.8			98.5			98.8			92.2		
0.6 MM	% PASSING	D422	95.7			96.2			99			99.6			97.9		
1.18 MM	% PASSING	D422	97.3			96.9			99.1			99.6			99		
19 MM	% PASSING	D422	100			100			100			100			100		
2.36 MM	% PASSING	D422	98.5			97.5			99.2			99.8			99.4		
3.35 MM	% PASSING	D422	99.2			99.2			99.8			99.9			99.7		
37.5 MM	% PASSING	D422	100			100			100			100			100		
4.75 MM	% PASSING	D422	99.7			100			100			100			99.9		
75 MM	% PASSING	D422	100			100			100			100			100		

Parameter Name	EI13-REF-C1-01-SD-092013 REF-C1-01 09/20/2013 Solid Regular Sample Sediment			EI13-REF-C1-02-SD-091913 REF-C1-02 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C1-02-SD-091913-D REF-C1-02 09/19/2013 Solid Field Duplicate Sediment			EI13-REF-C1-03-SD-091813 REF-C1-03 09/18/2013 Solid Regular Sample Sediment		
	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)												
2,6-DINITROTOLUENE		790	U	ND (150)	150	U		180	U		24	U
2-CHLORONAPHTHALENE		330	U	ND (64)	64	U		75	U		10	U
2-CHLOROPHENOL		790	U	ND (150)	150	U		180	U		24	U
2-METHYLNAPHTHALENE	280		J	ND (30)	30	U		36	U		5	U
2-METHYLPHENOL (O-CRESOL)		790	U	ND (150)	150	U		180	U		24	U
2-NITROANILINE		790	U	ND (150)	150	U		180	U		24	U
2-NITROPHENOL		790	U	ND (150)	150	U		180	U		24	U
3,3'-DICHLOROBENZIDINE		4800	U	ND (910)	910	U		1100	U		140	U
3-NITROANILINE		3200	U	ND (610)	610	U		720	U		96	U
4,6-DINITRO-2-METHYLPHENOL		7900	U	ND (1500)	1500	U		1800	U		240	U
4-BROMOPHENYL PHENYL ETHER		790	U	ND (150)	150	U		180	U		24	U
4-CHLORO-3-METHYLPHENOL		790	U	ND (150)	150	U		180	U		24	U
4-CHLOROANILINE		790	U	ND (150)	150	U		180	U		24	U
4-CHLOROPHENYL PHENYL ETHER		790	U	ND (150)	150	U		180	U		24	U
4-METHYLPHENOL (P-CRESOL)		790	U	ND (150)	150	U		180	U		24	U
4-NITROANILINE		3200	U	ND (610)	610	U		720	U		96	U
4-NITROPHENOL		7900	U	ND (1500)	1500	U		1800	U		240	U
ACENAPHTHENE		160	U	ND (30)	30	U		36	U		5	U
ACENAPHTHYLENE		160	U	ND (30)	30	U		36	U	7		J
ANTHRACENE		160	U	71		J	62 J		J	16		J
BENZO(A)ANTHRACENE	360		J	270			290			67		
BENZO(B)FLUORANTHENE	420		J	390			550			130		
BENZO(G,H,I)PERYLENE	430		J	200			280			71		
BENZO(K)FLUORANTHENE	330		J	200			190			54		
BENZO[A]PYRENE	410		J	280			350			84		
BIS(2-CHLORO-1-METHYLETHYL) ETHER		790	U		150	U		180	U		24	U
BIS(2-CHLOROETHOXY)METHANE		790	U		150	U		180	U		24	U
BIS(2-CHLOROETHYL)ETHER		790	U		150	U		180	U		24	U
BIS(2-ETHYLHEXYL)PHTHALATE		3200	U		610	U		720	U		96	U
BUTYL BENZYL PHTHALATE		3200	U		610	U		720	U		96	U
CARBAZOLE		790	U		150	U		180	U		24	U
CHRYSENE	390		J	290			430			85		
DI-N-BUTYL PHTHALATE		3200	U		610	U		720	U		96	U
DIBENZ(A,H)ANTHRACENE		160	U	59		J	60		J	16		J
DIBENZOFURAN		790	U		150	U		180	U		24	U
DIETHYL PHTHALATE		3200	U		610	U		720	U		96	U
DIMETHYL PHTHALATE		3200	U		610	U		720	U		96	U
FLUORANTHENE	670		J	650			940			170		
FLUORENE		160	U	38		J	40		J	6		J
HEXACHLOROBENZENE		160	U		30	U		36	U		5	U
HEXACHLOROBUTADIENE		790	U		150	U		180	U		24	U
HEXACHLOROCYCLOPENTADIENE		7900	U		1500	U		1800	U		240	U
HEXACHLOROETHANE		1600	U		300	U		360	U		48	U
INDENO (1,2,3-CD) PYRENE	230		J	190			230			66		
ISOPHORONE		790	U		150	U		180	U		24	U
N-DIOCTYL PHTHALATE		3200	U		610	U		720	U		96	U
N-NITROSODI-N-PROPYLAMINE		790	U		150	U		180	U		24	U
N-NITROSODIPHENYLAMINE		790	U		150	U		180	U		24	U
NAPHTHALENE		160	U		30	U		36	U		5	U
NITROBENZENE		790	U		150	U		180	U		24	U
PENTACHLOROPHENOL		1600	U		300	U		360	U		48	U
PHENANTHRENE	310		J	350			400			73		
PHENOL		790	U		150	U		180	U		24	U
PYRENE	690		J	530			740			150		
OTHER SEDIMENT PARAMETERS												
TOTAL ORGANIC CARBON	16800			10600		J	20900		J	3950		
PERCENT MOISTURE	57.9			45.7			54.2			30.6		
TOTAL SOLIDS	35.42			68.3						64.43		
GRAIN SIZE DISTRIBUTION												
0.001 MM		0.5	U	2		J		0.5	U		0.5	U
0.002 MM	1.5			2			1				0.5	U
0.005 MM	5			2			3				0.5	U
0.02 MM	12			7.5			9			1		
0.05 MM	27			12			14			2		
0.064 MM	41.5			15			18			4		
0.075 MM	49.6			17			20			5.4		
0.15 MM	76.6			31.5			36.6			6.9		
0.3 MM	98			88.1			90.3			24.4		
0.6 MM	99.2			99.2			98.8			85.2		
1.18 MM	99.6			99.6			99.4			97.4		
19 MM	100			100			100			100		
2.36 MM	100			99.8			99.7			98.5		
3.35 MM	100			99.9			99.9			98.8		
37.5 MM	100			100			100			100		
4.75 MM	100			100			100			99.3		
75 MM	100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-2
Summary of Analytical Data - Sediment Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-C1-04-SD-091813 REF-C1-04 09/18/2013 Solid Regular Sample Sediment			EI13-REF-C1-05-SD-091913 REF-C1-05 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C3-06-SD-091813 REF-C3-06 09/18/2013 Solid Regular Sample Sediment			EI13-REF-C3-07-SD-091913 REF-C3-07 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C3-08-SD-091913 REF-C3-08 09/19/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
MERCURY																	
MERCURY, LOW LEVEL	UG/KG	1631	194			250			115			19			165		
METHYL MERCURY	UG/KG	1630	0.602		J	0.353		J	0.352		J	0.124		J	1.17		J
METALS																	
ALUMINUM	MG/KG	6010B	16300			21600											
ANTIMONY	MG/KG	6010B		2.23	UJ		2.9	U									
ARSENIC	MG/KG	6010B	3.12		J	5.11		J									
BARIUM	MG/KG	6010B	122			160											
BERYLLIUM	MG/KG	6010B	1.03		J	1.35		J									
CADMIUM	MG/KG	6010B	1.16		J	1.04		J									
CHROMIUM	MG/KG	6010B	30.8		J	40.4											
COBALT	MG/KG	6010B	9.37			11.9											
COPPER	MG/KG	6010B	52.2			67											
LEAD	MG/KG	6010B	55			71.3											
MANGANESE	MG/KG	6010B	866			1050											
NICKEL	MG/KG	6010B	17.9		J	24.1											
SELENIUM	MG/KG	6010B		2.41	U		3.14	U									
SILVER	MG/KG	6010B	1.38		J		0.667	U									
THALLIUM	MG/KG	6010B		1.57	U		2.04	U									
VANADIUM	MG/KG	6010B	43.5			55.4											
ZINC	MG/KG	6010B	195			258											
SIMULTANEOUSLY EXTRACTED METALS/ACID VOLATILE SULFIDE																	
CADMIUM	UMOL/G	6010B	0.00689			0.00976											
COPPER	UMOL/G	6010B	0.525		J	0.822		J									
LEAD	UMOL/G	6010B	0.212			0.33											
MERCURY	UMOL/G	7471A		0.000023	R		0.000029	R									
NICKEL	UMOL/G	6010B	0.114			0.159											
SILVER	UMOL/G	6010B	0.00247		J	0.00388		J									
ZINC	UMOL/G	6010B	2.12			3.27											
SIMULTANEOUSLY EXTRACTED METLS (TOTAL)	UMOL/G	--	9.48			15.49											
ACID VOLATILE SULFIDE	UMOL/G	821-R-91-100	6.5		J	10.9		J									
PESTICIDES																	
4,4'-DDD	UG/KG	8081A		3.4	U		3.6	U									
4,4'-DDE	UG/KG	8081A	4.1		J	4.8		J									
4,4'-DDT	UG/KG	8081A	2.6		J	3		J									
ALDRIN	UG/KG	8081A		1	U		1.3	R									
ALPHA CHLORDANE	UG/KG	8081A	4.4		J	5.8		J									
ALPHA-BHC	UG/KG	8081A		1	U		1.3	U									
BETA-BHC	UG/KG	8081A		2.6	U		2.4	U									
DELTA-BHC	UG/KG	8081A		2.8	U	4.4		J									
DIELDRIN	UG/KG	8081A		2	U		2.6	U									
ENDOSULFAN I	UG/KG	8081A		1.4	U		1.7	U									
ENDOSULFAN II	UG/KG	8081A		2	U		2.6	U									
ENDOSULFAN SULFATE	UG/KG	8081A		2	U		2.6	U									
ENDRIN	UG/KG	8081A		2	U		2.6	U									
ENDRIN ALDEHYDE	UG/KG	8081A		2	U		2.6	U									
ENDRIN KETONE	UG/KG	8081A		3.7	U		4.7	U									
Gamma Chlordane	UG/KG	8081A		3.7	U		4.7	U									
HEPTACHLOR	UG/KG	8081A		1.4	U	1.7		J									
HEPTACHLOR EPOXIDE	UG/KG	8081A		1	U		1.3	R									
LINDANE	UG/KG	8081A		1	U		2.8	R									
METHOXYCHLOR	UG/KG	8081A		10	U		13	U									
TOXAPHENE	UG/KG	8081A		86	U		110	U									
2,4,5-T	UG/KG	8151A		2.5	U		3.2	U									
2,4-DICHLOROPHENOXYACETIC ACID	UG/KG	8151A		37	U		47	U									
2,4-DICHLOROPHENOXYBUTYRIC ACID	UG/KG	8151A		19	U		24	U									
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	UG/KG	8151A		2300	U		2900	U									
DALAPON 85	UG/KG	8151A		140	U		170	U									
DICAMBA	UG/KG	8151A		12	U		16	U									
DICHLOROPROP	UG/KG	8151A		28	U		35	U									
DINOSEB	UG/KG	8151A		28	R		35	R									
METHYL CHLOROPHENOXY ACETIC ACID	UG/KG	8151A		2300	U		3000	U									
PENTACHLOROPHENOL	UG/KG	8151A		1	U	2.1		J									
SILVEX	UG/KG	8151A		2.3	U		2.9	U									
SEMI-VOLATILE ORGANIC COMPOUNDS																	
1,2,4-TRICHLOROBENZENE	UG/KG	8270C		51	U		320	U									
1,2-DICHLOROBENZENE	UG/KG	8270C		51	U		320	U									
1,3-DICHLOROBENZENE	UG/KG	8270C		51	U		320	U									
1,4-DICHLOROBENZENE	UG/KG	8270C		51	U		320	U									
2,4,5-TRICHLOROPHENOL	UG/KG	8270C		51	U		320	U									
2,4,6-TRICHLOROPHENOL	UG/KG	8270C		51	U		320	U									
2,4-DICHLOROPHENOL	UG/KG	8270C		51	U		320	U									
2,4-DIMETHYLPHENOL	UG/KG	8270C		51	U		320	U									
2,4-DINITROPHENOL	UG/KG	8270C		910	U		5800	R									
2,4-DINITROTOLUENE	UG/KG	8270C		200	U		1300	U									

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Summary of Analytical Data - Sediment Samples
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DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-C1-04-SD-091813 REF-C1-04 09/18/2013 Solid Regular Sample Sediment			EI13-REF-C1-05-SD-091913 REF-C1-05 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C3-06-SD-091813 REF-C3-06 09/18/2013 Solid Regular Sample Sediment			EI13-REF-C3-07-SD-091913 REF-C3-07 09/19/2013 Solid Regular Sample Sediment			EI13-REF-C3-08-SD-091913 REF-C3-08 09/19/2013 Solid Regular Sample Sediment		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
SEMI-VOLATILE ORGANIC COMPOUNDS (continued)																	
2,6-DINITROTOLUENE	UG/KG	8270C		51	U		320	U									
2-CHLORONAPHTHALENE	UG/KG	8270C		21	U		140	U									
2-CHLOROPHENOL	UG/KG	8270C		51	U		320	U									
2-METHYLNAPHTHALENE	UG/KG	8270C	44		J		65	U									
2-METHYLPHENOL (O-CRESOL)	UG/KG	8270C		51	U		320	U									
2-NITROANILINE	UG/KG	8270C		51	U		320	U									
2-NITROPHENOL	UG/KG	8270C		51	U		320	U									
3,3'-DICHLOROBENZIDINE	UG/KG	8270C		300	U		1900	U									
3-NITROANILINE	UG/KG	8270C		200	U		1900	U									
4,6-DINITRO-2-METHYLPHENOL	UG/KG	8270C		510	U		3200	R									
4-BROMOPHENYL PHENYL ETHER	UG/KG	8270C		51	U		320	U									
4-CHLORO-3-METHYLPHENOL	UG/KG	8270C		51	U		320	U									
4-CHLOROANILINE	UG/KG	8270C		51	U		320	U									
4-CHLOROPHENYL PHENYL ETHER	UG/KG	8270C		51	U		320	U									
4-METHYLPHENOL (P-CRESOL)	UG/KG	8270C		51	U		320	U									
4-NITROANILINE	UG/KG	8270C		200	U		1300	U									
4-NITROPHENOL	UG/KG	8270C		510	U		3200	U									
ACENAPHTHENE	UG/KG	8270C	54				65	U									
ACENAPHTHYLENE	UG/KG	8270C	20		J		65	U									
ANTHRACENE	UG/KG	8270C	220			93		J									
BENZO(A)ANTHRACENE	UG/KG	8270C	170			380											
BENZO(B)FLUORANTHENE	UG/KG	8270C	300			670											
BENZO(G,H,I)PERYLENE	UG/KG	8270C	180			340											
BENZO(K)FLUORANTHENE	UG/KG	8270C	120			280		J									
BENZO[A]PYRENE	UG/KG	8270C	200			450											
BIS(2-CHLORO-1-METHYLETHYL) ETHER	UG/KG	8270C		51	U		320	U									
BIS(2-CHLOROETHOXY)METHANE	UG/KG	8270C		51	U		320	U									
BIS(2-CHLOROETHYL)ETHER	UG/KG	8270C		51	U		320	U									
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8270C		200	U		1300	U									
BUTYL BENZYL PHTHALATE	UG/KG	8270C		200	U		1300	U									
CARBAZOLE	UG/KG	8270C		51	U		320	U									
CHRYSENE	UG/KG	8270C	210			550											
DI-N-BUTYL PHTHALATE	UG/KG	8270C		200	U		1300	U									
DIBENZ(A,H)ANTHRACENE	UG/KG	8270C	38		J	91		J									
DIBENZOFURAN	UG/KG	8270C	74		J		320	U									
DIETHYL PHTHALATE	UG/KG	8270C		200	U		1300	U									
DIMETHYL PHTHALATE	UG/KG	8270C		200	U		1300	U									
FLUORANTHENE	UG/KG	8270C	420			950											
FLUORENE	UG/KG	8270C	99				65	U									
HEXACHLOROBENZENE	UG/KG	8270C		10	U		65	U									
HEXACHLOROBUTADIENE	UG/KG	8270C		51	U		320	U									
HEXACHLOROCYCLOPENTADIENE	UG/KG	8270C		510	U		3200	R									
HEXACHLOROETHANE	UG/KG	8270C		100	U		650	U									
INDENO (1,2,3-CD) PYRENE	UG/KG	8270C	150			340											
ISOPHORONE	UG/KG	8270C		51	U		320	U									
N-DIOCTYL PHTHALATE	UG/KG	8270C		200	U		1300	U									
N-NITROSODI-N-PROPYLAMINE	UG/KG	8270C		51	U		320	U									
N-NITROSODIPHENYLAMINE	UG/KG	8270C		51	U		320	U									
NAPHTHALENE	UG/KG	8270C	80				65	U									
NITROBENZENE	UG/KG	8270C		51	U		320	U									
PENTACHLOROPHENOL	UG/KG	8270C		100	U		650	U									
PHENANTHRENE	UG/KG	8270C	290			380											
PHENOL	UG/KG	8270C		51	U		320	U									
PYRENE	UG/KG	8270C	380			850											
OTHER SEDIMENT PARAMETERS																	
TOTAL ORGANIC CARBON	MG/KG	9060A MOD.	19700			53200		J	18200			5090		J	44400		J
PERCENT MOISTURE	%	2540 G-1997	67.5			74.5			63.2			37.3			70.3		
TOTAL SOLIDS	%	2540 G-1997	34.49			25.66			39.44			67.49			31.22		
GRAIN SIZE DISTRIBUTION																	
0.001 MM	% PASSING	D422		0.5	U	6.5				0.5	U	0.5				0.5	U
0.002 MM	% PASSING	D422	2.5			21			1			0.5			4		
0.005 MM	% PASSING	D422	8			39			2.5			0.5			10		
0.02 MM	% PASSING	D422	18			76.5			11			3			16.5		
0.05 MM	% PASSING	D422	46			91			28			7			45		
0.064 MM	% PASSING	D422	60			94			40			10			53		
0.075 MM	% PASSING	D422	65.4			95			48.1			11.4			58		
0.15 MM	% PASSING	D422	72.2			97.5			74.9			21.2			81.5		
0.3 MM	% PASSING	D422	77.6			98.2			83.8			55.5			97.5		
0.6 MM	% PASSING	D422	80.5			98.4			85.8			85.6			98.9		
1.18 MM	% PASSING	D422	83			98.5			87.1			87.9			99.5		
19 MM	% PASSING	D422	100			100			89.4			100			100		
2.36 MM	% PASSING	D422	86			98.8			88.6			89			99.9		
3.35 MM	% PASSING	D422	90.7			99.4			89			90.7			100		
37.5 MM	% PASSING	D422	100			100			100			100			100		
4.75 MM	% PASSING	D422	94.3			99.8			89.4			93.1			100		
75 MM	% PASSING	D422	100			100			100			100			100		

Notes:
MDL - Method Detection Limit
B - Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise.
R - Unusable result. Analyte may or may not be present in the sample.
U - Not detected.
UJ - Not detected. Reporting limit may not be accurate or precise.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-01-PW-091013 PLSA-C1-01 09/10/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-04-PW-091013 PLSA-C1-04 09/10/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-10-PW-091113 PLSA-C1-10 09/11/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-11-PW-091113 PLSA-C1-11 09/11/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-12-PW-091213 PLSA-C1-12 09/12/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-14-PW-090413 PLSA-C1-14 09/04/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-16-PW-091313 PLSA-C1-16 09/13/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.063			0.083			0.229			0.057			0.2			0.113			0.023		J
MERCURY, LOW LEVEL	NG/L	1631	0.41		J	0.42			1.45			0.94			3.68			0.45			0.86		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-19-PW-090413 PLSA-C1-19 09/04/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-20-PW-090613 PLSA-C1-20 09/06/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-22-PW-090513 PLSA-C1-22 09/05/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-24-PW-090913 PLSA-C1-24 09/09/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-25-PW-090513 PLSA-C1-25 09/05/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-28-PW-091713 PLSA-C1-28 09/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-30-PW-091713 PLSA-C1-30 09/17/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.133			0.091			0.085			0.054			0.049		J	0.064		J	0.115		
MERCURY, LOW LEVEL	NG/L	1631	0.64			0.7			1.9			0.53			0.53			0.6			0.48		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-33-PW-091613 PLSA-C1-33 09/16/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-39-PW-092413 PLSA-C1-39 09/24/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-40-PW-092513 PLSA-C1-40 09/25/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C2-03-PW-092313 PLSA-C2-03 09/23/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C2-06-PW-092413 PLSA-C2-06 09/24/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C2-09-PW-092413 PLSA-C2-09 09/24/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C2-32-PW-092513 PLSA-C2-32 09/25/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.035		J	0.213			0.075			0.04		J	0.427			1.31			0.058		
MERCURY, LOW LEVEL	NG/L	1631	0.42		J	8.26			1.76			6.89			2.16			10.1				0.16	U

