Lower Passaic River Restoration Project

AECOM

Low Resolution Coring Supplemental Sampling Program Characterization Summary

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Lower Passaic River Study Area RI/FS

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Executive Summary

The Low Resolution Coring (LRC) Supplemental Sampling Program (SSP) was conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) for the Lower Passaic River Study Area (LPRSA) and is documented in this report. The LPRSA includes the 17-mile tidal reach of the Lower Passaic River from below the Dundee Dam (River Mile [RM] 17.4) to the confluence with Newark Bay (RM 0). The LPRSA also includes the tributaries to this reach (i.e., Saddle River, Second River, Third River, and the unnamed creek to the head of tide). The LRC SSP represents a supplemental phase of the LRC sediment sampling program. The LRC SSP sampling was conducted to address the LRC SSP Data Quality Objectives (DQOs) as described in the Quality Assurance Project Plan Lower Passaic River Restoration Project Low Resolution Coring Supplemental Sampling Program (LRC SSP QAPP; AECOM2012a). The LRC SSP field program was conducted over six weeks between January 9, 2012 and February 16, 2012. Field work was followed by sample analysis, data validation, and report preparation. The LRC SSP was developed in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (United States Environmental Protection Agency [USEPA] 1988) and the May 2007 Settlement Agreement (USEPA 2007) to determine the nature and extent of sediment contamination, including identification of potential source areas, and to characterize physical characteristics of the sediment in the LPRSA. Two primary DQOs for the LRC SSP were identified (AECOM 2012a):

DQO 1 – Supplement the existing surficial sediment data for initialization and parameterization of the sediment transport and chemical fate and transport (CFT) models. The passage of Hurricane Irene on August 27-28, 2011 provided a unique opportunity to characterize the potential effects of a large storm event on the LPRSA.

DQO 2 – Provide additional characterization of potential ecological and human health exposure areas in locations not previously sampled.

LRC SSP sample locations were chosen based on the following specific data needs (AECOM 2012a):

- Increase data density in reaches with limited coverage,
- Increase data density in the different geomorphic regions,
- Increase data density in the different sediment type regions, and
- Target locations where potential human exposure could occur.

Figure ES-1 shows the LRC SSP sample locations.

Eighty six core and grab sampling locations were proposed. Sediment cores were successfully collected at 85 locations and grab samples were successfully collected at 78 locations. The one core location that was not sampled (12A-0466) was relocated twice, once because of utilities and a second time because it was located too close to shore to be accessed by the sampling vessel. After nine attempts the collection of sediment cores and grab samples was unsuccessful at this station because hard bottom was encountered and in accordance with the LRC SSP QAPP (AECOM 2012a) protocols, this station was abandoned. The grab samples at the other seven unsuccessful grab sample locations were also each attempted nine times before sampling at the locations was abandoned in accordance with the LRC SSP QAPP (AECOM 2012a) protocols.

The sampling included surficial (0 to 0.5 foot) sediment grab samples and cores to a depth of 2.5 ft below the sediment-water interface. Additionally the sampling included three surficial sediment grab samples and three cores to a depth of 4.5 ft below the sediment-water interface within the footprint of the 2005 Environmental Dredging Pilot Study Area (locations 12A-0416, 12A-0417, and 12A-0418). The target

core depth was achieved at all locations except two (12A-0430 and 12A-0482) where refusal was encountered at depths of 1.9 and 1.85 ft, respectively.

The following chemical, radiochemical, and physical analyses were conducted:

- Low Resolution Cores: polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), polychlorinated biphenyls (PCBs) (homologs and congeners), polycyclic aromatic hydrocarbon (PAHs) and alkyl PAHs, organochlorine pesticides (not including toxaphene), mercury (low-level), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals and titanium, butyltins, cyanide, total organic carbon (TOC), total petroleum hydrocarbons (TPH) extractable, grain size, specific gravity, and percent moisture.
- High Resolution Cores: Lead-210 (Pb-210) (analyzed as Polonium-210 [Po-210]) and Radium-226 [Ra-226]).
- Field Analysis: bulk density and salinity (for pore water).
- Grab Samples: total sulfide, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), phosphate (total), total kjeldahl nitrogen (TKN), and ammonia as nitrogen (N).

The terms “low and high resolution” refer to the thickness of the sediment slices analyzed. In the low resolution cores the following intervals were sampled: 6 inches (at the surface); subsequent 1-foot intervals below the surface sample. In the high resolution cores samples were collected at 0.25-foot intervals for the full length of the core.

Specific performance goals established for the LRC SSP to ensure that the DQOs were achieved are as follows:

- Field completeness, defined as the percentage of samples actually collected versus those intended to be collected had a stated goal of greater than 95 percent (AECOM 2012a). The LRC SSP program achieved 93.1 percent field completeness. As described above, one station was not sampled because hard bottom was encountered and native material was encountered at depths shallower than 2.5 ft at two stations. These sediments did not meet the LRC SSP sampling objectives, so not meeting this performance goal did not impact achievement of the DQOs.
- Analytical completeness was defined as the number of data points that are accepted as usable based on the validation process divided by the total number of data points for each analysis. The objective for this project was greater than 90 percent laboratory completeness (AECOM 2012a). Laboratory completeness was 100 percent (123,676 valid and acceptable results out of 123,676 total reportable sediment results) for each analysis and for the program.

The LRC SSP met the DQOs established for this sampling program.

This report summarizes the field procedures followed to collect the LRC SSP sediment samples. It also presents the data for select contaminants of potential concern (COPCs) collected during the LRC SSP in tables and figures. To provide a complete summary of the sediment analytical data collected to date the LRC (AECOM 2014) and benthic (Windward, 2011) sediment sampling programs data have been included on select figures and tables with the LRC SSP data. Each figure and table identifies if it includes LRC SSP, LRC and benthic data or only the LRC SSP data. Note that the sediment data collected during the River Mile 10.9 (RM 10.9) Characterization Program (CH2M Hill and AECOM 2012a) is not included in the select figures in this report because a Removal Action is planned for the RM 10.9 area.

The following observations are offered regarding the LRC SSP program:

- Declining concentrations were observed in samples collected above RM 12 for multiple COPCs (e.g., 2,3,7,8- tetrachlorodibenzodioxin (TCDD),total PCBs, and total DDx [sum of Dichlorodiphenyldichloroethane, Dichlorodiphenyldichloroethylene, and Dichlorodiphenyltrichloroethane isomers]) but not for PAHs (**Figures 3-1.a** through **3-1.n** and **3-2.a** through **3-2.z**).
- Shoals were a focus of the LRC SSP, to provide better characterization of these areas. Shoals were observed with both elevated and relatively low concentrations, as summarized below:
  - Previously uncharacterized elevated concentrations of 2,3,7,8-TCDD were observed in sediments of the left bank shoal at RM 4.54 (12A-0440) and RM 4.64 (12A-0444) with concentrations in the surface sediment at 21,900 nanogram per kilogram (ng/kg) and 10,800 ng/kg, respectively. 2,3,7,8-TCDD surface concentrations were at least 1-2 orders of magnitude higher at both locations than adjacent sediments at locations that extend laterally across the channel (**Figure 3-3.a**). 2,3,7,8-TCDD was found in subsurface intervals at elevated concentrations at these two locations (**Figures 3-4.a** and **3-5.a**). Elevated levels of total PCBs (18.6 and 20.4 milligram per kilogram [mg/kg]), High Molecular Weight (HMW) PAHs (342 and 59.3 mg/kg), Low Molecular Weight (LMW) PAHs (749 and 30.2 mg/kg), mercury (10.1 and 15.4 mg/kg) as well as pesticides and metals were observed in these surface sediment samples.
  - Additional confirmation of elevated concentrations of 2,3,7,8-TCDD in sediment located on the right bank shoal in the vicinity of RM 7 to RM 7.5 (12A-0458, 12A-0459, 12A-0460, and 12A-0464) was obtained, with concentrations in the surface sediment ranging from 6,170 to 34,100 ng/kg (**Figure 3-3a**). The surface concentration of 2,3,7,8-TCDD located at 12A-0460 represents the highest concentration detected in surface sediment in the LPRSA. Elevated levels of total PCBs (2.83 to 16.9 mg/kg), mercury (7.8 and 12.2 mg/kg) as well as pesticides and metals were located in these surface sediment locations (**Figures 3-3.a**, **3-3.c**, **3-3.f**, **3-3.g**, **3-3.h**, **3-3.i**, **3-3.j**, **3-3.k**, and **3-3.l**). 2,3,7,8-TCDD surface concentrations were at least 1-2 orders of magnitude higher at these locations than adjacent locations in the deeper portions of the channel (**Figure 3-3.a**). At locations 12A-0458 and 12A-0464, 2,3,7,8-TCDD was found in subsurface intervals at similar elevated concentrations (**Figures 3-4.a** and **3-5.a**). At 12A-0459 and 12A-0460 subsurface 2,3,7,8-TCDD concentrations were several orders of magnitude lower than the surficial concentrations (**Figures 3-4.a** and **3-5.a**).
- Elevated concentrations of several COPCs were observed in the surface sediment at 12A-0476 located at the mouth of Unnamed Creek (2,3,7,8-TCDD – 1,830 ng/kg; total PCBs – 3.51 mg/kg; mercury – 2.97 mg/kg; as well as pesticides and HMW PAHs). Previous data in this area indicated variability, with both elevated and relatively low surficial concentrations observed (**Figures 3-3.a** through **3-3.n**). Elevated concentrations were also observed in the sediment interval (0.5-1.5 feet [ft]) below the surface interval at this location.
- Elevated surficial concentrations of several COPCs were observed within the river bend at RM 3.5. Elevated concentrations were observed at 12A-0427, and for a subset of COPCs at 12A-0426 and 12A-0430 (**Figures 3-3.a** through **3-3.n**)
- Additional characterization above RM 11, where previous data was relatively sparse, indicated relatively low surficial 2,3,7,8-TCDD and total PCBs concentrations, which was generally consistent with data previously collected in this reach (**Figures 3-4a and 3-4c**).
- At several locations between RM 8.3 and RM 9.1 and above RM 11.7, locations were moved and/or grab samples were abandoned due to the presence of hard bottom. The limited surficial sediment and coarsened surface in some areas of the LPRSA was consistent with earlier observations from the LRC probing and sampling activities.

- Within the Dredge pilot area at RM 2.85 (12A-0416, 12A-0417, 12A-0418):
  - Surface COPC concentrations were generally similar to those of nearby samples (**Figures 3-3.a** through **3-3.n**).
  - Silt was observed at the surface in the three cores (**Figures 3-5.a** through **3-5.n**).
  - Surface COPC concentrations were generally lower than those observed at depth (**Figures 3-4.a** through **3-4.n** and **3-5.a** through **3-5.n**).

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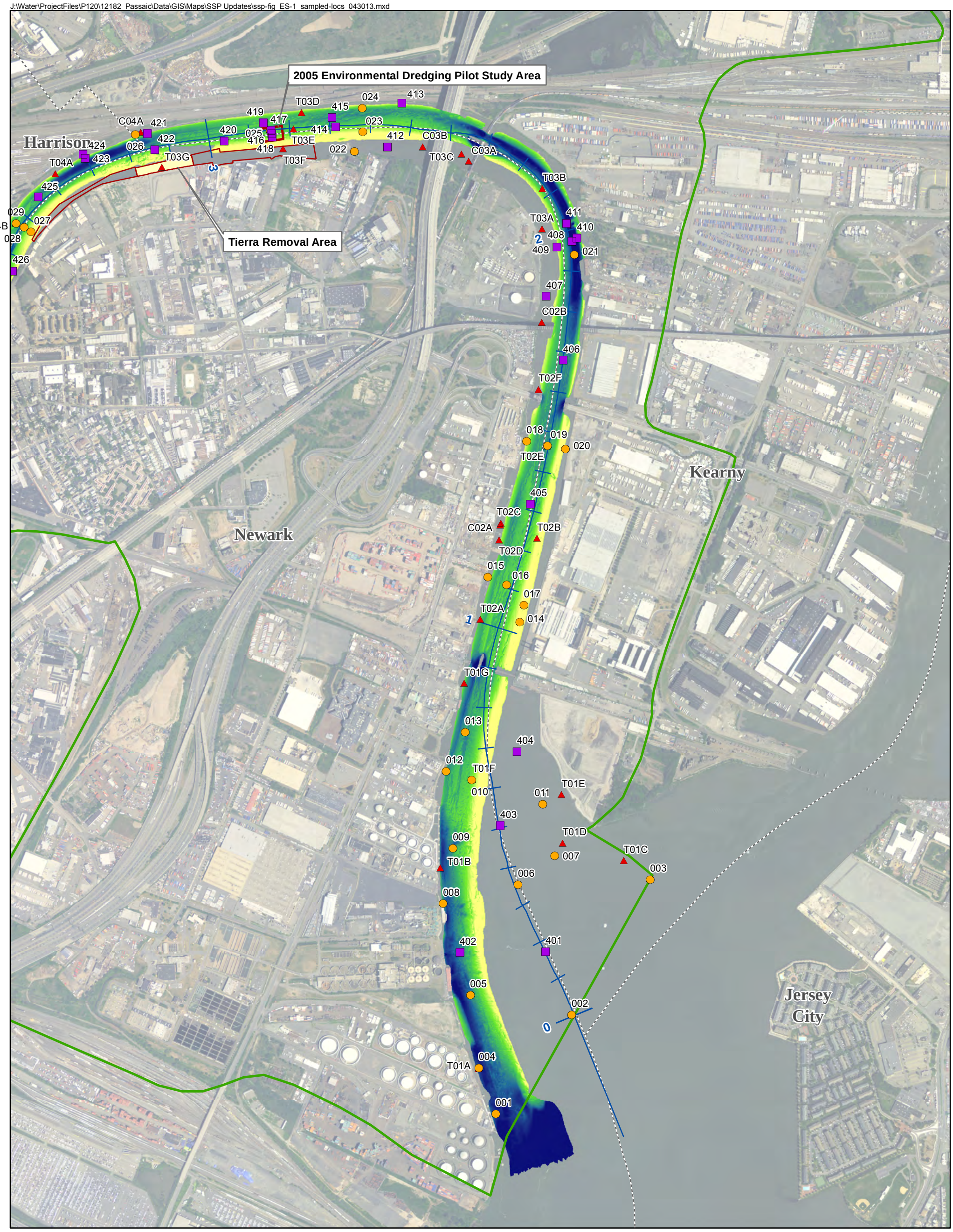

Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure ES-1 Sediment Sample Locations

RM 0 to 3.5

Page 1 of 5

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

N

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure ES-1 Sediment Sample Locations