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C2-35-PW-091713 PLSA-C2-35 09/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-02-PW-092313 PLSA-C3-02 09/23/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-05-PW-092313 PLSA-C3-05 09/23/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-07-PW-091013 PLSA-C3-07 09/10/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-08-PW-091113 PLSA-C3-08 09/11/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-13-PW-091213 PLSA-C3-13 09/12/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-15-PW-092313 PLSA-C3-15 09/23/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.056			0.042		J	0.234			0.091			0.037		J	0.074			0.052		
MERCURY, LOW LEVEL	NG/L	1631	0.28		J	4.38			4.11			0.67			0.44			0.75			0.54		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-17-PW-092313 PLSA-C3-17 09/23/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-18-PW-092413 PLSA-C3-18 09/24/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-21-PW-092513 PLSA-C3-21 09/25/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-23-PW-092413 PLSA-C3-23 09/24/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-26-PW-091313 PLSA-C3-26 09/13/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-27-PW-091313 PLSA-C3-27 09/13/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-29-PW-091613 PLSA-C3-29 09/16/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630		0.02	U	0.278			0.082			0.367			0.075			0.077			0.133		
MERCURY, LOW LEVEL	NG/L	1631	0.28		J	10.4			2.46			12.2			0.52			2.02			0.56		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C3-31-PW-092013 PLSA-C3-31 09/20/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-34-PW-092013 PLSA-C3-34 09/20/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-36-PW-092313 PLSA-C3-36 09/23/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-37-PW-092013 PLSA-C3-37 09/20/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C3-38-PW-092413 PLSA-C3-38 09/24/2013 Liquid Regular Sample Pore Water			EI13-REF-C1-01-PW-092013 REF-C1-01 09/20/2013 Liquid Regular Sample Pore Water			EI13-REF-C1-02-PW-091913 REF-C1-02 09/19/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.062			0.053			0.023		J	0.099			0.094			0.078			0.083		
MERCURY, LOW LEVEL	NG/L	1631		0.16	U	0.2		J	12.7			0.52			6.95			0.2		J	0.53		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-3
Summary of Analytical Data - Field Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-C1-03-PW-091813 REF-C1-03 09/18/2013 Liquid Regular Sample Pore Water			EI13-REF-C1-04-PW-091813 REF-C1-04 09/18/2013 Liquid Regular Sample Pore Water			EI13-REF-C1-05-PW-091913 REF-C1-05 09/19/2013 Liquid Regular Sample Pore Water			EI13-REF-C3-06-PW-091813 REF-C3-06 09/18/2013 Liquid Regular Sample Pore Water			EI13-REF-C3-07-PW-091913 REF-C3-07 09/19/2013 Liquid Regular Sample Pore Water			EI13-REF-C3-08-PW-091913 REF-C3-08 09/19/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.164			0.034		J	0.029		J	0.126			0.142			0.048		J
MERCURY, LOW LEVEL	NG/L	1631	0.36		J	0.27		J	0.34		J	0.4		J	0.61			0.38		J

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-4
Summary of Analytical Data - Toxicity Testing Day 7 Pore Water Samples
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-C1-10-TOXPW-101713 PLSA-C1-10-TOX 10/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-14-TOXPW-101713 PLSA-C1-14-TOX 10/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-19-TOXPW-101713 PLSA-C1-19-TOX 10/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-22-TOXPW-101713 PLSA-C1-22-TOX 10/17/2013 Liquid Regular Sample Pore Water			EI13-PLSA-C1-25-TOXPW-101713 PLSA-C1-25-TOX 10/17/2013 Liquid Regular Sample Pore Water		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/L	1630	0.81			0.328			0.344			0.173			0.264		
MERCURY, LOW LEVEL	NG/L	1631	28.8			33.5			44.4			42.6			35.5		

Notes:
MDL - Method Detection Limit

Table D-5
Summary of Analytical Data - Whole Body Larval Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-L-CHI-C1-01-091013 PLSA-L-CHI-C1-01 09/10/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-04-091013 PLSA-L-CHI-C1-04 09/10/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-11-091113 PLSA-L-CHI-C1-11 09/11/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-12-091213 PLSA-L-CHI-C1-12 09/12/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-14-090413 PLSA-L-CHI-C1-14 09/04/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-16-091313 PLSA-L-CHI-C1-16 09/13/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	4.75				3.17	U	3.23		J	6.12		J	5.76			1.84		J
MERCURY, LOW LEVEL	NG/G	1631	32.5		J	3.27			28		J	300		J	41.6		J	20.7		J

Notes:
MDL is Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-5
Summary of Analytical Data - Whole Body Larval Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-L-CHI-C1-19-090413 PLSA-L-CHI-C1-19 09/04/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-20-090613 PLSA-L-CHI-C1-20 09/06/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-22-090513 PLSA-L-CHI-C1-22 09/05/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-24-090913 PLSA-L-CHI-C1-24 09/09/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-30-091713 PLSA-L-CHI-C1-30 09/17/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-33-091613 PLSA-L-CHI-C1-33 09/16/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	5.32		J		1.96	U	5.29		J	2.57		J		3.89	U		2.34	U
MERCURY, LOW LEVEL	NG/G	1631	27.8		J	15.6			29.9		J	38.9		J	5.11			11.4		

Notes:
MDL is Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-5
Summary of Analytical Data - Whole Body Larval Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-L-CHI-C1-39-092413 PLSA-L-CHI-C1-39 09/24/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C1-40-092513 PLSA-L-CHI-C1-40 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C2-03-092313 PLSA-L-CHI-C2-03 09/23/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C2-06-092413 PLSA-L-CHI-C2-06 09/24/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C2-09-092413 PLSA-L-CHI-C2-09 09/24/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-L-CHI-C2-32-092513 PLSA-L-CHI-C2-32 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	3.5		J	11.3			3.55		J	4.61			5.49		J	3.72		
MERCURY, LOW LEVEL	NG/G	1631	82.3		J	104		J	40.8		J	23.8		J	48.4		J	35.1		J

Notes:
MDL is Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-5
Summary of Analytical Data - Whole Body Larval Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-L-CHI-C1-01-092013 REF-L-CHI-C1-01 09/20/2013 Biota Regular Sample Animal Tissue			EI13-REF-L-CHI-C1-02-091913 REF-L-CHI-C1-02 09/19/2013 Biota Regular Sample Animal Tissue			EI13-REF-L-CHI-C1-03-091813 REF-L-CHI-C1-03 09/18/2013 Biota Regular Sample Animal Tissue			EI13-REF-L-CHI-C1-05-091913 REF-L-CHI-C1-05 09/19/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630		1.69	U	4.5		J	2.18		J		5.49	U
MERCURY, LOW LEVEL	NG/G	1631	1.43			5.53			3.37			32.6		

Notes:
MDL is Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected.

Table D-6
Summary of Analytical Data - Whole Body Adult Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-A-CHI-TS[1] A-CHI-TS 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-01-092513 PLSA-A-CHI-C1-01 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-04-092513 PLSA-A-CHI-C1-04 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-10-092513 PLSA-A-CHI-C1-10 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-11-092513 PLSA-A-CHI-C1-11 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-12-092513 PLSA-A-CHI-C1-12 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-14-092513 PLSA-A-CHI-C1-14 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	-			13.3			12.7			16.8			8.7			16.9			25.7		
MERCURY, LOW LEVEL	NG/G	1631	-			22.6		J	17.7		J	40		J	21.8		J	52.6		J	37.5		J
TOTAL SOLIDS	%	2540 G-1997	33.97			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
TS - Total Solids
- - not analyzed
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-6
Summary of Analytical Data - Whole Body Adult Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-A-CHI-C1-16-092513 PLSA-A-CHI-C1-16 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-19-092513 PLSA-A-CHI-C1-19 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-20-092513 PLSA-A-CHI-C1-20 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-22-092513 PLSA-A-CHI-C1-22 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-24-092513 PLSA-A-CHI-C1-24 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-25-092513 PLSA-A-CHI-C1-25 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	5.56			12.3			11.4			29.7			14.2			13.8		
MERCURY, LOW LEVEL	NG/G	1631	7.7		J	22.9		J	17.7		J	50.2		J	18.1		J	20.6		J
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
TS - Total Solids
- - not analyzed
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-6
Summary of Analytical Data - Whole Body Adult Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-A-CHI-C1-28-092513 PLSA-A-CHI-C1-28 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-30-092513 PLSA-A-CHI-C1-30 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C1-33-092513 PLSA-A-CHI-C1-33 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C2-03-092513 PLSA-A-CHI-C2-03 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C2-06-092513 PLSA-A-CHI-C2-06 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C2-09-092513 PLSA-A-CHI-C2-09 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	17.9			5.61			8.2			15.2			15.5			12.5		
MERCURY, LOW LEVEL	NG/G	1631	26.2		J	11.3		J	16.6		J	25		J	28		J	22.9		J
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
TS - Total Solids
- - not analyzed
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-6
Summary of Analytical Data - Whole Body Adult Chironomid Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-A-CHI-C2-32-092513 PLSA-A-CHI-C2-32 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-A-CHI-C2-35-092513 PLSA-A-CHI-C2-35 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-A-CHI-C1-01-092513 REF-A-CHI-C1-01 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-A-CHI-C1-02-092513 REF-A-CHI-C1-02 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-A-CHI-C1-03-092513 REF-A-CHI-C1-03 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-A-CHI-C1-04-092513 REF-A-CHI-C1-04 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-A-CHI-C1-05-092513 REF-A-CHI-C1-05 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	7.81			5.26			6.17			6.11			10.2			11			12.3		J
MERCURY, LOW LEVEL	NG/G	1631	12.3		J	8.47		J	11.4		J	10.1		J	14.2		J	17.8		J	19.9		J
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
TS - Total Solids
- - not analyzed
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-7
Summary of Analytical Data - Whole Body Crayfish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-ABD-CRAY-01-092013 ABD-CRAY-01 09/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-CRAY-02-092013 ABD-CRAY-02 09/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-CRAY-03-091113 ABD-CRAY-03 09/11/2013 Biota Regular Sample Animal Tissue			EI13-ABD-CRAY-04-091113 ABD-CRAY-04 09/11/2013 Biota Regular Sample Animal Tissue			EI13-ABD-CRAY-05-091113 ABD-CRAY-05 09/11/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-01-091013 PLSA-CRAY-01 09/10/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-02-091013 PLSA-CRAY-02 09/10/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-03-091013 PLSA-CRAY-03 09/10/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	42.6			49.9			44.1			62.9			66.9			35.7			23.3			21.8		
MERCURY, LOW LEVEL	NG/G	1631	61.3			62.7			62.9			65.8			70.1			36.8			29.7			28.3		
TOTAL SOLIDS	%	2540 G-1997	27.48			30.04			26.43			28.94			17.98			27.77			22.18			27.87		

Notes:
MDL - Method Detection Limit

Table D-7
Summary of Analytical Data - Whole Body Crayfish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-CRAY-04-090913 PLSA-CRAY-04 09/09/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-05-090913 PLSA-CRAY-05 09/09/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-06-090913 PLSA-CRAY-06 09/09/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-07-090613 PLSA-CRAY-07 09/06/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-08-090613 PLSA-CRAY-08 09/06/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-09-090613 PLSA-CRAY-09 09/06/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-CRAY-10-090613 PLSA-CRAY-10 09/06/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-01-090413 REF-CRAY-01 09/04/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	7.01			8.62			14.5			24.2			16.2			29.6			17.8			7.91		
MERCURY, LOW LEVEL	NG/G	1631	10.9			11.9			15.2			28.5			19.2			30.3			21.4			15.3		
TOTAL SOLIDS	%	2540 G-1997	17.94			27.01			30.15			28.14			25.24			33.93			27.07			20.89		

Notes:
MDL - Method Detection Limit

Table D-7
Summary of Analytical Data - Whole Body Crayfish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-CRAY-02-090413 REF-CRAY-02 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-03-090413 REF-CRAY-03 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-04-090413 REF-CRAY-04 09/04/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	8.01			8.74			9.36		
MERCURY, LOW LEVEL	NG/G	1631	11.3			11.1			12.5		
TOTAL SOLIDS	%	2540 G-1997	24.12			23.35			23.58		

Parameter Name	Units	Analytical Method	EI13-REF-CRAY-05-090413 REF-CRAY-05 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-06-090413 REF-CRAY-06 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-07-090413 REF-CRAY-07 09/04/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	7.27			7.66			8.49		
MERCURY, LOW LEVEL	NG/G	1631	8.73			21.8			12.5		
TOTAL SOLIDS	%	2540 G-1997	26.58			27.86			26.16		

Parameter Name	Units	Analytical Method	EI13-REF-CRAY-08-090413 REF-CRAY-08 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-09-090413 REF-CRAY-09 09/04/2013 Biota Regular Sample Animal Tissue			EI13-REF-CRAY-10-090413 REF-CRAY-10 09/04/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	13.3			7.34			6.61		
MERCURY, LOW LEVEL	NG/G	1631	15.6			9.73			9.14		
TOTAL SOLIDS	%	2540 G-1997	25.72			29.86			29.72		

Notes:
MDL - Method Detection Limit

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	E13-LYCO-TS[1] LYCO-TS 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-01-092513 ABD-LYCO-01 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-02-092513 ABD-LYCO-02 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-03-092513 ABD-LYCO-03 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-04-092513 ABD-LYCO-04 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-05-092513 ABD-LYCO-05 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-07-092513 ABD-LYCO-07 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-08-092513 ABD-LYCO-08 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	-			309			238			101			132			179			259			420		
MERCURY, LOW LEVEL	NG/G	1631	-			458			369		J	104			165			412			271			542		
TOTAL SOLIDS	%	2540 G-1997	26.03			-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-ABD-LYCO-09-092513 ABD-LYCO-09 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-LYCO-10-092513 ABD-LYCO-10 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-01-092513 PLSA-LYCO-01 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-02-092513 PLSA-LYCO-02 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-03-092513 PLSA-LYCO-03 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-04-092513 PLSA-LYCO-04 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-05-092513 PLSA-LYCO-05 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	412			198			225			162			256			30.8			136		
MERCURY, LOW LEVEL	NG/G	1631	557	J		183			241			184			385			108			164		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-LYCO-06-092513 PLSA-LYCO-06 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-07-092513 PLSA-LYCO-07 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-08-092513 PLSA-LYCO-08 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-09-092513 PLSA-LYCO-09 09/25/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-LYCO-10-092513 PLSA-LYCO-10 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-01-092513 REF-LYCO-01 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-02-092513 REF-LYCO-02 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	83.3			129			28			56.6			92.7			103			80.4		
MERCURY, LOW LEVEL	NG/G	1631	97.5			137			28.5			57.3			86.7			109			88.5		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-LYCO-03-092513 REF-LYCO-03 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-04-092513 REF-LYCO-04 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-05-092513 REF-LYCO-05 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-06-092513 REF-LYCO-06 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-07-092513 REF-LYCO-07 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-08-092513 REF-LYCO-08 09/25/2013 Biota Regular Sample Animal Tissue			EI13-REF-LYCO-09-092513 REF-LYCO-09 09/25/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	28.3			70.9			48.5			70			75.8			59.5			53.9		
MERCURY, LOW LEVEL	NG/G	1631	38.1			87.8			62.4			82.3			89.9			44			68.1		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-LYCO-10-092513 REF-LYCO-10 09/25/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-01-081513 ABD-TETRA-01 08/15/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-02-081513 ABD-TETRA-02 08/15/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-03-081513 ABD-TETRA-03 08/15/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-04-081513 ABD-TETRA-04 08/15/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-05-081513 ABD-TETRA-05 08/15/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-06-081613 ABD-TETRA-06 08/16/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	67.6			176			178			200			132			180			112		
MERCURY, LOW LEVEL	NG/G	1631	69.3			257			315			519			279			332			254		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-ABD-TETRA-07-081613 ABD-TETRA-07 08/16/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-08-081613 ABD-TETRA-08 08/16/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-09-081613 ABD-TETRA-09 08/16/2013 Biota Regular Sample Animal Tissue			EI13-ABD-TETRA-10-081613 ABD-TETRA-10 08/16/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-01-081313 PLSA-TETRA-01 08/13/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-02-081313 PLSA-TETRA-02 08/13/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-03-081313 PLSA-TETRA-03 08/13/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	166			204			134			121			67.6			63.8			95.8		
MERCURY, LOW LEVEL	NG/G	1631	312			351			219			175			107			101			135		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			27.52			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-TETRA-04-081313 PLSA-TETRA-04 08/13/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-05-081413 PLSA-TETRA-05 08/14/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-06-081413 PLSA-TETRA-06 08/14/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-07-081413 PLSA-TETRA-07 08/14/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-08-081413 PLSA-TETRA-08 08/14/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-09-081513 PLSA-TETRA-09 08/15/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-TETRA-10-081513 PLSA-TETRA-10 08/15/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	77.8			39.5			71.3			55.4			85.7			75.8			72.4		
MERCURY, LOW LEVEL	NG/G	1631	123			86.7			99.6			88.3			128			116			102		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-TETRA-01-081613 REF-TETRA-01 08/16/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-02-082813 REF-TETRA-02 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-03-082913 REF-TETRA-03 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-04-082913 REF-TETRA-04 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-05-082913 REF-TETRA-05 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-06-082913 REF-TETRA-06 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-07-082913 REF-TETRA-07 08/29/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	52.1			54.7			66.9			78			72.9			86.4			57.4		
MERCURY, LOW LEVEL	NG/G	1631	91.4			92.7			99.2			119			107			125			92.4		
TOTAL SOLIDS	%	2540 G-1997	-			-			-			-			-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-8
Summary of Analytical Data - Whole Body Spider Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-TETRA-08-082913 REF-TETRA-08 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-09-082913 REF-TETRA-09 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-TETRA-10-082913 REF-TETRA-10 08/29/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	55.7			44.2			38.2		
MERCURY, LOW LEVEL	NG/G	1631	81.7			61.4			63		
TOTAL SOLIDS	%	2540 G-1997	-			-			-		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
- - not analyzed
Lyco - Lycosidae, Wolf Spider
Tetra - Tetrgnathidae, Long Jawed Orb Weaver
[1]TS sample was analyzed from a composite sample of individuals collected from sampling locations in the study area

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-ABD-Y-LEMAC-01-082013 ABD-Y-LEMAC-01 08/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-LEMAC-02-082013 ABD-Y-LEMAC-02 08/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-LEMAC-03-082013 ABD-Y-LEMAC-03 08/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-LEMAC-04-082013 ABD-Y-LEMAC-04 08/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-LEMAC-05-082013 ABD-Y-LEMAC-05 08/20/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-MISAL-01-082313 ABD-Y-MISAL-01 08/23/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-MISAL-02-082913 ABD-Y-MISAL-02 08/29/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	78.9			70.8			95.4			81.8			102			142			154		
MERCURY, LOW LEVEL	NG/G	1631	132			167			157			117			222			169			173		
TOTAL SOLIDS	%	2540 G-1997	23.92			20.05			22.65			22.07			25.42			21.11			21.73		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-ABD-Y-MISAL-03-082313 ABD-Y-MISAL-03 08/23/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-MISAL-04-082913 ABD-Y-MISAL-04 08/29/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-MISAL-05-082713 ABD-Y-MISAL-05 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-Y-PEFLA-01-082313 ABD-Y-PEFLA-01 41509 Biota Regular Sample Animal Tissue			EI13-ABD-Y-PEFLA-02-082313 ABD-Y-PEFLA-02 41509 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-LEMAC-01-081913 PLSA-Y-LEMAC-01 08/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-LEMAC-02-081913 PLSA-Y-LEMAC-02 08/19/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	98.2			108			120			81			39.3			30.6			25.3		
MERCURY, LOW LEVEL	NG/G	1631	121			120			116			120			51.9			44.8			29.2		
TOTAL SOLIDS	%	2540 G-1997	21.28			20.86			21.48			24.13			23.14			21.48			21.58		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-Y-LEMAC-03-082213 PLSA-Y-LEMAC-03 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-LEMAC-04-082113 PLSA-Y-LEMAC-04 08/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-LEMAC-05-082213 PLSA-Y-LEMAC-05 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-MISAL-01-082913 PLSA-Y-MISAL-01 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-MISAL-02-082613 PLSA-Y-MISAL-02 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-MISAL-03-082713 PLSA-Y-MISAL-03 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-MISAL-04-082713 PLSA-Y-MISAL-04 08/27/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	30.7			41.8			28.7			86.1			59.2			59.6			67.7		
MERCURY, LOW LEVEL	NG/G	1631	33.2			45.8			28.2			81.8			68.3			76.7			66.8		
TOTAL SOLIDS	%	2540 G-1997	16.57			22.97			19.37			21.74			22.32			21.88			20.73		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-Y-MISAL-05-082913 PLSA-Y-MISAL-05 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-PEFLA-01-082113 PLSA-Y-PEFLA-01 41507 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-PEFLA-02-082113 PLSA-Y-PEFLA-02 41507 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-PEFLA-03-100213 PLSA-Y-PEFLA-03 41549 Biota Regular Sample Animal Tissue			EI13-PLSA-Y-PEFLA-04-100213 PLSA-Y-PEFLA-04 41549 Biota Regular Sample Animal Tissue			EI13-REF-Y-LEMAC-01-082113 REF-Y-LEMAC-01 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-LEMAC-02-082313 REF-Y-LEMAC-02 08/23/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	67.9			50.9			55.9			37.8			29.3			31.9			40		
MERCURY, LOW LEVEL	NG/G	1631	58.9			62.3			56.7			42.7			35.8			32.7			35.9		
TOTAL SOLIDS	%	2540 G-1997	20.29			23.1			22.35			24.67			24.31			21.69			22.2		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-REF-Y-LEMAC-03-082313 REF-Y-LEMAC-03 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-LEMAC-04-082313 REF-Y-LEMAC-04 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-LEMAC-05-082313 REF-Y-LEMAC-05 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-MISAL-01-082313 REF-Y-MISAL-01 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-MISAL-02-082313 REF-Y-MISAL-02 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-MISAL-03-082313 REF-Y-MISAL-03 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-MISAL-04-082713 REF-Y-MISAL-04 08/27/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	29.6			39.1			30.9			52.1			54.1			46.5			49.6		
MERCURY, LOW LEVEL	NG/G	1631	36			43.3			34.2			56.6			63.6			56.6			55.2		
TOTAL SOLIDS	%	2540 G-1997	20.71			24.02			21.86			21.18			22.62			21.87			20.88		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-9
Summary of Analytical Data - Whole Body Young-of-Year (YOY) Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-REF-Y-MISAL-05-082713 REF-Y-MISAL-05 08/27/2013 Biota Regular Sample Animal Tissue			EI13-REF-Y-PEFLA-01-082313 REF-Y-PEFLA-01 41509 Biota Regular Sample Animal Tissue			EI13-REF-Y-PEFLA-02-082713 REF-Y-PEFLA-02 41513 Biota Regular Sample Animal Tissue			EI13-REF-Y-PEFLA-03-082713 REF-Y-PEFLA-03 41513 Biota Regular Sample Animal Tissue			EI13-REF-Y-PEFLA-04-082713 REF-Y-PEFLA-04 41513 Biota Regular Sample Animal Tissue			EI13-REF-Y-PEFLA-05-082713 REF-Y-PEFLA-05 41513 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	33.1			29.5			31.3			23.5			34.8			28.4		
MERCURY, LOW LEVEL	NG/G	1631	40.4			36.1			39			27.1			38.6			33.3		
TOTAL SOLIDS	%	2540 G-1997	20.86			22.54			23.55			22.2			23.59			22.69		

Notes:
MDL - Method Detection Limit
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-AMNAT-01-082613 PLSA-AMNAT-01 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-06-082113 PLSA-AMNAT-06 08/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-07-082113 PLSA-AMNAT-07 08/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-08-082213 PLSA-AMNAT-08 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-09-082213 PLSA-AMNAT-09 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-10-082213 PLSA-AMNAT-10 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-11-082613 PLSA-AMNAT-11 08/26/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	66.5			472			177			326			354			146			109		
MERCURY, LOW LEVEL	NG/G	1631	58.6			497			199			375			333			166			123		
TOTAL SOLIDS	%	2540 G-1997	21.4			23.48			20.24			20.97			18.53			19.93			25.2		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-AMNAT-12-082613 PLSA-AMNAT-12 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNAT-13-082713 PLSA-AMNAT-13 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-02-082613 PLSA-AMNEB-02 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-03-082613 PLSA-AMNEB-03 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-04-082613 PLSA-AMNEB-04 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-05-082913 PLSA-AMNEB-05 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-14-082913 PLSA-AMNEB-14 08/29/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	86.5			159			59.8			60.2			41.9			51.6			102		
MERCURY, LOW LEVEL	NG/G	1631	80.5			171			99.5			68.6			42.9			65.4			89.7		
TOTAL SOLIDS	%	2540 G-1997	21.28			22.83			24.04			24.41			23.31			22.41			26.49		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

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Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-AMNEB-15-082913 PLSA-AMNEB-15 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-16-082913 PLSA-AMNEB-16 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-17-082913 PLSA-AMNEB-17 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-AMNEB-18-082913 PLSA-AMNEB-18 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-01-082213 PLSA-MISAL-01 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-02-082213 PLSA-MISAL-02 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-03-082213 PLSA-MISAL-03 08/22/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	106			39.2			71.2			138		J	89			81.1			71.6		
MERCURY, LOW LEVEL	NG/G	1631	104			60.2			82.2			63.8		J	92.9			73.1			80.6		
TOTAL SOLIDS	%	2540 G-1997	24.9			23.63			33.7			35.85			22.33			22.96			21.62		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-MISAL-04-082213 PLSA-MISAL-04 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-05-082613 PLSA-MISAL-05 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-06-081913 PLSA-MISAL-06 8/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-07-081913 PLSA-MISAL-07 8/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-08-082213 PLSA-MISAL-08 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-09-082213 PLSA-MISAL-09 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-10-082213 PLSA-MISAL-10 08/22/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	82.9			70.7			88.5			100			321			213			350		
MERCURY, LOW LEVEL	NG/G	1631	96.3			77.6			123			153			348			222			364		
TOTAL SOLIDS	%	2540 G-1997	22			24.17			26.92			25.76			24.35			22.37			23.29		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-MISAL-11-082213 PLSA-MISAL-11 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-12-082213 PLSA-MISAL-12 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-13-082213 PLSA-MISAL-13 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-14-082213 PLSA-MISAL-14 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-15-082613 PLSA-MISAL-15 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-16-082613 PLSA-MISAL-16 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-17-082613 PLSA-MISAL-17 08/26/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	198			188			158			122			60.6			61.8			118		
MERCURY, LOW LEVEL	NG/G	1631	243			189			174			148			70.8			75.5			126		
TOTAL SOLIDS	%	2540 G-1997	22.15			23.59			23.1			22.07			22.2			23.72			22.25		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-MISAL-18-082613 PLSA-MISAL-18 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-19-082713 PLSA-MISAL-19 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-MISAL-20-082713 PLSA-MISAL-20 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-01-082713 PLSA-NOCRY-01 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-02-082113 PLSA-NOCRY-02 08/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-03-082113 PLSA-NOCRY-03 08/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-04-082713 PLSA-NOCRY-04 08/27/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	70.1			90.7			58.4			42.1			116			93.1			98.4		
MERCURY, LOW LEVEL	NG/G	1631	69.8			86.6			72.4			35.7			131			98.8			95.6		
TOTAL SOLIDS	%	2540 G-1997	22.74			23.61			22.15			23.11			28.93			26.4			27.74		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-NOCRY-05-082213 PLSA-NOCRY-05 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-06-082213 PLSA-NOCRY-06 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-NOCRY-07-082113 PLSA-NOCRY-07 8/21/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-PEFLA-06-082313 PLSA-PEFLA-06 08/23/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-PEFLA-07-082213 PLSA-PEFLA-07 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-PEFLA-08-082213 PLSA-PEFLA-08 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-PEFLA-09-082213 PLSA-PEFLA-09 08/22/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	112			24.8			84.5			142			420			154			94		
MERCURY, LOW LEVEL	NG/G	1631	105			28			94.5			188			463			142			101		
TOTAL SOLIDS	%	2540 G-1997	28.49			23.49			26.73			28.75			25.53			26.59			27.28		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
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Parameter Name	Units	Analytical Method	EI13-PLSA-PEFLA-10-082213 PLSA-PEFLA-10 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-PEFLA-11-082613 PLSA-PEFLA-11 08/26/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNAT-02-082713 REF-AMNAT-02 08/27/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNAT-03-082913 REF-AMNAT-03 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNAT-04-082913 REF-AMNAT-04 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNAT-05-082913 REF-AMNAT-05 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNAT-06-082113 REF-AMNAT-06 08/21/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	138			232			46.6			44.5			37.7			62.1			70.1		
MERCURY, LOW LEVEL	NG/G	1631	151			269			47.6			42.1			34.7			77.7			66		
TOTAL SOLIDS	%	2540 G-1997	27.84			28.09			20.14			22.26			24.69			21.95			25.27		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-AMNEB-01-082913 REF-AMNEB-01 08/29/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNEB-07-082113 REF-AMNEB-07 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNEB-08-082313 REF-AMNEB-08 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-AMNEB-09-082313 REF-AMNEB-09 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-01-082313 REF-MISAL-01 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-02-082313 REF-MISAL-02 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-03-082313 REF-MISAL-03 08/23/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	26.8			47.5			17.7			38.3			58.7			54.5			68.9		
MERCURY, LOW LEVEL	NG/G	1631	26.5			41.8			20			37.5			67			59.7			82.1		
TOTAL SOLIDS	%	2540 G-1997	26.38			20.15			23.47			24.79			20.9			21.11			23.48		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-REF-MISAL-04-082313 REF-MISAL-04 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-05-082313 REF-MISAL-05 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-06-082113 REF-MISAL-06 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-07-082113 REF-MISAL-07 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-08-082113 REF-MISAL-08 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-09-082113 REF-MISAL-09 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-10-082113 REF-MISAL-10 08/21/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	31.6			64.7			119			233			140			137			63.4		
MERCURY, LOW LEVEL	NG/G	1631	54.8			78			135			245			143			150			74.4		
TOTAL SOLIDS	%	2540 G-1997	22.99			23.54			26.3			25.4			24.85			24.74			22.21		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
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Parameter Name	Units	Analytical Method	EI13-REF-MISAL-11-082313 REF-MISAL-11 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-12-082313 REF-MISAL-12 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-13-082313 REF-MISAL-13 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-14-082313 REF-MISAL-14 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-15-082313 REF-MISAL-15 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-16-082713 REF-MISAL-16 08/27/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-17-082713 REF-MISAL-17 08/27/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	93.9			57.7			97.4			77.8			115			74.8			101		
MERCURY, LOW LEVEL	NG/G	1631	112			77.2			109			90.4			138			74.2			120		
TOTAL SOLIDS	%	2540 G-1997	22.32			22.82			24.04			24.65			23.66			22.73			23.11		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
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Parameter Name	Units	Analytical Method	EI13-REF-MISAL-18-082713 REF-MISAL-18 08/27/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-19-082713 REF-MISAL-19 08/27/2013 Biota Regular Sample Animal Tissue			EI13-REF-MISAL-20-082813 REF-MISAL-20 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-NOCRY-01-082313 REF-NOCRY-01 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-NOCRY-02-082313 REF-NOCRY-02 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-NOCRY-03-082313 REF-NOCRY-03 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-NOCRY-04-082313 REF-NOCRY-04 08/23/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	75.8			63.6			56.7			44.9			50.1			90.8			86.1		
MERCURY, LOW LEVEL	NG/G	1631	85.9			72			79.6			48.5			59.8			87.3			78.1		
TOTAL SOLIDS	%	2540 G-1997	23.5			21.86			22.22			25.19			26.47			28.21			25.65		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-10
Summary of Analytical Data - Whole Body Adult Fish Tissue
2013 Pompton Lakes Ecological Investigation Report
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Parameter Name	Units	Analytical Method	EI13-REF-NOCRY-05-082313 REF-NOCRY-05 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-06-082113 REF-PEFLA-06 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-07-082113 REF-PEFLA-07 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-08-082113 REF-PEFLA-08 08/21/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-09-082313 REF-PEFLA-09 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-10-082313 REF-PEFLA-10 08/23/2013 Biota Regular Sample Animal Tissue			EI13-REF-PEFLA-11-082813 REF-PEFLA-11 08/28/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	117			162			74.9			84.6			73.3			135			145		
MERCURY, LOW LEVEL	NG/G	1631	107			178			81.1			93.5			81.5			127			140		
TOTAL SOLIDS	%	2540 G-1997	27.39			26.72			29.18			29.21			30.41			27.97			29.5		

Notes:
MDL - Method Detection Limit
J - Analyte present. Reported value may not be accurate or precise.
AMNAT - Yellow Bullhead Catfish
AMNEB - Brown Bullhead Catfish
LEMAC - Bluegill Sunfish
MISAL - Largemouth Bass
NOCRY - Bolden Shiner
PEFLA - Yellow Perch

Table D-11
Summary of Analytical Data - Whole Body Adult American Bullfrog (*Rana catesbeianus*) Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-ABD-RACAT-01-082713 ABD-RACAT-01 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-02-082713 ABD-RACAT-02 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-03-082713 ABD-RACAT-03 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-04-082713 ABD-RACAT-04 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-05-082213 ABD-RACAT-05 08/22/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-06-082713 ABD-RACAT-06 08/27/2013 Biota Regular Sample Animal Tissue			EI13-ABD-RACAT-07-082713 ABD-RACAT-07 08/27/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	57.7			107			160			132			64.3			14.7			53.4		
MERCURY, LOW LEVEL	NG/G	1631	70			118			166			127			146			29			89		
TOTAL SOLIDS	%	2540 G-1997	19.04			20.77			17.73			17.63			23.07			15.78			17.91		

Notes:
MDL - Method Detection Limit
RACAT - American Bullfrog

Table D-11
Summary of Analytical Data - Whole Body Adult American Bullfrog (*Rana catesbeianus*) Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-RACAT-01-082613 PLSA-RACAT-01 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-02-082613 PLSA-RACAT-02 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-03-082713 PLSA-RACAT-03 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-04-082713 PLSA-RACAT-04 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-05-082713 PLSA-RACAT-05 08/27/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-06-081913 PLSA-RACAT-06 08/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-07-082613 PLSA-RACAT-07 08/26/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	21.4			28.1			30.9			134			42.3			22.3			69.2		
MERCURY, LOW LEVEL	NG/G	1631	29.3			35.9			30.1			157			45.7			24.9			84.6		
TOTAL SOLIDS	%	2540 G-1997	17.89			17.43			18.28			20.26			16.7			17.85			21.43		

Notes:
MDL - Method Detection Limit
RACAT - American Bullfrog

Table D-11
Summary of Analytical Data - Whole Body Adult American Bullfrog (*Rana catesbeianus*) Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Parameter Name	Units	Analytical Method	EI13-PLSA-RACAT-08-081913 PLSA-RACAT-08 08/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-09-082813 PLSA-RACAT-09 08/28/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-10-082613 PLSA-RACAT-10 08/26/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-11-082213 PLSA-RACAT-11 08/22/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-12-082913 PLSA-RACAT-12 08/29/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-13-081913 PLSA-RACAT-13 08/19/2013 Biota Regular Sample Animal Tissue			EI13-PLSA-RACAT-14-091213 PLSA-RACAT-14 09/12/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	8.85			9.13			7.34			16			52.1			74.3			75.5		
MERCURY, LOW LEVEL	NG/G	1631	10.5			14.4			9.23			15.4			137			82.6			75.3		
TOTAL SOLIDS	%	2540 G-1997	19.89			20.83			19.22			21.39			16.13			18.09			21.59		

Notes:
MDL - Method Detection Limit
RACAT - American Bullfrog

Table D-11
Summary of Analytical Data - Whole Body Adult American Bullfrog (*Rana catesbeianus*) Tissue
2013 Pompton Lakes Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

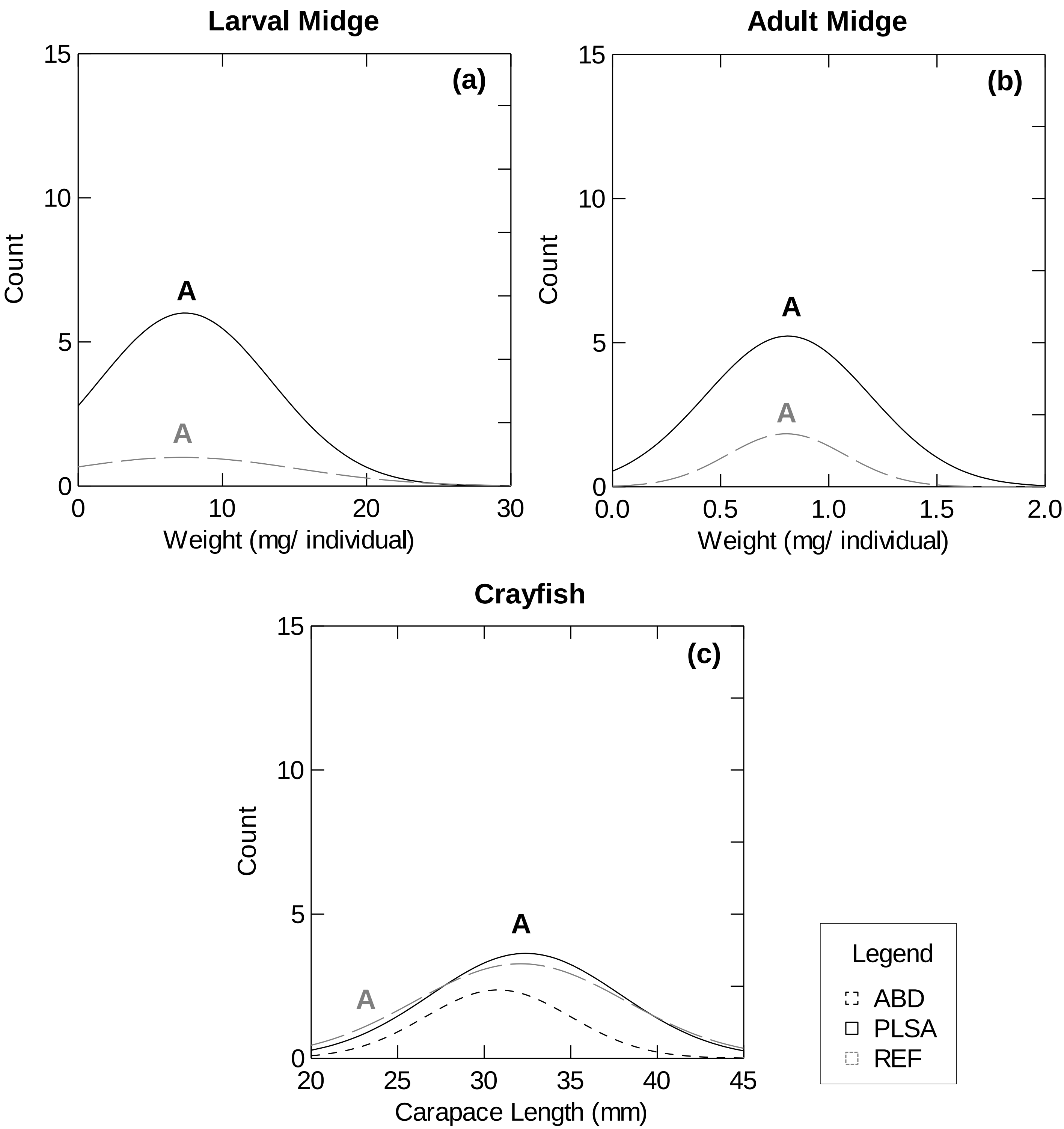
Parameter Name	Units	Analytical Method	EI13-REF-RACAT-01-082813 REF-RACAT-01 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-RACAT-02-082813 REF-RACAT-02 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-RACAT-03-082813 REF-RACAT-03 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-RACAT-04-082813 REF-RACAT-04 08/28/2013 Biota Regular Sample Animal Tissue			EI13-REF-RACAT-05-082913 REF-RACAT-05 08/29/2013 Biota Regular Sample Animal Tissue		
			Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier	Result	MDL	Qualifier
METHYL MERCURY	NG/G	1630	17.1			23.4			37.5			66			44.5		
MERCURY, LOW LEVEL	NG/G	1631	18.4			26.4			40.7			65.4			45.4		
TOTAL SOLIDS	%	2540 G-1997	16.15			18.31			19.93			30.79			17.41		