RM 3.5 to 7.3

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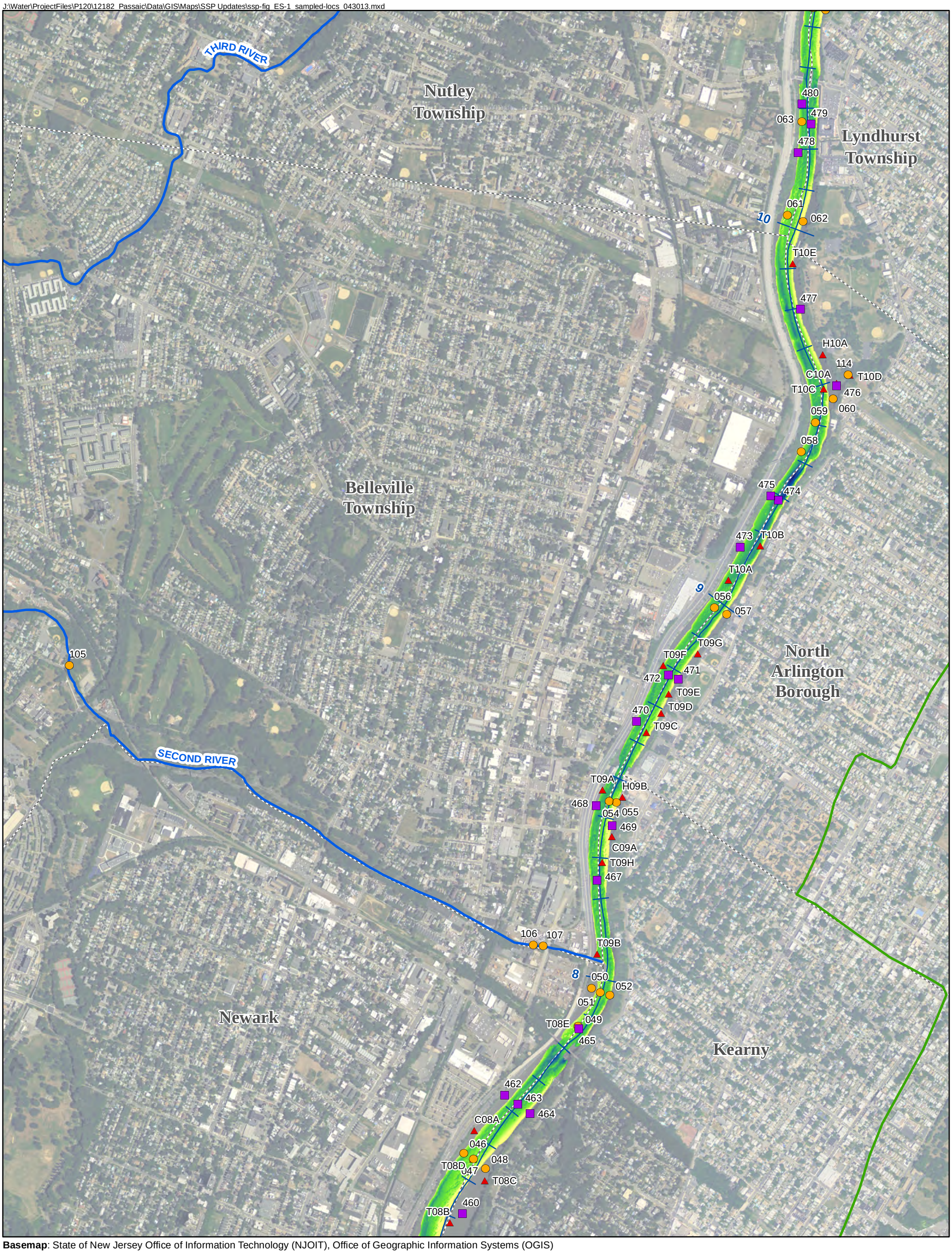

Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure ES-1 Sediment Sample Locations

RM 7.3 to 10.5

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

N

0 500 1,000 2,000 3,000 Feet

LRC SSP Sampled Locations (2012)

LRC Sampled Locations (2008)

Benthic Sampled Locations (2009/10)

LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure ES-1 Sediment Sample Locations

RM 10.5 to 13.9

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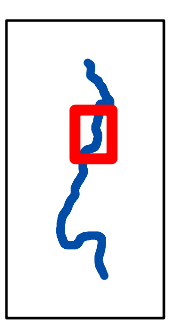

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

N

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure ES-1 Sediment Sample Locations

RM 13.9 to 18.4

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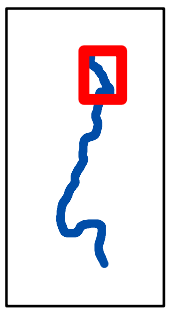

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List of Acronyms

AECOM	AECOM, Inc.
AVS/SEM	Acid Volatile Sulfide/Simultaneously Extracted Metals
Cas_rn	Chemical Abstract Service Number
CDM Smith	CDM Smith, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	Cubic Feet Per Second
CFT	Chemical Fate and Transport
CGAN	Coast Guard Advisory Notice
CN	Cyanide
COC	Chain-of-Custody
COPC	Contaminant of Potential Concern
CPG	Cooperating Parties Group
CSO	Combined Sewer Overflow
CVCC	Clean Venture/Cycle-Chem, Inc.
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DDx	Sum of DDD, DDE, and DDT isomers
DGPS	Differential Global Positioning System
DL	Detection Limit
dmi	de maximis, inc.
DQI	Data Quality Indicator
DQL	Data Quality Level
DQO	Data Quality Objective
DVR	Data Validation Report
EDD	Electronic Data Deliverable
EDL	Estimated Detection Limit
EMPC	Estimated Maximum Possible Concentration
ft	Feet
FM	Field Modification
foc	Fraction of Organic Carbon
FOD	Frequency of Detect
FSP	Field Sampling Plan

FSP1	The Lower Passaic River Restoration Project Field Sampling Plan Volume 1 (MPI 2006)
FSP2	The Lower Passaic River Restoration Project Draft Field Sampling Plan Volume 2 (MPI et al. 2006)
FSP3	The Lower Passaic River Restoration Project Revised Preliminary Draft Field Sampling Plan Volume 3 (MPI 2005b)
Gravity	Gravity Environmental, LLC
H_2S	Hydrogen Sulfide
HASP	Health and Safety Plan
HMW	High Molecular Weight
HRC	High Resolution Core
ICP	Inductively Coupled Plasma
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectrometry
IDW	Investigation-Derived Waste
kg	Kilogram
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDC	Laboratory Data Consultants
LMW	Low Molecular Weight
LPR	Lower Passaic River
LPRRP	Lower Passaic River Restoration Project
LPRSA	Lower Passaic River Study Area
LRC	Low Resolution Coring
MDL	Method Detection Limit
MEDD	Multi-Media Electronic Data Deliverable
Miller's	Miller's Launch, Inc.
mg/kg	Milligram per Kilogram
MPI	Malcolm Pirnie, Inc.
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N	Nitrogen
NCR	Nonconformance Report
ng/kg	Nanogram per Kilogram
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NOAA	National Oceanic and Atmospheric Administration
OSI	Ocean Surveys, Inc.

PAH	Polycyclic Aromatic Hydrocarbon
Pb-210	Lead-210
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-*p*-dioxin
PCDF	Polychlorinated Dibenzofuran
PE	Performance Evaluation
Po-210	Polonium-210
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
R/V	Research Vessel
Ra-226	Radium-226
RI/FS	Remedial Investigation/Feasibility Study
RM	River Mile
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SEM	Simultaneously Extracted Metals
Settlement Agreement	Administrative Settlement Agreement and Order on Consent
SOP	Standard Operating Procedure
SSP	Supplemental Sampling Program
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCDD	Tetrachlorodibenzodioxin
TCLP	Toxicity Characteristic Leaching Procedure
TEF	Toxicity Equivalency Factor
TEQ	Toxicity Equivalency Quotient
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UPR	Upper Passaic River
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard

USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VTSNYC	Vessel Traffic Service New York City
Work Plan	Lower Passaic River Restoration Project Work Plan

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1.0 Introduction

The Lower Passaic River Study Area (LPRSA) encompasses the 17.4-mile tidal reach of the Passaic River below the Dundee Dam, its tributaries, and the surrounding watershed that drains to the river below the Dundee Dam. The LPRSA is an operable unit of the Diamond Alkali Superfund Site. A Remedial Investigation/Feasibility Study (RI/FS), originally begun by the United States Environmental Protection Agency (USEPA), is currently underway for the LPRSA in accordance with:

- The Lower Passaic River Restoration Project Work Plan (Work Plan) (Malcolm Pirnie, Inc. [MPI] 2005a);
- The Lower Passaic River Restoration Project Field Sampling Plan Volume 1 (FSP1) (MPI 2006);
- The Lower Passaic River Restoration Project Draft Field Sampling Plan Volume 2 (FSP2) (MPI et al. 2006);
- The Lower Passaic River Restoration Project Revised Preliminary Draft Field Sampling Plan Volume 3 (FSP3) (MPI 2005b); and
- The Lower Passaic River Restoration Project Quality Assurance Project Plan (QAPP) (MPI 2005c).

In May 2007, the Lower Passaic River Cooperating Parties Group (CPG) entered into an agreement with USEPA). The Administrative Settlement Agreement and Order on Consent [Settlement Agreement]; (USEPA 2007) requires the Settling Parties to complete a comprehensive study of contamination and possible remedial approaches for the LPRSA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (USEPA 1980). The RI/FS is being conducted under the Settlement Agreement and includes the scopes of work identified in FSP1 (MPI 2006), FSP2 (MPI et al. 2006), and FSP3 (MPI 2005b).

This RI/FS is one component of the overall Lower Passaic River Restoration Project (LPRRP). The LPRRP is a joint CERCLA and Water Resources Development Act project. Several other federal and state agencies are participating in the project, including the United States Army Corps of Engineers (USACE), New Jersey Department of Transportation (NJDOT), National Oceanic and Atmospheric Administration (NOAA), United States Fish and Wildlife Service (USFWS), and New Jersey Department of Environmental Protection (NJDEP), collectively referred to as the “Partner Agencies.”

The Low Resolution Coring (LRC) program was developed in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA 1988) and the Settlement Agreement to determine the nature and extent of contamination, including identification of potential source areas, and to characterize physical characteristics of the sediment of the 17.4-mile LPRSA. The LRC field program was conducted from July 30 through December 16, 2008. A draft LRC Characterization Summary report was submitted by the CPG to USEPA on February 26, 2010 and resubmitted by the CPG to USEPA on July 26, 2011 (AECOM 2014). The USEPA provided comments to the CPG on the draft LRC Characterization Summary report on January 25, 2011 (USEPA 2011), including a request for a sediment-specific data needs analysis. The CPG undertook this task, and in June 2011 discussed the preliminary results of the data needs analysis with USEPA. During this discussion the CPG provided an overview of the proposed LRC Supplemental Sampling Program (SSP) designed to address identified sediment-specific data needs.

An additional data objective for the LRC SSP was identified following the passage of Hurricane Irene on August 27-28, 2011 which provided a unique opportunity to characterize the potential effects of a large storm event on the LPRSA. River flows following Hurricane Irene were the highest since October 1903, at 20,800 cubic feet per second (cfs) recorded at the United States Geological Survey (USGS) Little

Falls gauging station (concurrent flows at Dundee Dam were 26,000 cfs), exceeding the previous recent high flow events of March 2010 (15,800 cfs) and March 2011 (16,200 cfs). Water levels peaked at approximately 14 feet (ft), (exceeding flood stage by approximately 7 ft) and rose initially due to storm surge and remained elevated for several days due to freshwater runoff. Collection and analysis of sediments within a few months following this event was proposed to provide data on surficial sediment conditions for comparison with those observed in 2008-2010 to support characterization of changes which may have occurred during this high flow event. The LRC SSP was developed to meet the specific data use objectives, as detailed in Section 1.2 of this report, and implementation of the program in winter 2012 also supported characterization of post-Hurricane Irene (as well as Tropical Storm Lee) conditions.

Field and analytical details for the performance of the LRC SSP are described in the Quality Assurance Project Plan (QAPP) prepared for this program. The original version of the LRC SSP QAPP was submitted to USEPA on September 21, 2011. In response to USEPA comments two revisions of the QAPP (Revision 1 was submitted on November 7, 2011 and Revision 2 was submitted on January 14, 2012) were issued. Provisional approval for implementation of the LRC SSP was received from USEPA by email on January 5, 2012. Subsequently, one revision (Revision 3, submitted on June 25, 2012) has been issued. LRC SSP sample and data collection was conducted over six weeks between January 9, 2012 and February 16, 2012. Field work was followed by sample analysis, data validation, and report preparation. As described in the Statement of Work in the Settlement Agreement (Section B.5.d. on page 6) a Characterization Summary Report is required after each field investigation. In accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA 1988), this report presents the methods of data collection and field and analytical findings of the LRC SSP.

This LRC SSP Characterization Summary Report consists of the following sections, which are consistent with the outline for a site characterization summary provided in the Settlement Agreement:

- Executive Summary.
- Section 1.0 covers the history and background of the LPRRP, including the scope of the LRC SSP component and the Data Quality Objectives (DQOs) established for this component.
- Section 2.0 includes details of the field implementation of the LRC SSP, including sample collection and processing, sample analysis, data collection and validation, and quality assurance/quality control (QA/QC) measures.
- Section 3.0 presents analytical sample results for chemical, physical, and radioisotope parameters, shown through tabular and graphical displays, and significant observations offered from review of these displays. .To provide a complete summary of the sediment analytical data collected to date the LRC (AECOM 2014), LRC SSP, and benthic (Windward 2011) sediment sampling programs data have been included on select figures and in select tables in this section with the LRC SSP2 data.
- Section 4.0 provides an assessment of data usability.
- Section 5.0 provides document references.

Tables and figures can be found at the end of each section and all appendices follow the body of the main text.

The sediment data from the earlier LRC (AECOM 2014) and benthic (Windward 2011) sediment sampling programs data have been included on select figures and tables with the LRC SSP data to provide a complete summary of all sediment data collected by the CPG. Each figure and table identifies if it includes LRC SSP, LRC and benthic data or only the LRC SSP data. Note that the sediment data collected during the River Mile 10.9 (RM 10.9) Characterization Program (CH2M Hill and AECOM 2012) are not included in the select figures in this report because a Removal Action is planned for the RM 10.9

area. Additional information regarding the combined datasets related to figures and tables is presented in Section 3.0.

1.1 Environmental History and Setting

The LPRSA has been highly urbanized through the development of residential areas and industrial activities. **Figure 1-1** presents a map of the LPRSA. Changes in the Lower Passaic River (LPR) and watershed that accompanied European settlement and industrialization of the area to present day are well-chronicled (Iannuzzi et al. 2002). Most of the tidal marsh, mudflats, shallow nearshore areas, and tidal wetlands historically present in the LPRSA have been either filled or dredged. Today, much of the shoreline in the LPRSA consists of riprap and sheet pile walls, resulting in a highly channelized river. Upper portions of the LPRSA feature generally steeper and modified shorelines on the west banks with limited areas of riparian vegetation. The east bank is less modified, consisting of more natural shoreline, residential areas, and parks.

1.1.1 History of the LPR

More than 200 years of industrialization and urbanization have had a substantial effect on the LPR watershed, which was an important location for industry during the American Industrial Revolution (MPI 2007a). These early industries, as well as other industries that developed during the 19th and early 20th centuries, used the LPR for process water and waste disposal, which adversely affected water and sediment quality (Iannuzzi and Ludwig 2004). In addition, overall sediment and water quality is impaired as a result of historical direct municipal discharges, historical and continuing surface runoff, and municipal combined sewer overflows (CSOs) and storm water outfalls. These impacts to general water quality were reduced in 1970 when the Clean Water Act was passed (Iannuzzi and Ludwig 2004). Additional information regarding the history of the LPR can be found in the Lower Resolution Coring Characterization Summary (AECOM 2014).

The LPRSA is an operable unit of the Diamond Alkali Superfund Site. In 1984, the Diamond Alkali Superfund Site was placed on the National Priorities List as a result of past industrial operations at the Diamond Alkali plant (80/120 Lister Avenue in Newark, New Jersey), which resulted in the release of hazardous substances such as polychlorinated dibenzo-*p*-dioxins (PCDDs) and pesticides. Sampling of Passaic River sediments conducted during the RI/FS for the Diamond Alkali plant revealed numerous organic and inorganic compounds including, but not limited to, PCDDs and polychlorinated dibenzofurans (PCDFs), pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and metals. In 1994, an investigation of a 6-mile stretch of the Passaic River (RM 1-7) centered on the Diamond Alkali plant was initiated. Sampling showed that the sediments throughout RM 1-7 were contaminated with organic and inorganic substances, and were being potentially dispersed by the tidal nature of the LPR throughout the river. Therefore, in 2001, USEPA expanded the scope of the Superfund study to encompass the 17.4-mile stretch of the Passaic River.