Notes:
MDL - Method Detection Limit
RACAT - American Bullfrog

Appendix E

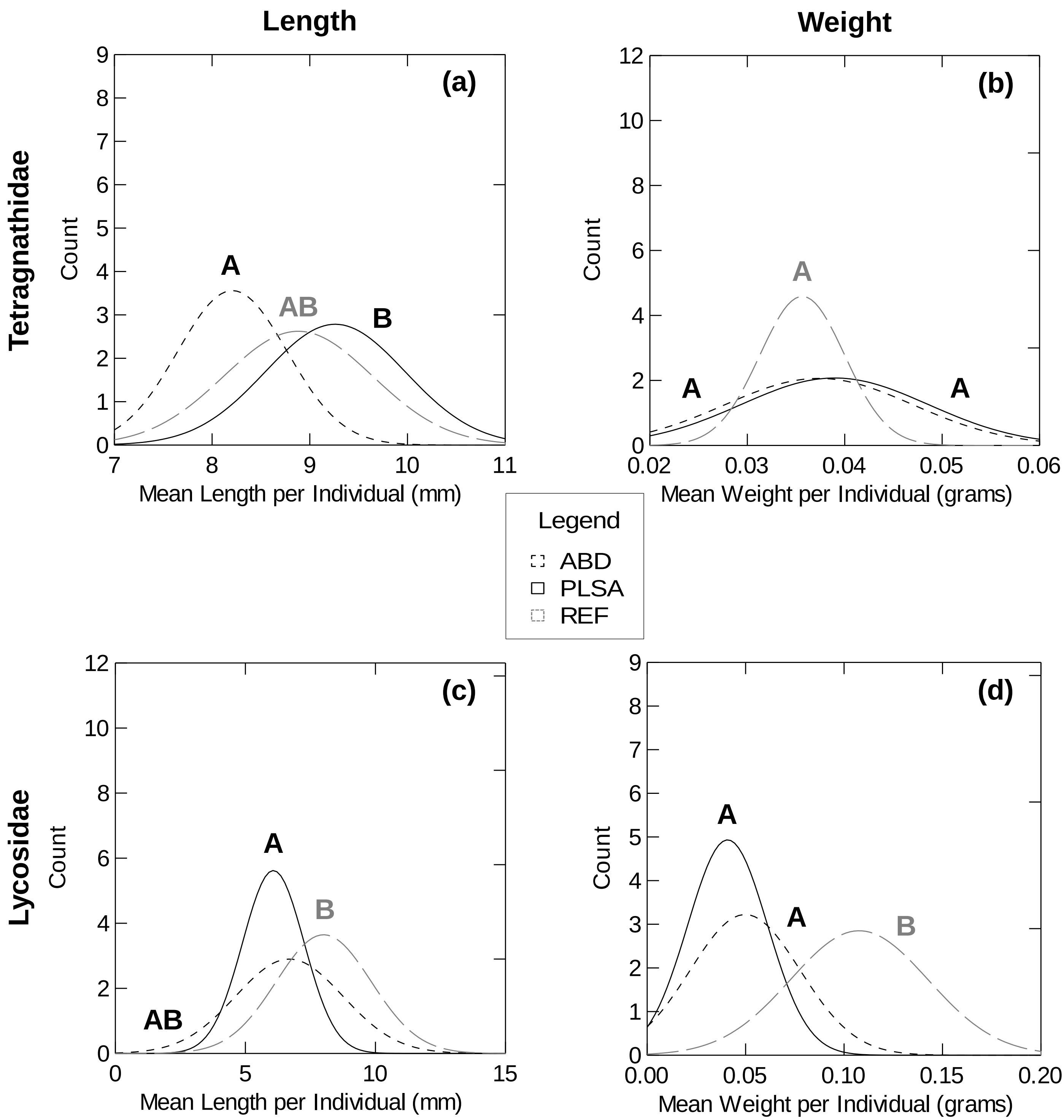
Size Distribution of Tissue Residue Samples

Figure E-1
Invertebrate Tissue Evaluation- Size Distribution
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



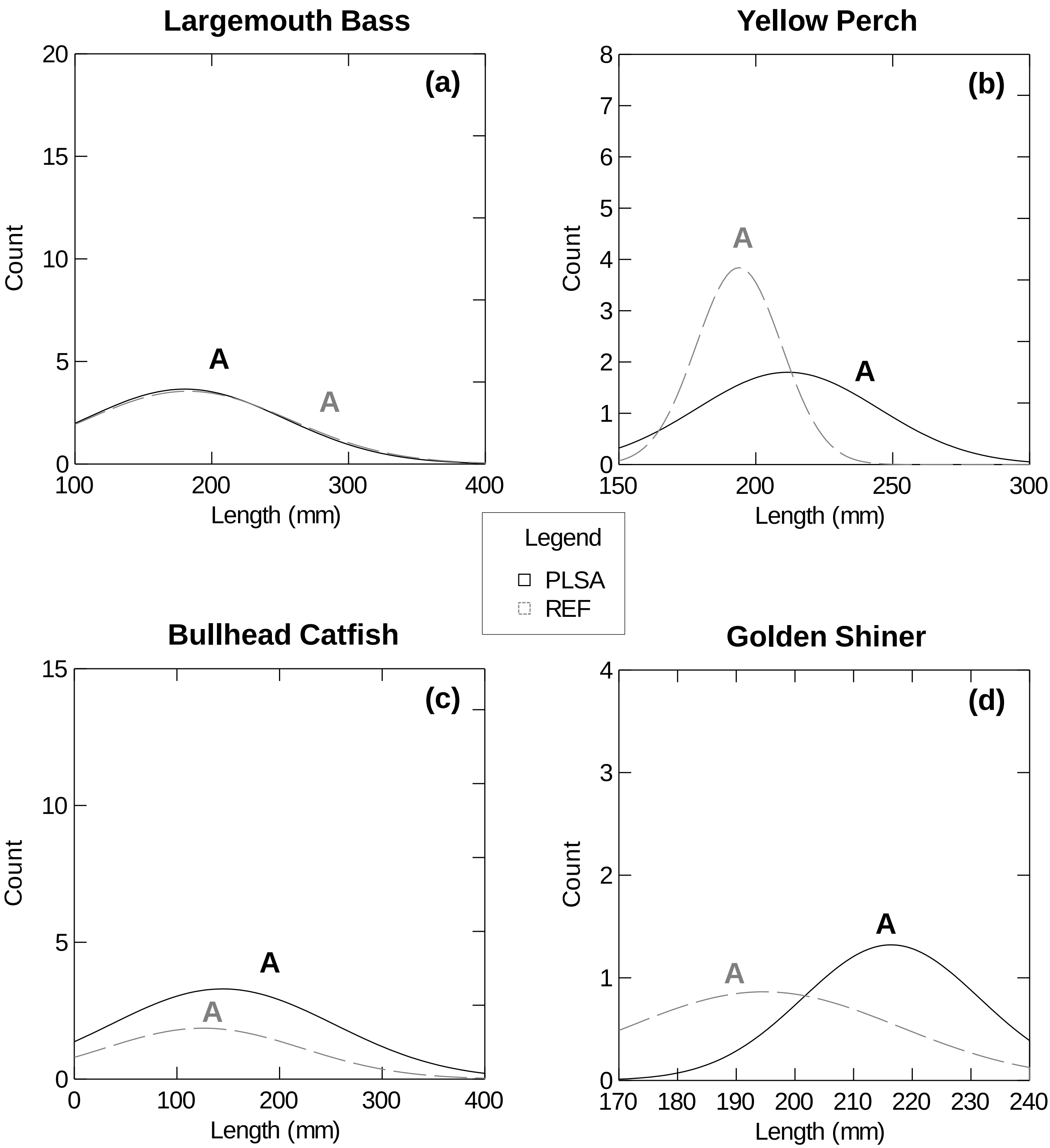
Notes: Data shown are the size distributions of aquatic (larval midge and crayfish) and emergent (adult midges) invertebrates collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and Reference Area (REF) sample locations. A two sample two-tailed t-Test was used to test for a significant difference between PLSA and REF (significant difference indicated by different letters, $\alpha = 0.05$). Where possible, data were transformed to meet assumptions of normality.

Figure E-2
Spider Tissue Evaluation- Size Distribution
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



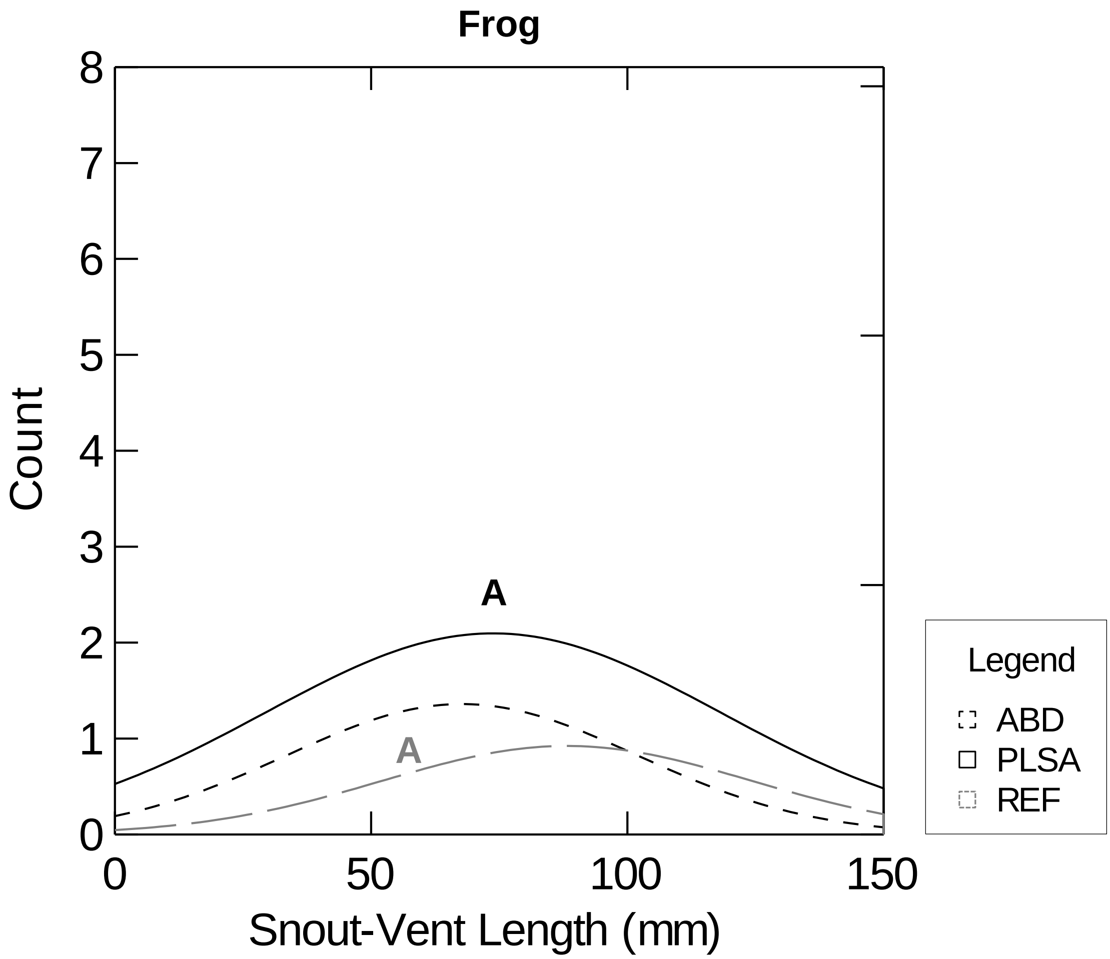
Notes: Data shown are the size distributions of spider samples collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and Reference Area (REF) sample locations. Analysis of variance (ANOVA) with Tukey HSD post hoc analysis was used to test for a significant differences between ABD, PLSA, and REF (significant differences indicated by different letters, α= 0.05).

Figure E-3
Fish Tissue Evaluation- Size Distribution
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the size distributions of adult fish (largemouth bass, yellow perch, bullhead catfish, and golden shiner) collected at Pompton Lake Study Area (PLSA), and Reference Area (REF) sample locations. Depending on normality of data distribution, a two sample two-tailed t-Test or Mann-Whitney Test was used to test for a significant difference between PLSA and REF (significant difference indicated by different letters, α= 0.05).

Figure E-4
Frog Tissue Evaluation- Size Distribution
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



Notes: Data shown are the size distributions of aquatic (larval midge and crayfish) and emergent (adult midges) invertebrates collected at Acid Brook Delta (ABD), Pompton Lake Study Area (PLSA), and Reference Area (REF) sample locations. A two sample two-tailed t-Test was used to test for a significant difference between PLSA and REF (significant difference indicated by different letters, $\alpha = 0.05$). Where possible, data were transformed to meet assumptions of normality.

Appendix F

Wildlife Exposure Modeling Calculations

Probabilistic Exposure Calculations for Wildlife Receptors 2013 Pompton Lake Ecological Investigation DuPont Pompton Lakes Works

1.0 Introduction

This appendix presents detailed results of probabilistic modeling of dietary methylmercury (MeHg) exposure for representative avian wildlife receptors. As summarized in Section 7.4 of the *2013 Ecological Investigation Report*, probabilistic modeling was conducted to further evaluate dietary MeHg exposure in the PLSA to the following avian receptors:

- Great blue heron (*Ardea herodias*)
- Belted kingfisher (*Megaceryle alcyon*)
- Double-crested cormorant (*Phalacrocorax auritus*)
- Carolina wren (*Thryothorus ludovicianus*).

This appendix provides further details regarding the model results and also provides additional details relevant to implementing the modeling approaches that are specific to the model platform (Oracle Crystal Ball v.11.1.2.1.000) used for the probabilistic calculations. Further details regarding the modeling approaches are provided in Appendix C and summarized in Section 6.5 of the Ecological Investigation Report.

2.0 Using Crystal Ball

As discussed in the general modeling approach presented in Appendix C of the 2013 *Ecological Investigation Report*, probabilistic distributions were estimated for the Daily Methylmercury Intake Rates (DMIR) and Average DMIR (averaged over the annual duration that a migratory receptor is expected forage in the PLSA). The DMIR distribution simulates the variability in daily doses and provides the probability (likelihood) that the maximum daily dose a receptor will exceed a threshold dose (such as the NOAEL or LOAEL) on any given day that it forages within the PLSA. The ADMIR distribution simulates the variability in average daily dose and quantifies the probability (likelihood) that the average daily dose for a receptor will exceed a threshold dose (such as the NOAEL or LOAEL) during an annual exposure within the PLSA.

Actual spreadsheet models are shown in Tables F-2 (great blue heron), F-5 (belted kingfisher), F-8 (double-crested cormorant), and F-11 (Carolina wren). Input distributions (green cells) are referred to as “assumptions” in Crystal Ball. The outputs, or “forecasts” in Crystal Ball, are shown in light blue cells. Each model requires four primary input variables: Distributions of Body Weight (BW), a Dietary Matrix, Distributions of Contaminant Concentrations in Surface Water, Sediment, and Diet Items, and an averaging duration. These inputs are provided in Tables F-1 (great blue heron), F-4 (belted kingfisher), F-7 (double-crested cormorant), and F-10 (Carolina wren). The model outputs are shown in Figures F-1 through F-7 and the statistics on the ADMIRs are shown in Tables F-3 (great blue heron), F-6 (belted kingfisher), F-9 (double-crested cormorant), and F-12 (Carolina wren).

Each simulation involved Latin Hypercube Sampling (with 500 bins) to ensure adequate sampling from all portions of the input distributions. The number of iterations for each simulation was based on the convergence criteria used in Sample et al. (1996). Under these criteria, iterations were performed until between-iteration percent change in the percentiles (10th and 90th), mean, and standard deviation were below 1.5 percent (i.e., the percentile, mean, and standard deviation for the latest iteration was < 1.5 percent different than those from the previous iterations). Using these criteria, numerical stability was obtained for 1,000 or more iterations; however, 10,000 iterations were used for all simulations.

2.1 DMIR

The base case inputs for the simulations (i.e., the starting inputs) used the corresponding point inputs for the deterministic models. During a simulation, Crystal Ball generates a random number for each assumption (based on how the assumption has been defined), places that new value in the cell, and saves the resulting forecast value (DMIR) in the forecast cell. Simulated values are displayed in a forecast chart, which is a histogram of the simulated values. The specific steps in DMIR calculations include:

1. Define all the assumptions and forecasts;
2. Go to Menu Item "Run Options";
    a. Under "Trials" tab input 10000;
    b. Under "Sampling" tab: Select Latin Hypercube with 500 bins under Sampling Method
3. Then "Start" the simulations.

After completing the simulations, the Forecast Chart can be used to analyze the results; the result statistics and percentiles can also be viewed.

The above simulations result in 10,000 DMIRs which are then fitted to a distribution. The resulting estimated DMIR distribution encompasses the daily exposure variability for a random receptor within a population.

2.2 ADMIR

Using the DMIR distribution estimated above and the number of days per year (N) a receptor is expected to reside at the PLSA, a distribution of ADMIR is estimated using the Bootstrapping Method in Crystal Ball. In this method, *N* DMIRs are randomly selected from the estimated DMIR distribution and their arithmetic mean (average) is calculated. This process is repeated 10,000 times to result in 10,000 ADMIRs that form the basis for the ADMIR distribution. The specific steps in ADMIR calculations include:

1. Open the above model;
2. Go to Menu Item "More Tools" and Select "Bootstrap";
    a. Select "Total Daily Mercury Intake Rate (DMIR)" as the Target Forecast;

b. Under Bootstrap Method, select the first of the two available methods;

c. Under Option, input:

i. No. of Bootstrap Samples = 10,0000

ii. No. of Trials Per Sample = 230 (This represents the number of days per year for averaging DMIR)

3. Then "Run" the model.

The resulting ADMIR distribution represents the variability in the average daily exposure for a receptor over the duration that receptor resides at the PLSA. It is likely that the average exposure is lower when a receptor is not resident at the PLSA (e.g., during winter) than when it is resident at the PLSA. The annual daily average for the non-resident receptors will then be lower than the ADMIR, i.e., the ADMIR determined here is a conservative average daily dose.

2.3 Area Use Factor (AUF) Adjustments

Initially, MeHg exposure distributions (both DMIR and ADMIR) were estimated separately for the PLSA and the reference area assuming an AUF = 1 (i.e., assuming the local bird population forages exclusively within the PLSA or the reference areas). While this assumption is appropriate for belted kingfisher and the Carolina wren that may forage exclusively within the PLSA, it is not appropriate for larger foraging ranges of great blue heron and the double-crested cormorant. For the latter two receptors, AUF-adjusted exposure distributions were also estimated with a more realistic assumption that they are likely to forage only partially at the PLSA (i.e., the PLSA is likely to provide a fraction of the foraging range for the local populations of these birds). The AUF for these birds were based on the habitat utilization evaluated by Exponent and Academy of Natural Sciences (ANSP; 2003). Briefly, Exponent and ANSP (2003) estimated the foraging range provided by the Pompton Lake relative to the potential foraging area of the receptors as follows:

- For the great blue heron, the total foraging range was conservatively assumed based on a 3.1 km radius, centered on the Pompton Lake. Within this foraging range, Pompton Lake represented 7.68 km of lake shoreline of the 80.7 km total available lake shoreline or river bank within the foraging range (9.52 percent of the total available lake or river bank). Therefore, an AUF = 0.095 for the PLSA and AUF = 0.905 for the reference area was used for the current probabilistic model to estimate AUF-adjusted exposures for the great blue heron.

- For the double-crested cormorant, a circular foraging range with a 10.7 km radius was conservatively used based on the closest nesting colony (at northeastern shore of the Wanaque Reservoir). Pompton Lake represented 70 hectares of surface water area or 2.4 percent of the 2,945 hectares of total available foraging habitat within the 10.7 km foraging radius. Therefore, an AUF = 0.024 for the PLSA (2.4 percent) and AUF = 0.976 for the reference area was used for the current probabilistic model to estimate AUF-adjusted exposures for the double-crested cormorant.

Distributions were estimated for AUF-adjusted DMIRs based on AUF-weighted average of the DMIRs in the PLSA and the reference area for each of the 10,000 trials in a Monte Carlo simulation [see the equation below]. The distributions of AUF-adjusted ADMIRs were estimated from the underlying distribution of AUF-adjusted DMIRs, as described above.

$$AUF - Adjusted\ DMIR = \sum_{i=1}^{2} (DMIR_i \times AUF_i)$$

3.0 Result of Probabilistic Modeling of Avian Exposure

The detailed results of the probabilistic dietary exposure modeling, with full exposure distributions based on the Monte Carlo simulations, are presented in Figures F-1 through F-7. As mentioned previously, DMIR distributions simulate the variability in the daily doses and the ADMIR distributions simulate the variability in the average daily doses. Toxicity reference values (TRVs, i.e., NOAELs and LOAELs) represent the average daily doses for the duration of the chronic exposures in the toxicity studies. Therefore, it is appropriate to compare the TRVs only to the ADMIRs. The distributions of both DMIR and ADMIR are compared to the corresponding TRVs in the following sections; however, the risk estimates are based on comparisons of the TRVs to the ADMIR distributions.

3.1 Great Blue Heron

Three populations of great blue heron were modeled: those foraging exclusively in the PLSA, those foraging exclusively in the reference areas, and those foraging partially in the PLSA based on the AUF discussed in Section 2.3.

Based on the most realistic population that forages only partially in the PLSA for 230 days per year, the exposure estimates indicate that there is negligible risk due to dietary MeHg exposures. There is a one percent probability that ADMIR will exceed the NOAEL for a heron within this population. Further details are provided below.

3.1.1 DMIR

Figure F-1 indicates that for a great blue heron foraging exclusively in the PLSA, there is less than a five percent chance that the DMIR will exceed the LOAEL of 0.055 mg/kg BW/day on any given day. However, for great blue heron foraging exclusively within the reference areas and partially in the PLSA (assuming a typical home range), the DMIR is unlikely (0 percent probability) to exceed the LOAEL.