1.1.2 Physical Setting of the LPRSA

Portions of the LPRSA below Dundee Dam can be characterized as a stratified estuary. The LPRSA receives inflows of marine (salt) water from Newark Bay and fresh water from the Upper Passaic River (UPR; above Dundee Dam), tributaries, surface run-off, CSOs, and storm water outfalls located below Dundee Dam. The less dense fresh water flows downstream over the tidally influenced salt water that, on the flood tide, moves upstream from Newark Bay. The exact extent of the salt wedge (i.e., a wedge-shaped intrusion of salt water into the estuary that slopes downward in the upstream direction) is dependent on the phase of the tide and the volume of fresh water flowing downstream.

The LPRSA is relatively shallow, with maximum thalweg depths ranging from a few feet (upper portions below Dundee Dam) to 30 ft near the mouth of the river. A federally authorized navigation channel exists between the mouth of the river and RM 15.4 (USACE 2008). Sediment grain size in the main stem of the LPRSA below Dundee Dam consists of fine (silts and sands) to coarse sediment (gravel or

rock). Coarser grained sediment occurs in the upstream reaches, with a larger proportion of fine sediment (silts and fine sand) in the lower reaches to the mouth (MPI et al. 2006). Some deviations from this trend are found in lower areas of the LPRSA where steepened shorelines have been armored and this material is found in the channel, in erosional areas associated with bridge abutments, and near river bends.

1.2 Data Quality Objectives for the LRC SSP

The DQO process establishes performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study. The document, Guidance on Systematic Planning Using the Data Quality Objectives Process (USEPA 2006), was used to develop the DQOs for the LRC SSP investigation. These DQOs are presented in the LRC SSP QAPP (AECOM 2012a). The DQOs define the decision to which the data would contribute and specify the overall degree of data quality or uncertainty the decision maker is willing to accept during the decision making process.

Two primary DQOs for the LRC SSP were identified (AECOM 2012a):

DQO 1 – Supplement the existing surficial sediment data for initialization and parameterization of the sediment transport and chemical fate and transport (CFT) models. The passage of Hurricane Irene on August 27-28, 2011 provided a unique opportunity to characterize the potential effects of a large storm event on the LPRSA.

DQO 2 – Provide additional characterization of potential ecological and human health exposure areas in locations not previously sampled.

The complete seven-step DQO process is presented in QAPP Worksheet #11 (AECOM 2012a).

1.3 LRC SSP Design

The LRC SSP was developed to address the following problem, as outlined in QAPP Worksheet #10 (AECOM 2012a):

> "Based on the LRC DQOs (ENSR 2008) and supporting decision statements, the CPG evaluated data needs to support delineating the nature and extent of chemical contamination, parameterizing and calibrating the sediment transport and CFT models, delineating stable and potentially erosional sediments, and completing the risk assessments and the FS.
>
> The review of the LRC data collected in 2008 identified data needs related to parameterizing the numerical models and characterizing human health exposure areas. Collection of sediment data in winter 2012 will also support some characterization of the potential effects of the record flows associated with Hurricane Irene (as well as Tropical Storm Lee) on the surface sediments of LPRSA. While the data collection effort detailed in the QAPP will help fill data needs, further evaluation will be performed to determine what additional data collection efforts may be required to meet the LRC DQOs (ENSR 2008)."

To address this problem sample locations were chosen to meet the following specific data needs (AECOM 2012a):

- To better support parameterization of the sediment transport and CFT models, additional sediment data was proposed to increase data density along the length of the river, within different surficial sediment types, in different geomorphic units, and within the footprint of the 2005 Environmental Dredging Pilot Study Area.

- To support the human health risk analysis and risk characterization surface sediment sample locations along the river were identified where potential human exposure could occur, but that have not previously been sampled. These data will also be used in the ecological risk assessment.

A total of 86 sampling locations were proposed for LRC SSP. The proposed sample locations, including the location siting rationale and the target station coordinates, are presented in QAPP Figures 1, 2 and 3 and Worksheet #18 (AECOM 2012a). Changes from this planned sampling effort, such as relocations required due to submerged utilities or armored substrate, are discussed in Section 2.0.

The LRC SSP sediment characterization program included the collection of both surface sediment grabs and core samples. A surface sediment grab sample was collected at each station using a stainless steel power grab with pneumatic ram. The grab sampling effort yielded a surface sediment sample from 0 to 0.5 foot below the sediment-water interface. The sediment grab samples were collected to provide sufficient sediment volume for analysis of specific target analytes, as well as additional volume, if needed beyond that collected by the vibracores, to meet the analytical chemistry requirements for the 0 to 0.5 foot sample depth.

A vibracore system was used to collect three cores at each station for chemical and physical analysis. Two cores were used for analyses for the suite of physical and chemical analytes (LRCs). Two cores were required to provide sufficient sample volume for chemical analyses. The third core was used for radiological analysis of Lead-210 (Pb-210) (High Resolution Cores [HRCs]). At select stations where the recovered core was soupy (i.e., had a high water content) or where the station geology made it difficult to collect multiple cores, only one LRC core was collected and the sample volume for the shallowest sample interval was supplemented with the grab sample. In order to address the identified data needs, 83 stations were selected for sampling. The SSP LRC sampling program was designed to yield 3 sample intervals per station and to produce 249 samples from the LRCs and to yield 10 sample intervals per station for the HRCs for a total of 830 samples. See Section 2.0 for descriptions of sample intervals.

In addition to these 83 stations, three stations (12A-0416, 12A-0417, and 12A-0418) were selected from within the footprint of the 2005 Environmental Dredging Pilot Study Area for analysis of physical and chemical analytes in grab samples and in 4.5-foot cores. The SSP LRC sampling program for these three stations was designed to yield 5 sample intervals per station and to produce an additional 15 samples from the LRCs. At the center station in the 2005 Environmental Dredging Pilot Study Area (12A-0416), a HRC was also collected for Pb-210 analysis, designed to yield an additional 18 sample intervals.

The proposed analyte list for the LRC SSP was based on the RM 10.9 analyte list with the removal of infrequently detected analytes in LPRSA. Sediment contaminant of potential concern (COPC) data were reviewed for the entire LPRSA to evaluate the frequency of detection (FOD) of analytes previously measured in the LRC (AECOM 2014) and benthic sediment sampling (Windward, 2011) programs. The FOD for herbicides and volatile organic compounds (VOCs) show that these constituents were infrequently detected in LPRSA sediments. VOCs and herbicides, therefore, were removed from the analyte list.

Field data collection and laboratory analyses were completed in accordance with the approved LRC SSP QAPP (AECOM 2012a) and standard of practice for environmental assessments. Details of the field program implementation are presented in Section 2.0.