The DMIR for great blue heron foraging exclusively within the PLSA may exceed the NOAEL of 0.017 mg/kg BW/day on any given day (< 80 percent probability). However, the probability of the AUF-adjusted DMIR exceeding the NOAEL (< 40 percent) is only slightly greater than the probability of the reference area DMIR exceeding the NOAEL (< 30 percent). As summarized in Table F-13, HQ_{NOAEL} values based on the respective 95th percentile DMIR for great blue heron range from 1.5 (reference area and AUF-adjusted PLSA) to 3.2 (exclusively PLSA).

3.1.2 ADMIR

Figure F-2 and Table F-3 indicate that the ADMIR for a great blue heron is unlikely to exceed the LOAEL (i.e., 0 percent probability) for all three populations. The ADMIR for a great blue heron foraging exclusively within the PLSA will likely exceed the NOAEL of 0.017 mg/kg BW/day (i.e. 100% probability). However, there is less than a one percent probability that the ADMIR will exceed the NOAEL for a great blue heron foraging partially within the PLSA based on its typical home range or exclusively within the reference areas (i.e. probability that HQ_{NOAEL} > 1 is less than one percent). These findings indicate that average daily exposures to a great blue heron population foraging partially within PLSA are similar to exposures to a population foraging exclusively in the reference area. As a result, population-level effects to great blue heron resulting from typical exposure in the PLSA are unlikely.

3.2 Belted Kingfisher

Two populations of belted kingfishers were modeled: those foraging exclusively in the PLSA and those foraging exclusively in the reference areas.

For the belted kingfisher population foraging exclusively within the PLSA for 230 days/year, there is negligible population-level risk beyond what is estimated based on exposure in the reference area. Average daily exposures (and hence the estimated risks) are similar for the belted kingfisher population foraging exclusively in the reference area; therefore, incremental dietary MeHg exposures to belted kingfishers foraging in the PLSA are not substantially greater than reference area exposures. Further details of the exposure evaluations are provided below.

3.2.1 DMIR

Figure F-3 indicates that for belted kingfisher foraging exclusively within the PLSA, there is less than a 10 percent chance that the DMIR will exceed the LOAEL of 0.055 mg/kg BW/day. For belted kingfisher foraging exclusively in the reference areas, the DMIR is unlikely to exceed the LOAEL (0 percent probability).

The probability of DMIRs exceeding the NOAEL of 0.017 mg/kg BW/day is similar between the PLSA and reference areas. There is less than 95 percent and a less than 80 percent probability the DMIRs will exceed the NOAEL for belted kingfisher foraging exclusively in the PLSA and the reference areas, respectively. As summarized in Table F-13, the associated HQ_{NOAEL} values based on the respective 95^{th} percentile DMIRs for the PLSA and reference areas are 3.3 and 2.2, respectively.

3.2.2 ADMIR

As illustrated in Figure F-4 and Table F-6, ADMIRs are similar for the belted kingfisher populations foraging exclusively in the PLSA or the reference areas. It is highly unlikely (0 percent probability) that the ADMIRs will exceed the LOAEL for populations foraging exclusively within the PLSA or reference area. However, it is likely (100 percent probability) that the ADMIR will exceed the NOAEL for PLSA and reference area populations. Corresponding HQ_{NOAEL} values based on the 95th percentile ADMIRs for the belted kingfisher populations in the PLSA and reference area are 1.9 and 1.4, respectively (Table F-13). These findings indicate that exposure to belted kingfisher populations are similar between the PLSA and reference areas and that adverse effects associated with dietary MeHg exposure are not likely in either population.

3.3 Double-Crested Cormorant

Three populations of double-crested cormorant were modeled: those foraging exclusively in the PLSA, those foraging exclusively in the reference areas, and those foraging partially in the PLSA based on an AUF-adjusted dose (Section 2.3).

Based on the most realistic population that forages only partially in the PLSA for 230 days/year, the exposure estimates indicate that there is negligible risk due to dietary MeHg exposures to the double-crested cormorant population associated with the PLSA. Further details are provided below.

3.3.1 DMIR

Figure F-5 indicates that for double-crested cormorant foraging exclusively in the PLSA, there is less than five percent chance that the DMIRs will exceed the LOAEL of 0.078 mg/kg BW/day on any given day. Daily doses are nearly identical for double-crested cormorant foraging exclusively in the reference areas and partially in the PLSA based on a typical home range. Exposure estimates for both populations indicate that the DMIR is unlikely to exceed the LOAEL on any given day (0 percent probability).

The probability that the DMIR for a double-crested cormorant foraging exclusively within the PLSA will exceed the NOAEL of 0.024 mg/kg BW/day on any given day is less than 50 percent; the associated HQ_{NOAEL} based on the respective 95th percentile DMIR is 2.3 for double-crested cormorant foraging exclusively within the PLSA. The probability is less than 10 percent that the DMIR will exceed the NOAEL for double-crested cormorant populations foraging exclusively within the reference area or partially within the PLSA (Table F-13).

3.3.2 ADMIR

Based on ADMIRs, it is highly unlikely that average daily doses to double-crested cormorant will exceed the LOAEL (0 percent probability) for any of the three modeled populations (Figure F-6 and Table F-9). The ADMIRs for a double-crested cormorant foraging exclusively within the PLSA will likely exceed the NOAEL (100 percent probability); however, the ADMIR is unlikely to exceed the NOAEL (< 1 percent probability) for double-crested cormorant foraging partially within the PLSA (AUF-adjusted) based on its typical home range or exclusively within the reference areas (Table F-13). The similarities in ADMIRs estimated for AUF-adjusted and reference area populations indicates that exposure to dietary MeHg within the PLSA do not result in greater incremental risk relative to reference exposure. As a result, adverse effects to double-crested cormorant populations foraging within the PLSA are not likely.

3.4 Carolina Wren

Two populations of Carolina wren were modeled: those foraging exclusively in the PLSA and those foraging exclusively in the reference areas.

For the year-round resident population of Carolina wren foraging exclusively within the PLSA, there is negligible population-level risk beyond what is estimated based on exposure in the reference area. Average daily exposures (and hence the estimated risks) are similar for the Carolina wren population foraging exclusively in the reference area; therefore, incremental dietary MeHg exposures to Carolina wren foraging in the PLSA are not substantially greater than reference area exposures. Further details of the exposure evaluations are provided below.

3.4.1 DMIR

As illustrated in Figure F-7, there is a less than a 30 percent probability that the DMIR for Carolina wren foraging exclusively in the PLSA will exceed the lower range NOAEL of 0.025 mg/kg BW/day and a 0 percent probability that the DMIR will exceed the upper bound NOAEL of 0.078 mg/kg BW/day. For the Carolina wren foraging exclusively in the reference area, there is less than a 1 percent probability that the DMIR will exceed the lower range NOAEL and a 0 percent probability that the DMIR will exceed the upper bound NOAEL. The associated HQ_{NOAEL} based on the respective 95^{th} percentile DMIR and lower range NOAEL are 1.4 and 0.9 for the populations foraging exclusively in the PLSA and reference area, respectively; the HQ_{NOAEL} based on the upper bound NOAEL are less than one (Table F-13).

3.4.2 ADMIR

Based on the average daily dose, the probabilities that the ADMIR for the two Carolina wren populations will exceed the lower and upper bound NOAELs is 0 percent (Figure F-8 and Table F-12). These findings indicate that the adverse effects to Carolina wren resulting from dietary MeHg exposure in the PLSA are not likely.

3.5 Summary of Probabilistic Modeling of Avian Exposure

The results of probabilistic dietary exposure modeling indicate negligible potential for adverse effects to avian receptors foraging in the PLSA. Probabilistic modeling assuming realistic exposure conditions based on typical foraging behavior indicates that average exposure to MeHg from dietary sources for great blue heron, belted kingfisher, double-crested cormorant, and Carolina wren did not result doses exceeding the LOAEL TRVs. In many cases, the average doses calculated for the PLSA were only slightly greater than the doses calculated for the upstream reference area, indicating minimal incremental risks associated with dietary exposure to MeHg in the PLSA when compared to reference conditions. Based on the outcome of the probabilistic exposure modeling, potential risks associated with dietary MeHg exposure to avian receptors foraging in the PLSA are negligible.

4.0 References

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Sample, B.E., Hinzman, R.L., Jackson, B.L., Baron, L. 1996. Preliminary assessment of ecological risks to wide-ranging wildlife species on the Oak Ridge Reservation. Environmental Restoration Division, P.O. Box 2003, Oak Ridge, Tennessee, 37831-7298, September 1996, DOE/OR/01-1407&D2.

Tables

Table F-1
Probabilistic Exposure Modeling Input Values for the Adult Great Blue Heron Population[1]
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Great Blue Heron			
Parameters	**Distributions**	**Parameter Values**	
Body Weight (BW, g)	Normal	μ = 2229, σ = 762 (Range: 1940-2970)	
Food Ingestion Rate (FIR, g ww/day)	Calculated	$FIR = 3.048\times (BW)^{0.665}$	
Water Ingestion Rate (WIR, L/day)	Calculated	$WIR = 0.059\times(BW/1000)^{0.67}$	
Sediment Ingestion Rate (SIR, g dw/day)	Calculated	$SIR = 0.02\times0.849\times(BW)^{0.663}$	
Dietary Preference			
Fish (> 130 mm TL)	Discrete Uniform	45-55%	
Fish (< 130 mm TL)	Discrete Uniform	35-45%	
Crayfish	Discrete Uniform	2-10%	
Frogs	Discrete Uniform	0-15%	
Media MeHg Concentrations		**PLSA**	**REF**
Surface Water (pg/L)	Normal/Point Estimate[2]	μ = 45.6, σ = 18.9	EPC = 38.0
Sediment (ng/g dw)	Lognormal/Normal[2]	μ = 0.91, σ = 0.95 (Location = -0.05)	μ = 0.45, σ = 0.35
Dietary Item MeHg Concentrations (ng/g ww)		**PLSA**	**REF**
Fish (> 130 mm TL)	Lognormal	μ = 184.57, σ = 153.24 (Location = 65.52)	μ = 92.62, σ = 44.22 (Location = -40.99)
Fish (< 130 mm TL)	Lognormal/Gamma[2]	μ = 60.48, σ = 26.16 (Location = -7.43)	μ = 10.88, β = 1.875 (Location = 22.30)
Crayfish	Normal	μ = 19.87, σ = 8.93	μ = 8.47, σ = 1.87
Frogs	Lognormal/Point Estimate[2]	μ = 42.24, σ = 35.79 (Location = 0)	EPC = 66
Areas Use Factor (AUF)	--	0.095	0.905
Averaging Time for ADMIR (days)	--	230	230

NOTES:

[1] Details and references can be found in Appendix C and Section 6.5

[2] The first distribution applies to the Pompton Lakes Study Area (PLSA) and point estimate and/or the second distribution applies to the Reference Area (REF)

Table F-2
Daily Methylmercury Intake Rates (DMIRs) Simulation Model for Great Blue Heron
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Pompton Lakes, New Jersey

Exposure Factors	**Value**	**Units**	**Notes**				
Body Weight (BW)	2229.00	g	Normal Distribution, Mean = 2229 g; SD = 762 g; Range of 1940-2970 g				
Food Ingestion Rate (FIR)	513.46	g ww/day	FIR (g ww/day) = 3.048 × BW$^{0.665}$, BW is in g				
Incidental Sediment Ingestion Rate (SIR)	2.82	g dw/day	2% of dry food ingestion: SIR (g dw/day) =0.02×0.849×BW$^{0.663}$, where BW is in g				
Drinking Water Ingestion Rate (WIR)	0.10	L/day	WIR (L/day) = 0.059 × BW$^{0.67}$, where BW is in kg.				
Dietary Preference Calculation							
Round 1	**Value (%)**	**Round 2**	**Value (%)**	**Notes**			
Fish (> 130 mm)	50	2Fish (> 130 mm)	50	Discrete Uniform Distribution, Range = 45-55%			
Fish (< 130 mm)	40	2Fish (< 130 mm)	40	Discrete Uniform Distribution, Range = 35-45%			
Crayfish	5	2Crayfish	5	Discrete Uniform Distribution, Range = 2-10%			
Frogs	5	2Frogs	5	Discrete Uniform Distribution, Range = 0-15%			
Daily Dietary Preference	**Value**	**Units**					
dFish (> 130 mm)	50	%					
dFish (< 130 mm)	40	%					
dCrayfish	5	%					
dFrogs	5	%					
DMIR Calculations for Pompton Lake Study Area (PLSA)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (> 130 mm)_PLSA	50	0.1152	g ww/g BW/day	262.8	ng/g ww	30.269	ng/g BW/day
cFish (< 130 mm)_PLSA	40	0.0921	g ww/g BW/day	67.62	ng/g ww	6.231	ng/g BW/day
cCrayfish_PLSA	5	0.0115	g ww/g BW/day	25.05	ng/g ww	0.289	ng/g BW/day
cFrogs_PLSA	5	0.0115	g ww/g BW/day	59.19	ng/g ww	0.682	ng/g BW/day
cWater_PLSA	-	0.0000	L/g BW/day	50.40	pg/L	0.000	ng/g BW/day
cSediment_PLSA	-	0.0013	g dw/g BW/day	1.17	ng/g dw	0.001	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	37.471	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - PLSA	-	-	-	-	-	0.037	mg/kg BW/day
DMIR Calculations for Reference Area (REF)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (> 130 mm)_REF	50	0.1152	g ww/g BW/day	106.4	ng/g ww	12.255	ng/g BW/day
cFish (< 130 mm)_REF	40	0.0921	g ww/g BW/day	47.41	ng/g ww	4.368	ng/g BW/day
cCrayfish_REF	5	0.0115	g ww/g BW/day	9.55	ng/g ww	0.110	ng/g BW/day
cFrogs_REF	5	0.0115	g ww/g BW/day	66.0	ng/g ww	0.760	ng/g BW/day
cWater_REF	-	0.0000	L/g BW/day	38.0	pg/L	0.000	ng/g BW/day
cSediment_REF	-	0.0013	g dw/g BW/day	0.68	ng/g dw	0.001	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	17.494	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - Reference Area	-	-	-	-	-	0.017	mg/kg BW/day
AUF-Adjusted Daily Mercury Intake Rate (DMIR)						0.019	mg/kg BW/day

Table F-3
Average Daily Methylmercury Intake Rates (ADMIRs) for Great Blue Heron
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AUF-Adjusted Greater Pompton Lakes Study Area (Greater PLSA)

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	0	0.015	Lognormal	0.2359	0.683	Location=0.000,Mean=0.016,Std. Dev.=0.000
Base Case	-	-	10%	0.016	0.016	Gamma	0.2374	0.695	Location=0.006,Scale=0.000,Shape=999
Mean	0.016	0.016	20%	0.016	0.016	Beta	0.5145	-	Minimum=0.012,Maximum=0.021,Alpha=100,Beta=100
Median	0.016	0.016	30%	0.016	0.016	Normal	0.5681	0.141	Mean=0.016,Std. Dev.=0.000
Mode	0.016	-	40%	0.016	0.016	Logistic	8.9256	0	Mean=0.016,Scale=0.000
Standard Deviation	0	0	50%	0.016	0.016	Max Extreme	101.2391	0	Likeliest=0.016,Scale=0.000
Variance	0	0	60%	0.016	0.016	Min Extreme	130.0841	0	Likeliest=0.016,Scale=0.000
Skewness	0.0598	0.0585	70%	0.016	0.016	Student's t	219.0152	-	Midpoint=0.016,Scale=0.000,Deg. Freedom=1
Kurtosis	3.01	2.98	80%	0.016	0.016	BetaPERT	518.3955	-	Minimum=0.015,Likeliest=0.016,Maximum=0.018
Coeff. of Variability	0.0199	0.0199	90%	0.017	0.017	Triangular	625.3413	-	Minimum=0.015,Likeliest=0.016,Maximum=0.018
Minimum	0	0.015	100%	Infinity	0.018	Uniform	1,655.42	0	Minimum=0.015,Maximum=0.018
Maximum	Infinity	0.018				Weibull	2,035.45	0	Location=0.015,Scale=0.001,Shape=3.36943
Mean Std. Error	-	0				Pareto	2,520.03	-	Location=0.015,Shape=13.02942
						Exponential	4,410.50	0	Rate=61.869

Pompton Lakes Study Area (PLSA)

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	0.012	0.024	Lognormal	0.3594	0.326	Location=0.012,Mean=0.027,Std. Dev.=0.001
Base Case	-	-	10%	0.026	0.026	Gamma	0.3794	0.267	Location=0.017,Scale=0.000,Shape=87.16699
Mean	0.027	0.027	20%	0.026	0.026	Student's t	4.8314	-	Midpoint=0.027,Scale=0.001,Deg. Freedom=30
Median	0.027	0.027	30%	0.027	0.027	Normal	4.9713	0	Mean=0.027,Std. Dev.=0.001
Mode	0.027	-	40%	0.027	0.027	Beta	5.1123	-	Minimum=0.011,Maximum=0.043,Alpha=100,Beta=100
Standard Deviation	0.001	0.001	50%	0.027	0.027	Logistic	8.2793	0	Mean=0.027,Scale=0.001
Variance	0	0	60%	0.028	0.028	Max Extreme	75.9748	0	Likeliest=0.027,Scale=0.001
Skewness	0.2215	0.224	70%	0.028	0.028	Min Extreme	186.6671	0	Likeliest=0.028,Scale=0.001
Kurtosis	3.09	3.15	80%	0.028	0.028	BetaPERT	412.1994	-	Minimum=0.024,Likeliest=0.027,Maximum=0.032
Coeff. of Variability	0.041	0.041	90%	0.029	0.029	Triangular	600.6195	-	Minimum=0.024,Likeliest=0.027,Maximum=0.032
Minimum	0.012	0.024	100%	Infinity	0.032	Weibull	1411.7388	0	Location=0.024,Scale=0.003,Shape=2.83833
Maximum	Infinity	0.032				Uniform	1,728.03	0	Minimum=0.024,Maximum=0.032
Mean Std. Error	-	0				Pareto	2,279.31	-	Location=0.024,Shape=7.23223
						Exponential	4,230.11	0	Rate=36.526

Reference Area

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	-0.001	0.014	Lognormal	0.2999	0.461	Location=-0.001,Mean=0.015,Std. Dev.=0.000
Base Case	-	-	10%	0.015	0.015	Gamma	0.3008	0.476	Location=0.004,Scale=0.000,Shape=967.44494
Mean	0.015	0.015	20%	0.015	0.015	Normal	0.733	0.054	Mean=0.015,Std. Dev.=0.000
Median	0.015	0.015	30%	0.015	0.015	Beta	0.7865	-	Minimum=0.010,Maximum=0.021,Alpha=100,Beta=100
Mode	0.015	-	40%	0.015	0.015	Student's t	1.1745	-	Midpoint=0.015,Scale=0.000,Deg. Freedom=30
Standard Deviation	0	0	50%	0.015	0.015	Logistic	6.7121	0	Mean=0.015,Scale=0.000
Variance	0	0	60%	0.016	0.016	Max Extreme	105.1	0	Likeliest=0.015,Scale=0.000
Skewness	0.0647	0.0651	70%	0.016	0.016	Min Extreme	136.7118	0	Likeliest=0.016,Scale=0.000
Kurtosis	3.01	3.02	80%	0.016	0.016	BetaPERT	449.9363	-	Minimum=0.014,Likeliest=0.015,Maximum=0.017
Coeff. of Variability	0.0234	0.0234	90%	0.016	0.016	Triangular	525.8733	-	Minimum=0.014,Likeliest=0.015,Maximum=0.017
Minimum	-0.001	0.014	100%	Infinity	0.017	Uniform	1507.1686	0	Minimum=0.014,Maximum=0.017
Maximum	Infinity	0.017				Pareto	2,614.62	-	Location=0.014,Shape=10.52898
Mean Std. Error	-	0				Weibull	3,297.80	0	Location=0.014,Scale=0.001,Shape=3.3446
						Exponential	4,380.12	0	Rate=64.845

Table F-4
Probabilistic Exposure Modeling Input Values for the Adult Belted Kingfisher Population[1]
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Belted Kingfisher			
Parameters	**Distributions**	**Values**	
Body Weight (BW, g)	Normal	μ = 148, σ = 21 (Range: 125-215)	
Food Ingestion Rate (FIR, g ww/day)	Calculated	$FIR = 3.048\times(BW)^{0.665}$	
Water Ingestion Rate (WIR, L/day)	Calculated	$WIR = 0.059\times(BW/1000)^{0.67}$	
Sediment Ingestion Rate (SIR, g dw/day)	Calculated	$SIR = 0.01\times0.849\times(BW)^{0.663}$	
Dietary Preference			
Fish (< 130 mm TL)	Discrete Uniform	75-95%	
Crayfish	Discrete Uniform	2-25%	
Frogs	Discrete Uniform	0-25%	
Media MeHg Concentrations		**PLSA**	**REF**
Surface Water (pg/L)	Normal/Point Estimate[2]	μ = 45.6, σ = 18.9	EPC = 38.0
Sediment (ng/g dw)	Lognormal/Normal[2]	μ = 0.91, σ = 0.95 (Location = -0.05)	μ = 0.45, σ = 0.35
Dietary Item MeHg Concentrations (ng/g ww)		**PLSA**	**REF**
Fish (< 130 mm)	Lognormal	μ = 184.57, σ = 153.24 (Location = 65.52)	μ = 92.62, σ = 44.22 (Location = -40.99)
Crayfish	Normal	μ = 19.87, σ = 8.93	μ = 8.47, σ = 1.87
Frogs	Lognormal/Point Estimate[2]	μ = 42.24, σ = 35.79 (Location = 0)	EPC = 66.0
Area Use Factor	--	1	1
Averaging Time for ADMIR (days)	--	230	230