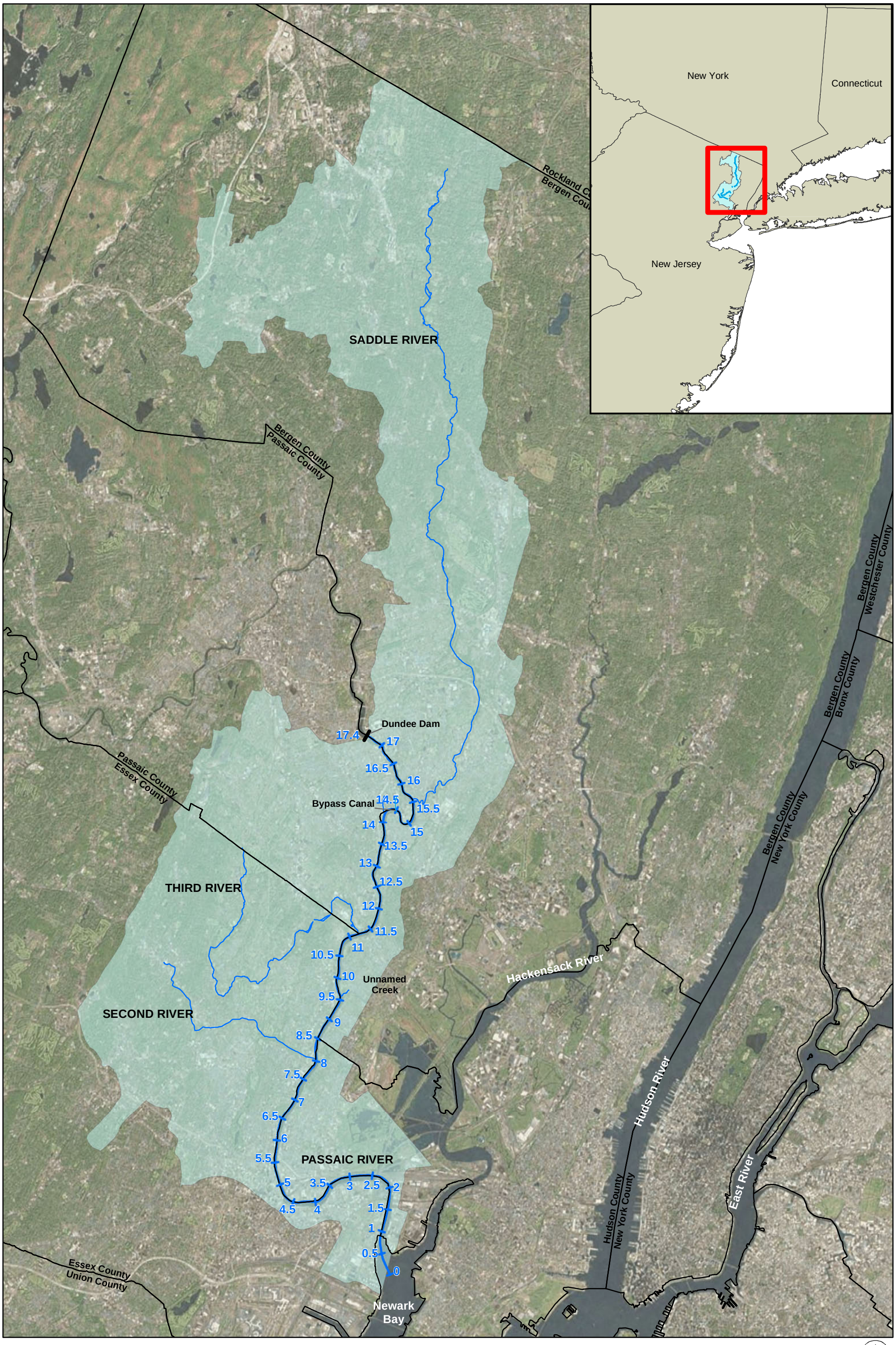

Figure 1-1 Lower Passaic River Study Area

0.5 Passaic River measured centerline (miles)

Passaic River Tributaries

Lower Passaic River Study Area

County Boundary

0 1.2 2.4 3.6 4.8 6 Miles

AECOM

November 2014

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Map Projection: NJ State Plane, NAD 83 Feet

J:\Water\ProjectFiles\P120\12182_Passaic\Data\DataSummaries\Plans and Reports\2008LRC_Revisions\Figures\1-XLRC 1_1 Site Map_rev2.mxd

2.0 LRC SSP Sampling and Analysis

This section provides a description of the field and laboratory activities performed during the LRC SSP. Each aspect of the LRC SSP is described briefly in this section. Multiple sample collection systems were mobilized and implemented, including two vibracores, two power grab samplers, and two sampling vessels. Samples were collected, prepared and shipped to eight separate laboratory locations for analysis. The LRC SSP was conducted in accordance with the procedures presented in the LRC SSP QAPP (AECOM 2012a) and the associated field and laboratory SOPs (Appendices A and B of the LRC SSP QAPP). The following sections describe variances, if any, from the approved procedures.

Anticipated modifications to field procedures that were necessary due to field conditions or equipment limitations were documented as field modifications (FMs) and submitted to USEPA for approval. Deviations from approved field procedures, generally due to unforeseen circumstances, were documented in the field records at the time of occurrence. Significant deviations were additionally recorded as nonconformance reports (NCRs) and are summarized in this report.

The LRC SSP field investigations were conducted over six weeks from January 9 through February 16, 2012. Field work was followed by sample analysis, data validation, and report preparation.

2.1 Field Contractors and Subcontractors

AECOM served as the primary contractor for the LRC SSP field program, working under the direction of de maximis, inc. (dmi). Sample collection and processing, sample management, and data management were performed by AECOM personnel. Subcontractors were used by AECOM for sediment coring and sampling support, surveying, data validation, and laboratory analyses, as described below. Additional marine services were provided by dmi, which operated and maintained a motorized Jon boat (19-foot SeaArk) that is owned by the CPG as part of the field facility. On-site QA/QC support also was provided by dmi.

2.1.1 Ocean Surveys, Inc.

Sediment sampling support was provided by Ocean Surveys, Inc. (OSI) of Old Saybrook, Connecticut. OSI provided vessels, vessel operators, and equipment for sediment coring and sampling. OSI provided sediment vibracoring and surficial sediment grab sampling support using their vessels, the Research Vessel (R/V) CanDu and R/V WillDu. Each vessel was equipped with a vibracore unit and required accessories. OSI also provided and operated one pneumatically activated stainless steel power grab sampler aboard the R/V CanDu. In addition to this sediment sampling support OSI provided tide gauge location and elevation survey support.

2.1.2 Gravity Environmental, LLC

Surficial (0 to 0.5 ft) sediment sampling support was provided by Gravity Environmental, LLC (Gravity) of Fall City, Washington. Gravity provided a stainless steel power grab sampler with pneumatic ram and an equipment operator. In addition to operating the power grab sampler, Gravity personnel assisted with deckhand and sampling duties aboard the R/V WillDu.

2.1.3 Miller's Launch, Inc.

Support vessel services were provided by Miller's Launch, Inc. (Miller's) of Staten Island, New York. Miller's provided the Sandy Miller, a 22-foot work boat, and a captain for transporting samples and personnel on the LPR. The Sandy Miller was also used by USEPA's third party oversight (CDM Smith, Inc. [CDM Smith]) personnel for observing sampling operations.

2.1.4 Laboratories

The analytical subcontractors to AECOM for the LRC SSP included seven laboratories, at nine locations (AECOM 2012a):

- Analytical Perspectives in Wilmington, North Carolina;
- Columbia Analytical Services, Inc. in Kelso, Washington;
- Brooks Rand, LLC in Seattle, Washington;
- GeoTesting Express, Inc. in Acton, Massachusetts;
- GEL Laboratories, LLC in Charleston, South Carolina;
- TestAmerica Laboratories, Inc. in Knoxville, Tennessee; West Sacramento, California; and South Burlington, Vermont; and
- PTS Laboratories Inc. in Santa Fe Springs, California.

The primary laboratory identified for each analysis was utilized with the exception of analysis of grain size, specific gravity, and moisture content at station 12A-0424. Mercury vapors observed at this station at the field facility exceeded the action level established in the Health and Safety Plan (HASP) (AECOM 2012b). All the laboratories were notified of the occurrence prior to sample receipt and the primary laboratory for these geotechnical analyses, GeoTesting Express, determined that they could not safely perform these analyses. The backup laboratory, PTS Laboratories Inc. in Santa Fe Springs, California, therefore performed these analyses on the samples from this one station.

The laboratories and the analyses performed by each laboratory are shown in **Table 2-1**.

2.1.5 Laboratory Data Consultants

All data validation services were conducted by Laboratory Data Consultants (LDC) of Carlsbad, California, under contract to AECOM. AECOM provided coordination and oversight of data validation.

2.2 Sampling Program Design

The LRC SSP design, including selection of station locations, target depths, and analytical parameters, is included in the LRC SSP QAPP (AECOM 2012a). A summary of the design, including any changes from the proposed program, is presented below.

2.2.1 Station Location Selection

The LRC SSP was designed to include the collection of sediment cores and grab samples at 86 stations. Specific considerations for the selection of each station were provided in the LRC SSP QAPP (AECOM 2012a).

During the implementation of the LRC SSP, 24 sample stations were relocated either due to being in close proximity to utilities, being located in areas of hard river bottom, or being located too close to the shoreline with overhanging trees. Following the utility clearance of sample stations (see Section 2.3.2) 19 sample stations were moved because they were located too close to utilities. The sample stations were relocated so that sampling could be conducted safely and without risk of damaging utilities. During sampling five sample stations could not be sampled because of rocky or hard river bottom conditions. These sample stations did not meet the sampling objectives so these sample stations were relocated. The new sample location for one of the stations moved for utilities (12A-0466) was moved a second time because it was located too close to shore, and overhanging trees prevented the mobilization of the sampling vessel to the location. FMs were submitted to and approved by USEPA for all 24 of these relocations.