NOTES:
[1] Details and references can be found in Appendix C and Section 6.5
[2] The first distribution applies to the Pompton Lakes Study Area (PLSA) and point estimate and/or the second distribution applies to the Reference Area (REF)

Table F-5
Daily Methylmercury Intake Rates (DMIRs) Simulation Model for Belted Kingfisher
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Exposure Factors	**Value**	**Units**	**Notes**				
Body Weight (BW)	148.00	g	Normal Distribution, Mean = 148 g, SD = 21 g, Range of 125-215 g				
Food Ingestion Rate (FIR)	84.57	g ww/day	FIR (g ww/day) = 3.048 × $BW^{0.665}$, BW is in g.				
Incidental Sediment Ingestion Rate (SIR)	0.23	g dw/day	1% of dry food ingestion: SIR (g dw/day) =0.01×0.849×$BW^{0.663}$, where BW is in g				
Water Ingestion Rate (WIR)	0.02	L/day	WIR (L/day) = 0.059 × $BW^{0.67}$, where BW is in kg				
Dietary Preference Calculation							
Round 1	**Value (%)**	**Round 2**	**Value (%)**	**Notes**			
Fish (< 130 mm)	90	2Fish (< 130 mm)	90	Discrete Uniform Distribution, Range = 75-95%			
Crayfish	5	2Crayfish	5	Discrete Uniform Distribution, Range = 2-25%			
Frogs	5	2Frogs	5	Discrete Uniform Distribution, Range = 0-25%			
Daily Dietary Preference	**Value**	**Units**					
dFish (< 130 mm)	90	%					
dCrayfish	5	%					
dFrogs	5	%					
DMIR Calculations for Pompton Lake Study Area (PLSA)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (< 130 mm)_PLSA	90	0.5143	g ww/g BW/day	67.62	ng/g ww	34.777	ng/g BW/day
cCrayfish_PLSA	5	0.0286	g ww/g BW/day	25.05	ng/g ww	0.716	ng/g BW/day
cFrogs_PLSA	5	0.0286	g ww/g BW/day	59.19	ng/g ww	1.691	ng/g BW/day
cWater_PLSA	-	0.0001	L/g BW/day	50.4	pg/L	0.000	ng/g BW/day
cSediment_PLSA	-	0.0016	g dw/g BW/day	1.17	ng/g dw	0.002	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	37.186	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - PLSA	-	-	-	-	-	**0.037**	mg/kg BW/day
DMIR Calculations for Reference Area (REF)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (< 130 mm)_REF	90	0.5143	g ww/g BW/day	47.41	ng/g ww	24.383	ng/g BW/day
cCrayfish_REF	5	0.0286	g ww/g BW/day	9.55	ng/g ww	0.273	ng/g BW/day
cFrogs_REF	5	0.0286	g ww/g BW/day	66.0	ng/g ww	1.886	ng/g BW/day
cWater_REF	-	0.0001	L/g BW/day	38.0	pg/L	0.000	ng/g BW/day
cSediment_REF	-	0.0016	g dw/g BW/day	0.68	ng/g dw	0.001	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	26.543	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - Reference Area	-	-	-	-	-	**0.027**	mg/kg BW/day

Table F-6
Average Daily Methylmercury Intake Rates (ADMIRs) for Belted Kingfisher
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Pompton Lakes Study Area (PLSA)									
Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	-0.018	0.029	Lognormal	0.2865	0.503	Location=-0.018,Mean=0.032,Std. Dev.=0.001
Base Case	-	-	10%	0.031	0.031	Gamma	0.2888	0.515	Location=0.007,Scale=0.000,Shape=999
Mean	0.032	0.032	20%	0.031	0.031	Normal	0.6215	0.104	Mean=0.032,Std. Dev.=0.001
Median	0.032	0.032	30%	0.032	0.032	Beta	0.7005	-	Minimum=0.021,Maximum=0.043,Alpha=100,Beta=100
Mode	0.032	-	40%	0.032	0.032	Student's t	0.8864	-	Midpoint=0.032,Scale=0.001,Deg. Freedom=30
Standard Deviation	0.001	0	50%	0.032	0.032	Logistic	6.3945	0	Mean=0.032,Scale=0.000
Variance	0	0	60%	0.032	0.032	Max Extreme	110.1719	0	Likeliest=0.032,Scale=0.001
Skewness	0.0472	0.0488	70%	0.032	0.032	Min Extreme	135.9159	0	Likeliest=0.032,Scale=0.001
Kurtosis	3	3.06	80%	0.033	0.033	BetaPERT	428.3968	-	Minimum=0.029,Likeliest=0.032,Maximum=0.035
Coeff. of Variability	0.0247	0.0247	90%	0.033	0.033	Triangular	521.2184	-	Minimum=0.029,Likeliest=0.032,Maximum=0.035
Minimum	-0.018	0.029	100%	Infinity	0.035	Weibull	1,214.29	0	Location=0.029,Scale=0.003,Shape=3.40672
Maximum	Infinity	0.035				Uniform	1,517.41	0	Minimum=0.029,Maximum=0.035
Mean Std. Error	-	0				Pareto	2,474.48	-	Location=0.029,Shape=10.78581
						Exponential	4,369.25	0	Rate=31.266

Reference Area									
Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Gamma	Forecast values	Percentile	Fit: Gamma	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	0.014	0.02	Gamma	0.2023	0.813	Location=0.014,Scale=0.000,Shape=285.40052
Base Case	-	-	10%	0.022	0.022	Lognormal	0.208	0.776	Location=0.010,Mean=0.022,Std. Dev.=0.000
Mean	0.022	0.022	20%	0.022	0.022	Beta	0.2515	-	Minimum=0.018,Maximum=0.030,Alpha=56.43377,Beta=100
Median	0.022	0.022	30%	0.022	0.022	Normal	1.7871	0	Mean=0.022,Std. Dev.=0.000
Mode	0.022	-	40%	0.022	0.022	Logistic	8.9896	0	Mean=0.022,Scale=0.000
Standard Deviation	0	0	50%	0.022	0.022	Max Extreme	88.8179	0	Likeliest=0.022,Scale=0.000
Variance	0	0	60%	0.022	0.022	Min Extreme	145.8328	0	Likeliest=0.023,Scale=0.000
Skewness	0.1184	0.1157	70%	0.023	0.023	Student's t	209.3896	-	Midpoint=0.022,Scale=0.000,Deg. Freedom=1
Kurtosis	3.02	2.99	80%	0.023	0.023	BetaPERT	558.2784	-	Minimum=0.020,Likeliest=0.022,Maximum=0.024
Coeff. of Variability	0.0213	0.0213	90%	0.023	0.023	Triangular	636.1125	-	Minimum=0.020,Likeliest=0.022,Maximum=0.024
Minimum	0.014	0.02	100%	Infinity	0.024	Uniform	1,632.39	0	Minimum=0.020,Maximum=0.024
Maximum	Infinity	0.024				Pareto	2,776.97	-	Location=0.020,Shape=10.54773
Mean Std. Error	-	0				Exponential	4,398.66	0	Rate=44.742
						Weibull	8,598.00	0	Location=0.020,Scale=0.002,Shape=3.16879

Table F-7

Probabilistic Exposure Modeling Input Values for the Adult Double-Crested Cormorant Population[1]

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Double-Crested Cormorant			
Parameters	**Distributions**	**Values**	
Body Weight (BW, g)	Normal	μ = 2429, σ = 278 (Range: 1650-3000)	
Food Ingestion Rate (FIR, g ww/day)	Calculated	$FIR = 3.048 \times (BW)^{0.665}$	
Water Ingestion Rate (WIR, L/day)	Calculated	$WIR = 0.059 \times (BW/1000)^{0.67}$	
Dietary Preference			
Fish (> 130 mm TL)	Discrete Uniform	45-55%	
Fish (< 130 mm TL)	Discrete Uniform	35-45%	
Crayfish	Discrete Uniform	1-10%	
Frogs	Discrete Uniform	0-10%	
Media MeHg Concentrations		**PLSA**	**REF**
Surface Water (pg/L)	Normal/Point Estimate[2]	μ = 45.6, σ = 18.9	EPC = 38.0
Dietary Item MeHg Concentrations (ng/g ww)		**PLSA**	**REF**
Fish (> 130 mm TL)	Lognormal	μ = 184.57, σ = 153.24 (Location = 65.52)	μ = 92.62, σ = 44.22 (Location = -40.99)
Fish (< 130 mm TL)	Lognormal/Gamma[2]	μ = 60.48, σ = 26.16 (Location = -7.43)	μ = 10.88, β = 1.875 (Location = 22.30)
Crayfish	Normal	μ = 19.87, σ = 8.93	μ = 8.47, σ = 1.87
Frogs	Lognormal/Point Estimate[2]	μ = 42.24, σ = 35.79 (Location = 0)	EPC = 66.0
Area Use Factor (AUF)	--	0.024	0.976
Averaging Time for ADMIR (days)	--	230	230

NOTES:

[1] Details and references can be found in Appendix C and Section 6.5

[2] The first distribution applies to the Pompton Lakes Study Area (PLSA) and point estimate and/or the second distribution applies to the Reference Area (REF)

Table F-8
Daily Methylmercury Intake Rates (DMIRs) Simulation Model for Double-Crested Cormorant
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Exposure Factors	**Value**	**Units**	**Notes**				
Body Weight (BW)	2429.00	g	Normal Distribution; Mean = 2429 g; SD = 278 g; Range of 1650-3000 g				
Food Ingestion Rate (FIR)	543.66	g ww/day	FIR (g ww/day) = 3.048 × $BW^{0.665}$, BW is in g.				
Drinking Water Ingestion Rate (WIR)	0.107	L/day	WIR (L/day) = 0.059 × $BW^{0.67}$, where BW is in kg.				
Dietary Preference Calculation:							
Round 1	**Value (%)**	**Round 2**	**Value (%)**	**Notes**			
Fish (> 130 mm)	50	2Fish (> 130 mm)	50	Discrete Uniform, Range = 45-55%			
Fish (< 130 mm)	40	2Fish (< 130 mm)	40	Discrete Uniform Distribution, Range = 35-45%			
Crayfish	5	2Crayfish	5	Discrete Uniform Distribution, Range = 1-10%			
Frogs	5	2Frogs	5	Discrete Uniform Distribution, Range = 0-10%			
Daily Dietary Preference	**Value**	**Units**					
dFish (> 130 mm)	50	%					
dFish (< 130 mm)	40	%					
dCrayfish	5	%					
dFrogs	5	%					
DMIR Calculations for Pompton Lake Study Area (PLSA)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (> 130 mm)_PLSA	50	0.1119	g ww/g BW/day	262.8	ng/g ww	29.410	ng/g BW/day
cFish (< 130 mm)_PLSA	40	0.0895	g ww/g BW/day	67.62	ng/g ww	6.054	ng/g BW/day
cCrayfish_PLSA	5	0.0112	g ww/g BW/day	25.05	ng/g ww	0.280	ng/g BW/day
cFrogs_PLSA	5	0.0112	g ww/g BW/day	59.19	ng/g ww	0.662	ng/g BW/day
cWater_PLSA	-	0.0239	L/g BW/day	50.4	pg/L	0.001	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	36.408	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - PLSA	-	-	-	-	-	**0.036**	**mg/kg BW/day**
DMIR Calculations for Reference Area (REF)							
Dietary Items	**Dietary Preference (*f*, %)**	**Ingestion Rates (IR)**	**Units**	**Concentration ('C)**	**Units**	**DMIRs**	**Units**
cFish (> 130 mm)_REF	50	0.1119	g ww/g BW/day	106.4	ng/g ww	11.907	ng/g BW/day
cFish (< 130 mm)_REF	40	0.0895	g ww/g BW/day	47.41	ng/g ww	4.245	ng/g BW/day
cCrayfish_REF	5	0.0112	g ww/g BW/day	9.55	ng/g ww	0.107	ng/g BW/day
cFrogs_REF	5	0.0112	g ww/g BW/day	66.0	ng/g ww	0.739	ng/g BW/day
cWater_REF	-	0.0002	L/g BW/day	38.0	pg/L	0.000	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	16.997	ng/g BW/day
Daily Mercury Intake Rate (DMIR) - Reference Area	-	-	-	-	-	**0.017**	**mg/kg BW/day**
AUF-Adjusted Daily Mercury Intake Rate (DMIR)						**0.017**	**mg/kg BW/day**

Table F-9
Average Daily Methylmercury Intake Rates (ADMIRs) for Double-Crested Cormorant
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AUF-Adjusted Greater Pompton Lakes Study Area (Greater PLSA)

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Gamma	Forecast values	Percentile	Fit: Gamma	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	0.008	0.015	Gamma	0.2804	0.538	Location=0.008,Scale=0.000,Shape=410.41445
Base Case	-	-	10%	0.016	0.016	Lognormal	0.2824	0.513	Location=0.004,Mean=0.016,Std. Dev.=0.000
Mean	0.016	0.016	20%	0.016	0.016	Normal	1.081	0	Mean=0.016,Std. Dev.=0.000
Median	0.016	0.016	30%	0.016	0.016	Beta	1.0844	-	Minimum=0.011,Maximum=0.022,Alpha=100,Beta=100
Mode	0.016	-	40%	0.016	0.016	Student's t	1.8835	-	Midpoint=0.016,Scale=0.000,Deg. Freedom=30
Standard Deviation	0	0	50%	0.016	0.016	Logistic	8.0835	0	Mean=0.016,Scale=0.000
Variance	0	0	60%	0.016	0.016	Max Extreme	95.6183	0	Likeliest=0.016,Scale=0.000
Skewness	0.0987	0.0992	70%	0.016	0.016	Min Extreme	143.3352	0	Likeliest=0.016,Scale=0.000
Kurtosis	3.01	3.03	80%	0.016	0.016	BetaPERT	553.2904	-	Minimum=0.015,Likeliest=0.016,Maximum=0.018
Coeff. of Variability	0.0243	0.0243	90%	0.017	0.017	Triangular	659.1151	-	Minimum=0.015,Likeliest=0.016,Maximum=0.018
Minimum	0.008	0.015	100%	Infinity	0.018	Uniform	1,687.61	0	Minimum=0.015,Maximum=0.018
Maximum	Infinity	0.018				Pareto	2,579.61	-	Location=0.015,Shape=10.35258
Mean Std. Error	-	0				Weibull	3,421.18	0	Location=0.015,Scale=0.001,Shape=3.2249
						Exponential	4,372.37	0	Rate=62.390

Pompton Lakes Study Area (PLSA)

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	0.018	0.023	Lognormal	0.2321	0.708	Location=0.018,Mean=0.026,Std. Dev.=0.001
Base Case	-	-	10%	0.025	0.025	Gamma	0.3082	0.445	Location=0.020,Scale=0.000,Shape=32.64224
Mean	0.026	0.026	20%	0.025	0.025	Logistic	15.1614	0	Mean=0.026,Scale=0.001
Median	0.026	0.026	30%	0.026	0.026	Student's t	15.4887	-	Midpoint=0.026,Scale=0.001,Deg. Freedom=30
Mode	0.026	-	40%	0.026	0.026	Normal	15.6391	0	Mean=0.026,Std. Dev.=0.001
Standard Deviation	0.001	0.001	50%	0.026	0.026	Beta	15.788	-	Minimum=0.012,Maximum=0.041,Alpha=100,Beta=100
Variance	0	0	60%	0.026	0.026	Max Extreme	46.5385	0	Likeliest=0.026,Scale=0.001
Skewness	0.3605	0.3563	70%	0.027	0.027	Min Extreme	227.0787	0	Likeliest=0.027,Scale=0.001
Kurtosis	3.23	3.18	80%	0.027	0.027	BetaPERT	409.103	-	Minimum=0.023,Likeliest=0.026,Maximum=0.031
Coeff. of Variability	0.0387	0.0387	90%	0.028	0.028	Triangular	545.2459	-	Minimum=0.023,Likeliest=0.026,Maximum=0.031
Minimum	0.018	0.023	100%	Infinity	0.031	Uniform	1625.7501	0	Minimum=0.023,Maximum=0.031
Maximum	Infinity	0.031				Pareto	2,336.80	-	Location=0.023,Shape=7.5055
Mean Std. Error	-	0				Weibull	3,658.87	0	Location=0.023,Scale=0.003,Shape=2.50456
						Exponential	4,250.51	0	Rate=38.136

Reference Area

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	Fit: Lognormal	Forecast values	Percentile	Fit: Lognormal	Forecast values	Distribution	Anderson-Darling	P-Value	
Trials	-	10,000	0%	-0.002	0.014	Lognormal	0.2564	0.606	Location=-0.002,Mean=0.016,Std. Dev.=0.000
Base Case	-	-	10%	0.015	0.015	Gamma	0.2633	0.6	Location=0.004,Scale=0.000,Shape=999
Mean	0.016	0.016	20%	0.015	0.015	Normal	0.4946	0.22	Mean=0.016,Std. Dev.=0.000
Median	0.016	0.016	30%	0.016	0.016	Beta	0.5386	-	Minimum=0.011,Maximum=0.021,Alpha=100,Beta=100
Mode	0.016	-	40%	0.016	0.016	Logistic	6.7204	0	Mean=0.016,Scale=0.000
Standard Deviation	0	0	50%	0.016	0.016	Max Extreme	105.2027	0	Likeliest=0.016,Scale=0.000
Variance	0	0	60%	0.016	0.016	Min Extreme	133.0113	0	Likeliest=0.016,Scale=0.000
Skewness	0.0614	0.0606	70%	0.016	0.016	Student's t	201.9947	-	Midpoint=0.016,Scale=0.000,Deg. Freedom=1
Kurtosis	3.01	2.99	80%	0.016	0.016	BetaPERT	303.9733	-	Minimum=0.014,Likeliest=0.016,Maximum=0.017
Coeff. of Variability	0.0232	0.0232	90%	0.016	0.016	Weibull	347.8207	0	Location=0.014,Scale=0.001,Shape=3.36153
Minimum	-0.002	0.014	100%	Infinity	0.017	Triangular	393.506	-	Minimum=0.014,Likeliest=0.016,Maximum=0.017
Maximum	Infinity	0.017				Uniform	1,363.81	0	Minimum=0.014,Maximum=0.017
Mean Std. Error	-	0				Pareto	2,304.80	-	Location=0.014,Shape=12.53794
						Exponential	4,382.44	0	Rate=63.686

Table F-10
Probabilistic Exposure Modeling Input Values for the Adult Carolina Wren Population[1]
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Carolina Wren			
Parameters	**Distributions**	**Values**	
Body Weight (BW, g)	Normal	μ = 21.00, σ = 1.15 (Range: 17-23)	
Food Ingestion Rate (FIR, g ww/day)	Calculated	$FIR = 2.438 \times (BW)^{0.67}$	
Water Ingestion Rate (WIR, L/day)	Calculated	$WIR = 0.059\times(BW/1000)^{0.67}$	
Dietary Preference			
Emergent Invertebrates (Adult Midge)	Discrete Uniform	65-90%	
Terrestrial Invertebrates (Spiders)			
Lycosidae	Discrete Uniform	1-15%	
Tetragnathidae	Discrete Uniform	1-15%	
Media MeHg Concentrations		**PLSA**	**REF**
Surface Water (pg/L)	Normal/Point Estimate[2]	μ = 45.6, σ = 18.9	EPC = 38.0
Dietary Item MeHg Concentrations (ng/g ww)		**PLSA**	**REF**
Adult Midge (ng/g ww))	Lognormal	μ = 13.53, σ = 6.50 (Location = -1.81)	EPC = 12.30
Lycosidae (ng/g ww)	Normal	μ = 119.9, σ = 77.57	μ = 65.79, σ = 20.09
Tetragnathidae (ng/g ww)	Normal	μ = 70.51, σ = 15.63	μ = 60.65, σ = 15.17
Area Use Factor (AUF)	--	1	1
Averaging Time for ADMIR (days)	--	365	365

NOTES:
[1] Details and references can be found in Appendix E and Section 6.5
[2] The first distribution applies to the Pompton Lakes Study Area (PLSA) and point estimate and/or the second distribution applies to the Reference Area (REF)

Table F-11
Daily Methylmercury Intake Rates (DMIRs) Simulation Model for Carolina Wren
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Expoure Factors	Value	Units	Notes
Body Weight (BW)	21.00	g	Normal Distribution, Mean = 21.0 g SD = 1.15, Range = 17-23g
Food Ingestion Rate (FIR)	15.47	g ww/day	FIR (g ww/day) = {2.438 × (BW)$^{0.6.7}$}, BW is in g
Drinking Water Ingestion Rate (WIR)	0.004	L/day	WIR (L/day) = 0.059 × BW$^{0.67}$, where BW is in kg

Dietary Preference Calculation

Round 1	Value (%)	Round 2	Value (%)	Notes
Midge	70	2Midge	70	Discrete Uniform Distribution, Range = 65-90%
Lyco	15	2Lyco	15	Discrete Uniform Distribution, Range = 1-15%
Tetra	15	2Tetra	15	Discrete Uniform Distribution, Range = 1-15%

Daily Dietary Preference	Value	Units
dMidge	70	%
dLyco	15	%
dTetra	15	%

DMIR Calculations for Pompton Lake Study Area (PLSA)

Dietary Items	Dietary Preference (*f*, %)	Ingestion Rates (IR)	Units	Concentration ('C)	Units	DMIRs	Units
cMidge_PLSA	70	0.516	g ww/g BW/day	15.87	ng/g ww	8.186	ng/g BW/day
cLyco_PLSA	15	0.111	g ww/g BW/day	164.9	ng/g ww	18.227	ng/g BW/day
cTetra_PLSA	15	0.111	g ww/g BW/day	79.57	ng/g ww	8.795	ng/g BW/day
cWater_PLSA	-	0.000	L/g BW/day	50.4	pg/L	0.000	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	35.208	ng/g BW/day
Daily Mercury Inake Rate (DMIR) - PLSA	-	-	-	-	-	**0.035**	mg/kg BW/day

DMIR Calculations for the Reference Areas (REF)

Dietary Items	Dietary Preference (*f*, %)	Ingestion Rates (IR)	Units	Concentration ('C)	Units	DMIRs	Units
cMidge_REF	70	0.516	g ww/g BW/day	12.3	ng/g ww	6.345	ng/g BW/day
cLyco_REF	15	0.111	g ww/g BW/day	77.43	ng/g ww	8.559	ng/g BW/day
cTetra_REF	15	0.111	g ww/g BW/day	69.44	ng/g ww	7.675	ng/g BW/day
cWater_REF	-	0.000	L/g BW/day	38.0	pg/L	0.000	ng/g BW/day
Sum of DMIRs	-	-	-	-	-	22.579	ng/g BW/day
Daily Mercury Inake Rate (DMIR) - Reference Areas	-	-	-	-	-	**0.023**	mg/kg BW/day

Table F-12
Average Daily Methylmercury Intake Rates (ADMIRs) for Carolina Wren
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Pompton Lakes Study Area (PLSA)

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	**Fit: Normal**	**Forecast values**	**Percentile**	**Fit: Normal**	**Forecast values**	**Distribution**	**Anderson-Darling**	**P-Value**	
Trials	-	10,000	0%	Infinity	0.018	Normal	0.2506	0.738	Mean=0.020,Std. Dev.=0.000
Base Case	-	-	10%	0.02	0.02	Lognormal	0.2511	0.674	Location=-4.342,Mean=0.020,Std. Dev.=0.000
Mean	0.02	0.02	20%	0.02	0.02	Beta	0.3366	-	Minimum=0.014,Maximum=0.026,Alpha=100,Beta=100
Median	0.02	0.02	30%	0.02	0.02	Student's t	0.4795	-	Midpoint=0.020,Scale=0.000,Deg. Freedom=30
Mode	0.02	-	40%	0.02	0.02	Gamma	0.8124	0.011	Location=0.006,Scale=0.000,Shape=999
Standard Deviation	0	0	50%	0.02	0.02	Weibull	3.2667	0	Location=0.019,Scale=0.002,Shape=3.68075
Variance	0	0	60%	0.02	0.02	Logistic	6.1739	0	Mean=0.020,Scale=0.000
Skewness	0	-0.0185	70%	0.02	0.02	Min Extreme	118.8599	0	Likeliest=0.020,Scale=0.000
Kurtosis	3	3.04	80%	0.02	0.02	Max Extreme	125.97	0	Likeliest=0.020,Scale=0.000
Coeff. of Variability	0.0215	0.0215	90%	0.021	0.021	BetaPERT	378.99	-	Minimum=0.018,Likeliest=0.020,Maximum=0.022
Minimum	-Infinity	0.018	100%	Infinity	0.022	Triangular	459.69	-	Minimum=0.018,Likeliest=0.020,Maximum=0.022
Maximum	Infinity	0.022				Uniform	1,432.43	0	Minimum=0.018,Maximum=0.022
Mean Std. Error	-	0				Pareto	2,582.75	-	Location=0.018,Shape=11.64654
						Exponential	4,396.77	0	Rate=49.747

Reference Area

Descriptive Statistic			Percentile			Goodness of Fit			Parameters
Statistic	**Fit: Lognormal**	**Forecast values**	**Percentile**	**Fit: Lognormal**	**Forecast values**	**Distribution**	**Anderson-Darling**	**P-Value**	
Trials	-	10,000	0%	0.004	0.014	Lognormal	0.2768	0.536	Location=0.004,Mean=0.015,Std. Dev.=0.000
Base Case	-	-	10%	0.015	0.015	Gamma	0.2784	0.548	Location=0.008,Scale=0.000,Shape=999
Mean	0.015	0.015	20%	0.015	0.015	Normal	0.7178	0.059	Mean=0.015,Std. Dev.=0.000
Median	0.015	0.015	30%	0.015	0.015	Beta	0.7985	-	Minimum=0.012,Maximum=0.018,Alpha=100,Beta=100
Mode	0.015	-	40%	0.015	0.015	Student's t	0.9817	-	Midpoint=0.015,Scale=0.000,Deg. Freedom=30
Standard Deviation	0	0	50%	0.015	0.015	Logistic	6.8118	0	Mean=0.015,Scale=0.000
Variance	0	0	60%	0.015	0.015	Max Extreme	108.0334	0	Likeliest=0.015,Scale=0.000
Skewness	0.0623	0.0658	70%	0.015	0.015	Min Extreme	141.6734	0	Likeliest=0.015,Scale=0.000
Kurtosis	3.01	3.1	80%	0.015	0.015	BetaPERT	476.22	-	Minimum=0.014,Likeliest=0.015,Maximum=0.016
Coeff. of Variability	0.015	0.015	90%	0.015	0.015	Triangular	582.83	-	Minimum=0.014,Likeliest=0.015,Maximum=0.016
Minimum	0.004	0.014	100%	Infinity	0.016	Uniform	1,600.66	0	Minimum=0.014,Maximum=0.016
Maximum	Infinity	0.016				Weibull	1,604.46	0	Location=0.014,Scale=0.001,Shape=3.34201
Mean Std. Error	-	0				Pareto	2,458.34	-	Location=0.014,Shape=17.96734
						Exponential	4,454.23	0	Rate=67.459

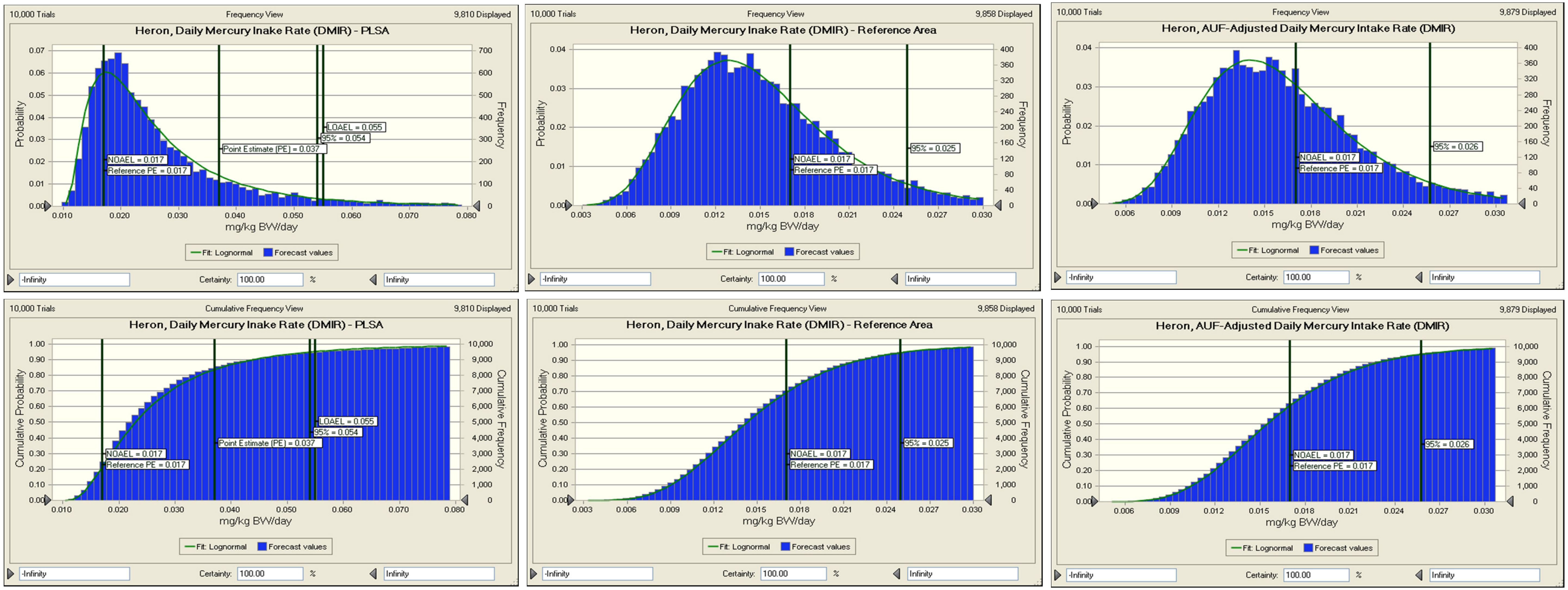
Table F-13
Summary of Probabilistic Estimates of Dietary Methylmercury Exposures and Risk Characterization for Wildlife Receptors
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Receptors/Exposure Areas[1]	Exposures (mg/kg BW/day)			TRVs (mg/kg BW/day)		Risks					
	Point Estimates[3]	Probabilistic Estimates				Point Estimates[5]		Probabilistic Estimates			
		95th Percentile						p (DMIR >TRV)[6]		p (ADMIR >TRV)[7]	
		DMIR	ADMIR	NOAEL	LOAEL[4]	HQ_{NOAEL}	HQ_{LOAEL}	NOAEL	LOAEL	NOAEL	LOAEL
Great blue heron (*Ardea herodias*)											
PLSA	0.037	0.054	0.029	0.017	0.055	**2.2**	0.7	**< 80% (HQ = 3.2)**	< 5% (HQ = 1.0)	**100% (HQ = 1.7)**	0% (HQ = 0.5)
REF	0.017	0.025	0.016	0.017	0.055	1.0	0.3	**< 30% (HQ = 1.5)**	0% (HQ = 0.5)	0% (HQ = 0.9)	0% (HQ = 0.3)
AUF-Adjusted	--	0.026	0.017	0.017	0.055	--	--	**< 40% (HQ = 1.5)**	0% (HQ = 0.5)	< 1% (HQ = 1.0)	0% (HQ = 0.3)
Belted kingfisher (*Megaceryle alcyon*)[2]											
PLSA	0.037	0.056	0.033	0.017	0.055	**2.2**	0.7	**< 95% (HQ = 3.3)**	< 10% (HQ = 1.0)	**100% (HQ = 1.9)**	0% (HQ = 0.6)
REF	0.027	0.037	0.023	0.017	0.055	**1.6**	0.5	**< 80% (HQ = 2.2)**	0% (HQ = 0.7)	**100% (HQ = 1.4)**	0% (HQ = 0.4)
Double-crested cormorant (*Phalacrocorax auritus*)											
PLSA	0.036	0.055	0.028	0.024	0.078	**1.5**	0.5	**< 50% (HQ = 2.3)**	< 5% (HQ = 0.7)	**100% (HQ = 1.2)**	0% (HQ = 0.4)
REF	0.017	0.025	0.016	0.024	0.078	0.7	0.2	< 10% (HQ = 1.0)	0% (HQ = 0.3)	0% (HQ = 0.7)	0% (HQ = 0.2)
AUF-Adjusted	--	0.025	0.017	0.024	0.078	--	--	< 10% (HQ = 1.0)	0% (HQ = 0.3)	<1% (HQ = 0.7)	0% (HQ = 0.2)
Carolina wren (*Thryothorus ludovicianus*)[2]											
PLSA	0.035	0.036	0.021	0.025	0.078	**1.4**	0.5	**< 30% (HQ = 1.4)**	0% (HQ = 0.5)	0% (HQ = 0.8)	0% (HQ = 0.3)
REF	0.023	0.022	0.015	0.025	0.078	0.9	0.3	< 1% (HQ = 0.9)	0% (HQ = 0.3)	0% (HQ = 0.6)	0% (HQ = 0.2)

Notes:
PLSA - Pompton Lakes Study Area; REF - Reference Area; AUF - Area Use Factor; DMIR - Daily Mercury Intake Rate; ADMIR - Average Daily Mercury Intake Rate; TRVs - Toxicity Reference Values; NOAEL - No Observed Adverse Effects Level; LOAEL - Lowest Observed Adverse Effects Level; HQ - Hazard Quotient
1, Exposure estimates assumed that the receptor foraged exclusively within PLSA (PLSA), exclusively within the REF (REF), and within both PLSA and REF proportional to their areas relative to the receptor home ranges
2, AUF-Adjusted Exposures are not applicable for the Belted kingfisher and the Carolina wre as the PLSA provides sufficient home range (i.e., an AUF = 1).
3, Deterministic (Point) estimates of DMIR from Table 7-4.
4, LOAEL for Carolina wren represents the higher range of NOAEL.
5, Deterministic estimates; HQ = Point Estimates of DMIR/TRVs.
6, Represents the probability that DMIR exceeds the respective TRVs; where p > 20%, the HQ (= 95th Percentile DMIR/TRV) is shown to indicate the severity of the exceedance. Bold values indicate HQ exceeding 1.0
7, Represents the probability that ADMIR exceeds the respective TRVs; where p > 20%, the HQ (= 95th Percentile ADMIR/TRV) is shown to indicate the severity of the exceedance. Bold values indicate HQ exceeding 1.0

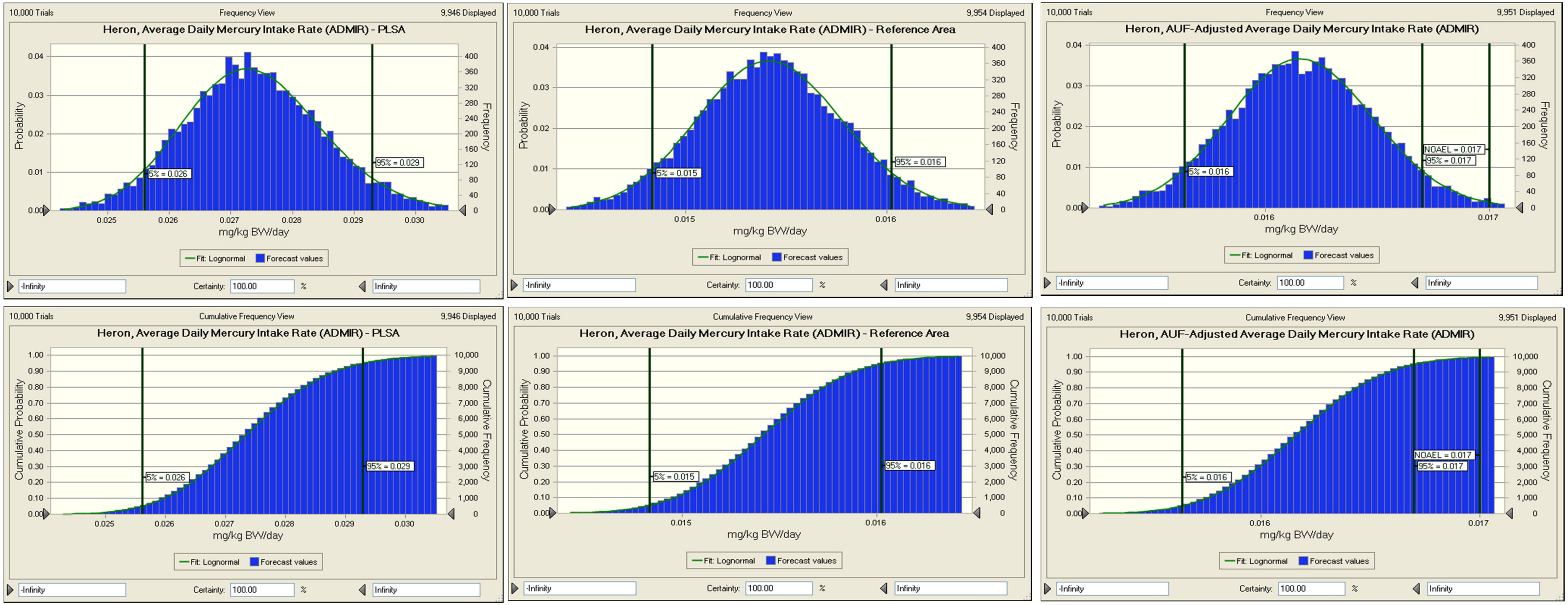
Figures

Figure F-1
Daily Methylmercury Intake Rates (DMIRs) for Great Blue Heron
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



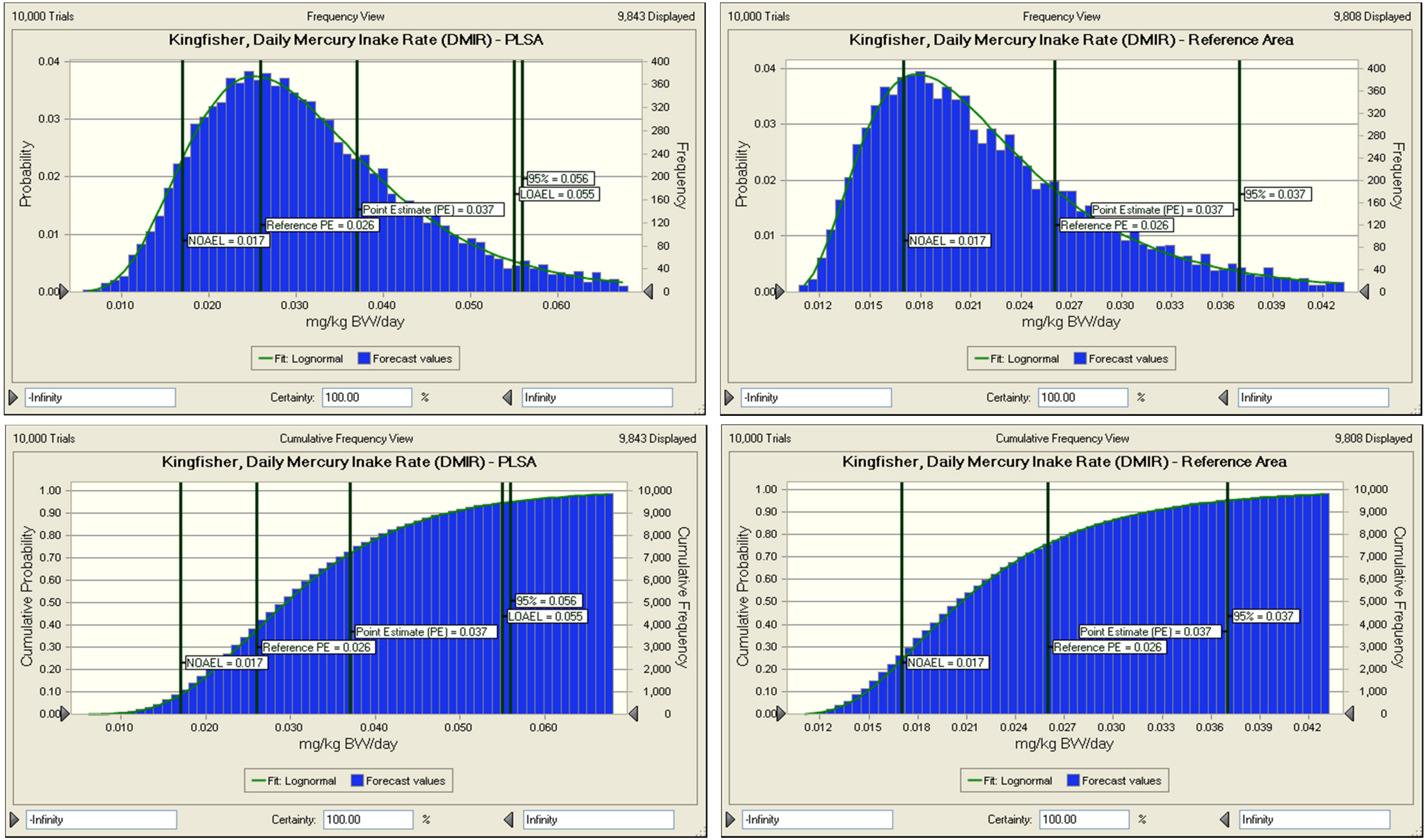
NOTES:
PLSA - Pompton Lake Study Area
AUF-Adjusted DMIR - Adjusted for Area Use Factor within the Greater PLSA
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
Point Estimate (PE) - Deterministic Exposure Estimate in PLSA
Reference PE - Deterministic Exposure Estimate in Reference Area
5% - 5th Percentile of the simulated values (DMIRs)
95% - 95th Percentile of the simulated values (DMIRs)