During sample collection, one sample station, 12A-0466, was not sampled. This sample station was moved twice (as describe above). During sampling at this new station hard bottom was encountered and nine cores were advanced with less than one foot of sediment recovery achieved in only one core. Similarly, nine unsuccessful attempts were made to collect a grab sediment sample at this station. Because the sample location was moved twice and that the hard bottom did not meet the sampling objectives and that samples were not collected after nine attempts, sampling of this station was abandoned as per LRC SSP protocol (AECOM 2012a).

In addition to location 12A-0466, grab samples were not collected at seven stations (12A-0424, 12A-0430, 12A-0470, 12A-0471, 12A-0473, 12A-0481, 12A-0484). At these stations grab samples were not successfully obtained after nine attempts. Grab sampling at these stations, therefore, was abandoned as per LRC SSP protocol (AECOM 2012a).

Figure 2-1 presents the locations of the 85 sample locations were sediment samples were successfully collected. **Table 2-2** presents a summary of core collection information and **Table 2-3** presents a summary of the grab sample collection information.

2.2.2 Target Depths and Sample Intervals

The LRC SSP was designed to include surficial (0 to 0.5 foot) sediment grab samples, cores to a depth of 2.5 ft below the sediment-water interface, and cores to a depth of 4.5 ft below the sediment-water interface within the footprint of the 2005 Environmental Dredging Pilot Study Area to meet the data needs and station location selection criteria noted above. The target core depth was achieved at all except two stations (12A-0430 and 12A-0482) where refusal was encountered at depths of 1.8 and 1.85 ft, respectively.

The core penetration depth, recovered length, and percent recovery for each retained core are provided in **Table 2-2**.

2.2.2.1 Low Resolution Cores

Cores for LRC segmentation were collected at each station. Samples from the LRCs were collected from the 0 to 0.5 foot surface interval (from the core and grab sample), and from 1-foot segments throughout the remaining depth to a total depth of 2.5 ft at all locations except the three locations within the 2005 Environmental Dredging Pilot Study Area were the cores were advanced to 4.5 ft. All LRC samples were submitted for chemical analysis and physical evaluation (see Section 2.2.3).

2.2.2.2 High Resolution Cores

Cores for HRC segmentation were collected at each station where a LRC was collected, except for two of the locations (12A-0417 and 12A-0418) which were within the 2005 Environmental Dredging Pilot Study Area. In accordance with the LRC SSP QAPP (AECOM 2012) a HRC sample was collected at only one of the three stations within the 2005 Environmental Dredging Pilot Study Area. The HRCs were sampled in 0.25 foot increments for the full length of the collected core. These cores had the same target depths as the LRCs. Samples from the HRCs were analyzed for Pb-210 (see Section 2.2.3).

Core segments were measured at the CPG field facility based on actual lengths observed. Sampling intervals were adjusted at limited locations where voids were noted in the cores.

2.2.2.3 Surficial Sediment Grab Samples

In addition to the collection of cores, the LRC SSP included the collection of surficial sediment grab samples from 0 to 0.5 ft. The surficial sediment grab samples were collected with a stainless steel power grab sampler. In general, surficial sediment grab samples were collected on the same day as the cores. Grab sampling was conducted to collect sediment for analysis of specific target analytes, as well as to collect volume beyond that collected by the vibracores to meet the analytical chemistry

requirements for the “A” sample interval (0 to 0.5 ft). Surficial sediment grab samples were collected to obtain surface sediment for the collection of acid volatile sulfide/simultaneously extracted metals (AVS/SEM), total sulfide, and nutrients (ammonia as nitrogen [N], phosphorus, and TKN) analyses and to provide volume for those parameters collected from surficial samples only.

2.2.3 Sample Analyses

The following groups of analyses were completed for the LRC SSP sediment characterization samples (AECOM 2012a):

1) A comprehensive list of physical parameters, inorganic and organic chemical analyses for all LRC cores sampled. These analyses were PCDDs, PCDFs, PCBs (homologs and congeners), PAHs and alkyl PAHs, organochlorine pesticides (not including toxaphene), mercury (low-level), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals and titanium, butyltins, cyanide, total organic carbon (TOC), total petroleum hydrocarbons (TPH) extractable, grain size, specific gravity, and percent moisture.
2) Analysis of AVS/SEM, sulfide, and selected nutrients (ammonia-N, phosphorus, and TKN) from the surface sediment (0 to 0.5 ft) for the full set of LRC stations where grab samples were collected. If grab samples were not collected at a station, samples for these analytes were not collected.
3) Analysis for a finer segmentation for radiochemistry analysis of Pb-210 (analyzed as Polonium-210 [Po-210] and Radium-226 [Ra-226]) for all HRC locations sampled.
4) Field measurements including salinity measurement of pore water and calculation of bulk density for all LRC stations sampled.

For each interval processed from a LRC core, analytes were collected in order of priority starting with the primary core. Analytical hierarchies were established based on a number of factors, including sample volume, method of collection, nature of the analytes (e.g., volatility), and USEPA input. The analyte prioritization scheme (PCDD/PCDFs, PCBs [homologs and congeners], PAHs, pesticides, mercury (low level), SVOCs, TAL metals and titanium, cyanide, butyltins, TOC, TPH-extractables, grain size, and specific gravity) was consistent with the scheme outlined in the 2008 LRC effort. At USEPA’s request, PCDD/PCDF, PCBs, PAHs, pesticides, and mercury were analyzed in samples collected from the primary cores. Once the sediment from the primary core was depleted, samples were collected from the secondary core in continuing order of priority.

At one location, Station 12A-0455, limited recovery (recovery of only 1.5 to 1.89 ft) of the “C” interval (1.5 to 2.5 ft) resulted in insufficient volume for collection of all required analytes. Therefore, samples for butyltins, cyanide, TAL metals and titanium, TOC, and TPH analyses were not collected from the “C” interval of Station 12A-0455.

Additional sample cores were generally required to obtain sufficient volume for samples that were split with CDM Smith on behalf of USEPA (see Section 2.8.3.2). Sample stations, intervals, and analyses submitted for each sediment sample are shown in **Table A-1** in **Appendix A**. **Table A-2** in **Appendix A** presents the same information for the field quality control (QC) samples.

2.3 General Field Activities

The following section describes general field activities undertaken for the LRC SSP.

2.3.1 Notifications

The following section describes the notifications made prior to the initiation of field activities.

2.3.1.1 Coast Guard Vessel Traffic and Homeland Security Notification and Coordination

United States Coast Guard (USCG) notification is required for projects located within any charted or Federal Channel, or for any other surveys conducted as per the Inland Navigation Rules, within the Vessel Traffic Safety Area of Responsibility. Authorization to perform work is granted under the Ports and Waterways Safety Act [(33 United States Code 1225(a)(2)(C)].

The USCG Sector New York was given written notice of the planned scope, schedule, and vessel information for sediment sampling for LRC SSP activities on December 23, 2011. USCG authorization was given to proceed with the work outlined in the written notification, starting on January 9 and terminating on March 12, 2012.

On January 5, 2012, e-mail notification was given to USCG Sector New York regarding the addition of the R/V CanDu to the project. A revised Coast Guard Advisory Notice (CGAN 2012-002) was issued on January 9, 2012. In addition, the Vessel Traffic Service New York City (VTSNYC) was notified either by phone or by marine radio each day prior to operation in the lower reaches of the river, as required.

2.3.1.2 Homeland Security Notifications

For each municipality located along the Passaic River, local Homeland Security officers were identified and contacted. Written Homeland Security notifications were mailed, faxed, or e-mailed to corresponding municipal police Homeland Security designees informing each that environmental surveying was planned within the river. The sampling schedule and project contact information were provided with these notifications.