Figure F-2
Average Daily Methylmercury Intake Rates (ADMIRs) for Great Blue Heron
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



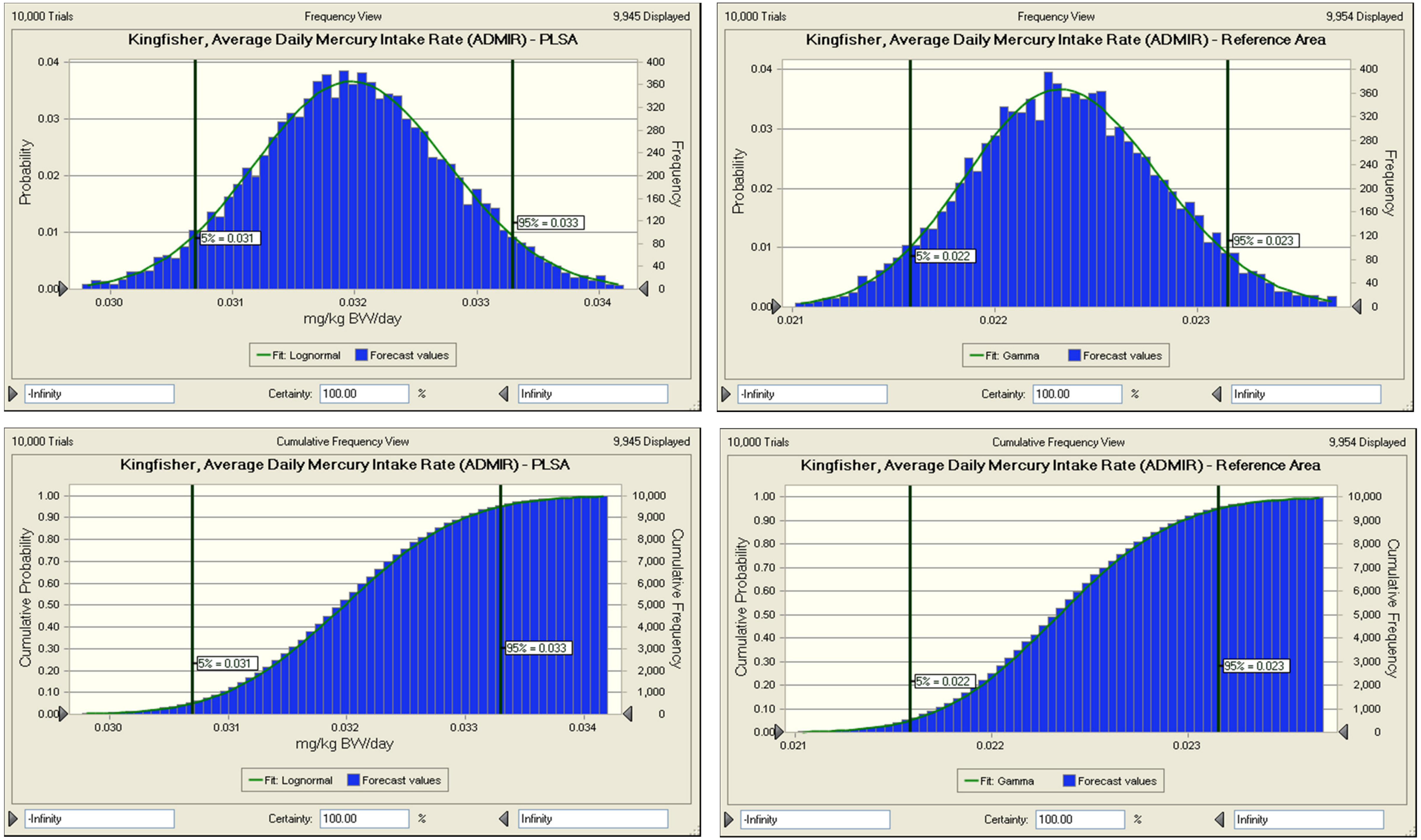
NOTES:
PLSA - Pompton Lake Study Area
AUF-Adjusted ADMIR - Adjusted for Area Use Factor within the Greater PLSA
NOAEL - No Observed Adverse Effect Level
5% - 5th Percentile of the simulated values (ADMIRs)
95% - 95th Percentile of the simulated values (ADMIRs)

Figure F-3
Daily Methylmercury Intake Rates (DMIRs) for Belted Kingfisher
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



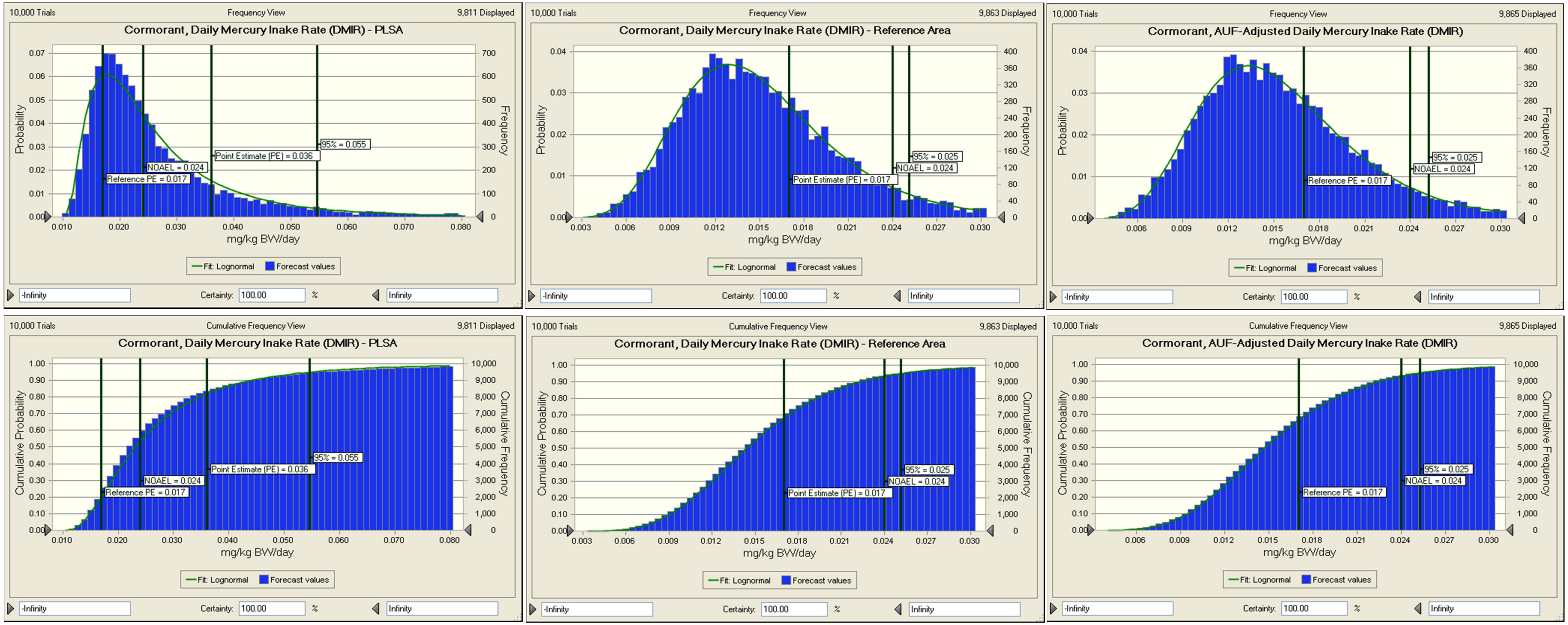
NOTES:
PLSA - Pompton Lake Study Area
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
Point Estimate (PE) - Deterministic Exposure Estimate in PLSA
Reference PE - Deterministic Exposure Estimate in Reference Area
5% - 5th Percentile of the simulated values (DMIRs)
95% - 95th Percentile of the simulated values (DMIRs)

Figure F-4
Average Daily Methylmercury Intake Rates (ADMIRs) for Belted Kingfisher
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



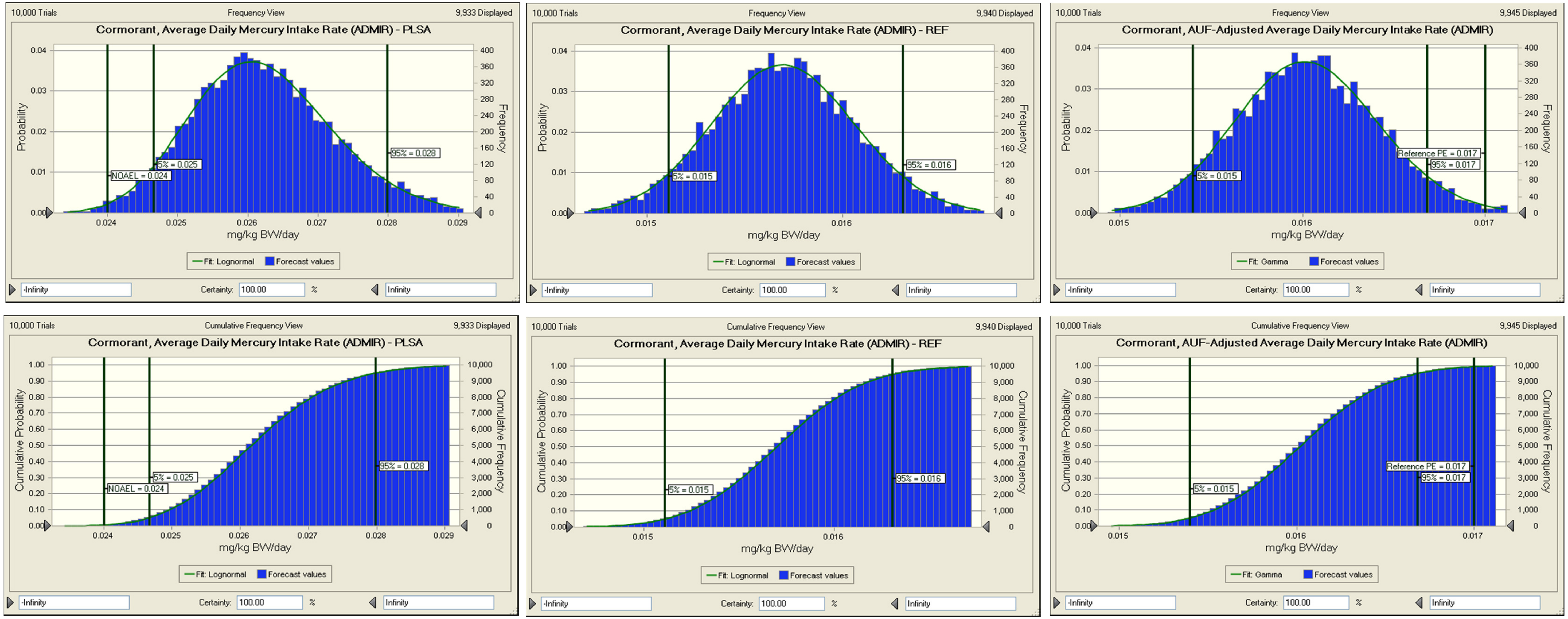
NOTES:
PLSA - Pompton Lake Study Area
5% - 5th Percentile of the simulated values (ADMIRs)
95% - 95th Percentile of the simulated values (ADMIRs)

Figure F-5
Daily Methylmercury Intake Rates (DMIRs) for Double-Crested Cormorant
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



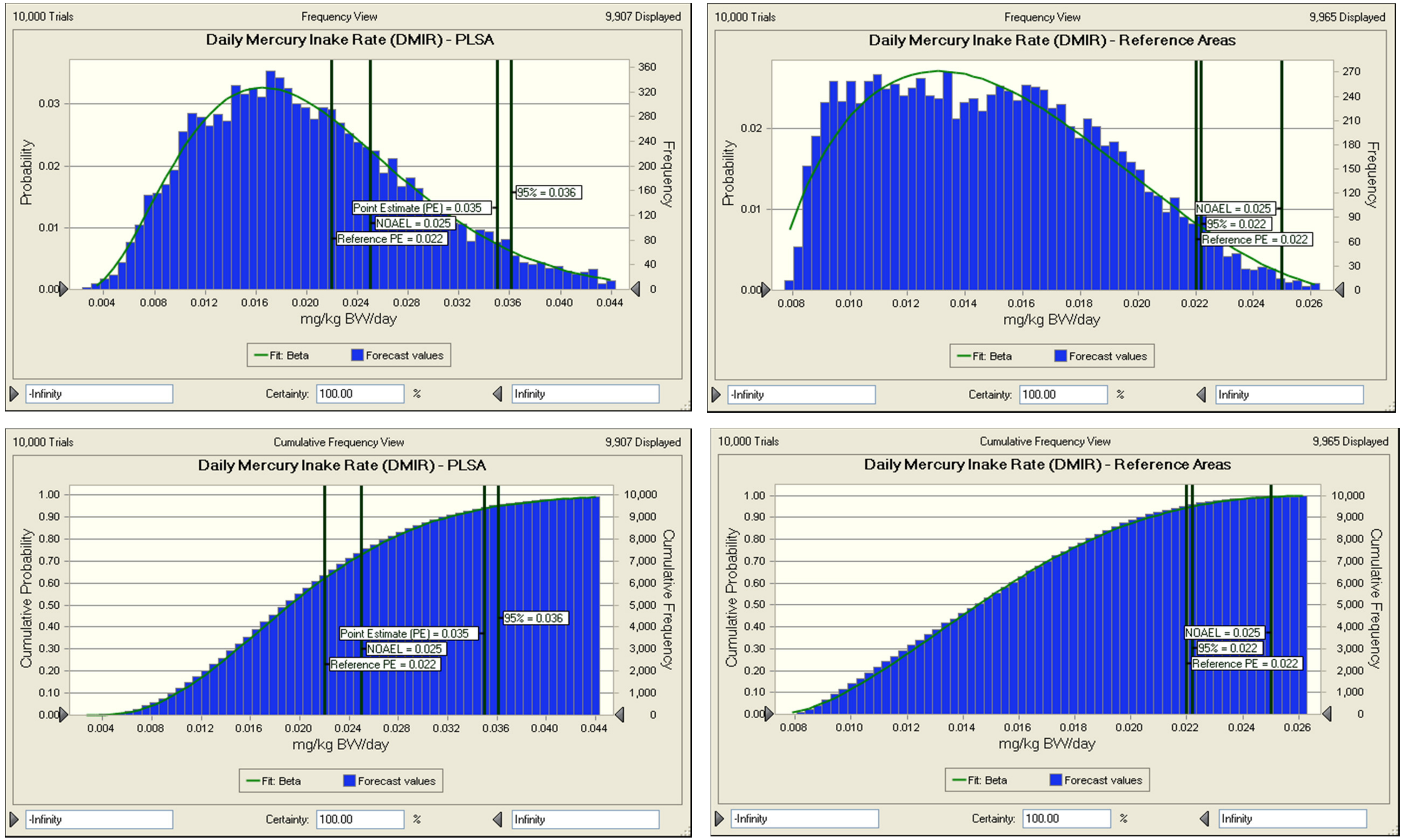
NOTES:
PLSA - Pompton Lake Study Area
AUF-Adjusted DMIR - Adjusted for Area Use Factor within the Greater PLSA
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
Point Estimate (PE) - Deterministic Exposure Estimate in PLSA
Reference PE - Deterministic Exposure Estimate in Reference Area
5% - 5th Percentile of the simulated values (DMIRs)
95% - 95th Percentile of the simulated values (DMIRs)

Figure F-6
Average Daily Methylmercury Intake Rates (ADMIRs) for Double-Crested Cormorant
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



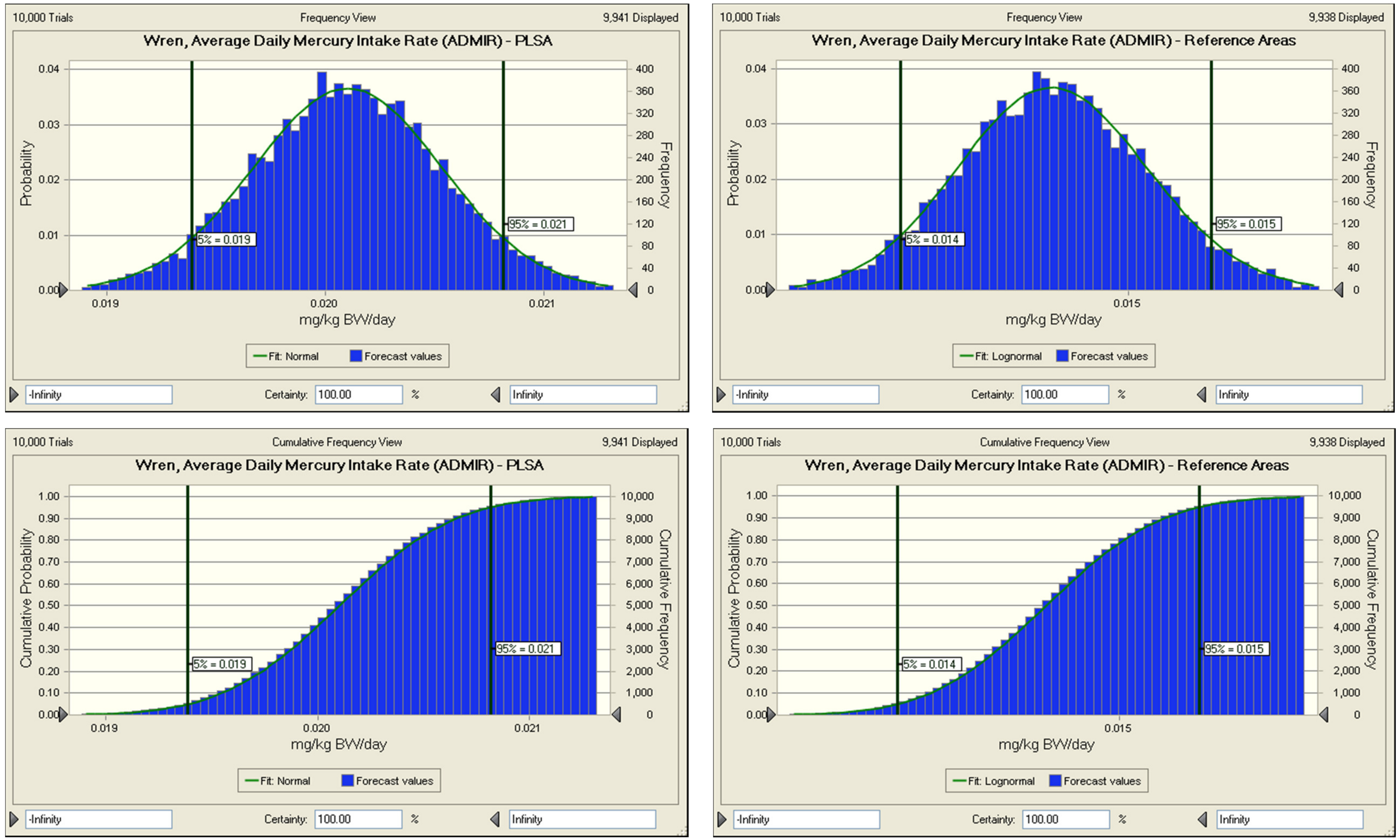
NOTES:
PLSA - Pompton Lake Study Area
AUF-Adjusted ADMIR - Adjusted for Area Use Factor within the Greater PLSA
NOAEL - No Observed Adverse Effect Level
5% - 5th Percentile of the simulated values (ADMIRs)
95% - 95th Percentile of the simulated values (ADMIRs)

Figure F-7
Daily Methylmercury Intake Rates (DMIRs) for Carolina Wren
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



NOTES:
PLSA - Pompton Lake Study Area
AUF-Adjusted DMIR - Adjusted for Area Use Factor within the Greater PLSA
NOAEL - No Observed Adverse Effect Level
Point Estimate (PE) - Deterministic Exposure Estimate in PLSA
Reference PE - Deterministic Exposure Estimate in Reference Area
5% - 5th Percentile of the simulated values (DMIRs or ADMIRs)
95% - 95th Percentile of the simulated values (DMIRs or ADMIRs)

Figure F-8
Average Daily Methylmercury Intake Rates (ADMIRs) for Carolina Wren
2013 Pompton Lake Ecological Investigation Report
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey



NOTES:
PLSA - Pompton Lake Study Area
5% - 5th Percentile of the simulated values (ADMIRs)
95% - 95th Percentile of the simulated values (ADMIRs)