2.3.1.3 Bridge Notifications

A total of eighteen bridges are located within the LRC SSP project area (**Table 2-4**). These bridges include one open dismantled railroad bridge, seven swing bridges, four lift deck bridges, five fixed structures, and one double leaf bascule bridge. AECOM identified and confirmed contact/ownership information for each bridge located within the LPRSA. Opening notifications were confirmed and bridge crews were contacted as specified by the bridge contact.

In addition to bridge openings, permission was required for the installation of tide gauges on a number of these structures. See Section 2.3.3 for additional detail regarding tide gauge installation and **Figure 2-2** for the tide gauge station locations. Electronic or hardcopy approval was received prior to tide gauge attachment on bridges. In addition, for structures located below RM 2.6 that would be used for tide gauge installation, the USCG was notified in advance of the planned work.

2.3.2 Utility Clearance

Where possible, sample stations were selected to avoid known utility crossings within the LRC SSP work area. However, some mapped utility crossing areas on nautical charts were large enough that it was necessary to plan cores proximate to the crossing in order to provide adequate study area coverage. Utility clearance notifications for all stations were made by AECOM and OSI personnel through the New Jersey One-Call system. In some cases, coordination with the utility company was required. This coordination included reviewing maps and figures provided by the utility company, ground-truthing utility layouts, and meeting utility company representatives on site in order to establish the utility's location. As a result of sample stations being collocated at utility crossing locations or within the buffer zones requested by the utilities, the proposed sampling station coordinates for 19 stations were adjusted. Approvals for the sample stations relocations were received from USEPA via the FM process.

2.3.3 Tide Gauge Station Installation and Vertical Control

In order to establish the sediment surface elevation at each sample station, water levels of the LPR were continuously monitored and recorded at select locations. Fixed water level (tide) gauges that consisted of an electronic pressure transducer and an integrated data logger (HOBO® model U20-001-04) were installed at five locations along the LPR. All gauges were installed on existing fixed structures, in accordance with SOP No. LPR-FI-07, HOBO Water Level Data Logger Data Collection. Not all gauges were recording continuously – monitoring was dependent on the sampling schedule and stations were adjusted accordingly as the investigation progressed. Stations were added or removed to different parts of the LPRSA to provide gauges upstream and downstream of the stations being sampled. The data loggers were downloaded on an approximately weekly basis. Tide gauge station locations are shown on **Figure 2-2**; locations and corresponding water level data are included in **Appendix B**.

SOP No. LPR-FI-07 HOBO Water Level Data Logger Data Collection requires collection of surface water salinity data during HOBO deployment, routine servicing and removal. Salinity measurements were not collected during initial deployment, but were collected during routine servicing, and retrieval.

The reference elevations for the tide gauges were surveyed by OSI at the end of the field program. The surveys were completed on February 16, 2012. The data were processed to calculate the elevation of the water surface at each tide station, and then used to determine the water elevation at each sampling station at the time of sampling.

2.3.4 Vessel Positioning/Horizontal Control

Vessel positioning was performed in accordance with SOP No. LPR-G-02, Navigation/Positioning, with clarifications on position accuracy provided in the LRC SSP QAPP (AECOM 2012a). For each station the on-board Differential Global Positioning System (DGPS) was used to position the vessel as close to the target location as possible and the vessel position was secured via setting anchors or spuds. Once within the target radius (25 ft), the DGPS system was used to record the actual northing and easting (New Jersey State Plane NAD 83) of each core attempt along with the distance from the target coordinates.

The accuracy of the DPGS system was maintained by using a second DGPS. The fixed station used during the investigation was the USCG beacon at Sandy Hook, New Jersey. Calibration with the Sandy Hook signal was performed twice a day, at the start of field activities and at the completion of field activities, using fixed and known survey points located at the CPG facility dock and at the Passaic Yacht Club.

2.3.5 Sample Nomenclature

Samples were identified using the following sample nomenclature protocols:

Event – 12A represents the first sampling event of 2012 (the LRC SSP).

Sample station – 0401 to 0486. Sample stations were numbered sequentially starting at the mouth of the LPR and moving upriver.

Core or grab number – C1, C2, etc.; and G1, G2, etc. The number corresponds to the retained core or grab from which the sample was processed.

Sample interval – A, B, C, etc. The sample interval designation is from the segmentation scheme based on depth below sediment surface with “A” being the most shallow interval. The following sample interval designation was used for the LRCs:

Interval	Core Depth	Sample Scheme
A interval:	0 to 0.5 ft	(sampled in conjunction with surface grab sampling)
B interval:	0.5 to 1.5 ft	1-foot interval
C interval:	1.5 to 2.5 ft	1-foot interval
D interval	2.5 to 3.5 ft	1-foot interval (three cores in the in the 2005 Environmental Dredging Pilot Study Area only)
E interval	3.5 to 4.5 ft	1-foot interval (at three stations in the in the 2005 Environmental Dredging Pilot Study Area only)

The following sample interval designation was used for the HRCs:

Interval	Core Depth	Sample Scheme
A interval:	0 to 0.25 ft	0.25-foot interval
B interval:	0.25 to 0.5 ft	0.25-foot interval
C interval:	0.5 to 0.75 ft	0.25-foot interval
D interval:	0.75 to 1.0 ft	0.25-foot interval
E interval:	1.0 to 1.25 ft	0.25-foot interval
F interval:	1.25 to 1.5 ft	0.25-foot interval
G interval:	1.5 to 1.75 ft	0.25-foot interval
H interval:	1.75 to 2.0 ft	0.25-foot interval
I interval:	2.0 to 2.25 ft	0.25-foot interval
J interval:	2.25 to 2.5 ft	0.25-foot interval
K - R intervals:	2.5 to 4.5 ft	0.25-foot intervals (at one station in the in the 2005 Environmental Dredging Pilot Study Area only)

Type of sample – Sample types include field samples (S), field duplicate samples (T), equipment rinsate blanks (R), and performance evaluation sample (P).

For example, 12A-0423-C1BS would refer to a sample obtained during the LRC SSP (12A) from Station 23 (-0423), of Core 1 (-C1) at the 0.5- to 1.5-foot interval (B), and representing a field sample (S). Performance evaluation (P) samples were identified using similar nomenclature which included date of shipment.

2.3.6 Equipment Decontamination

Sampling equipment and related materials were decontaminated in accordance with SOP No. LPR-G-03, Equipment Decontamination. Residual acids, solvents, and wash and rinse waters were captured separately and containerized for proper disposal as investigation derived waste (IDW) as described in Section 2.3.8.

2.3.7 Sample Custody, Storage, and Shipment

Following collection aboard the sampling vessel, cores were placed in a prefabricated container constructed to keep the cores vertically positioned and chilled. The grab samples were placed on ice in coolers or in the prefabricated core containers. Cores and grab samples were either transferred from the sampling vessel to a truck or from the sampling vessel to the transport vessel, from the transport vessel to a truck, and then from the truck to the walk-in-cooler at the CPG field facility. Both the

transport vessel and truck were equipped with a prefabricated core container that kept the cores vertically positioned and cores and grab samples chilled.

SOP No. LPR-S-03, Sediment Coring Using a Vibracorer, states that "Cores greater than 5.5 ft will be segmented on the vessel to allow for storage and transportation." Cores longer than 5.5 ft were retrieved at one location (12A-0418) and not segmented on the vessel. These cores were placed on ice in the core transportation box and were transported by AECOM staff directly to the CPG field facility. This procedure was not repeated.

Samples were maintained under chain-of-custody (COC) from collection, through delivery to the CPG field facility, and then through delivery to the laboratories per SOP No. LRC-G-05, Sample Custody.

Sample handling, packaging, and shipment followed procedures outlined in SOP No. LPR-G-06, Sample Packaging and Shipping. Samples were stored in the walk-in cooler maintained between 2°C and 6°C prior to and following processing. At the end of each day, sample coolers were packed for shipment and COC forms were prepared for each cooler. All coolers were shipped via United Parcel Service priority overnight delivery.

2.3.8 Investigation-Derived Waste

The management of IDW was conducted in accordance with SOP No. LPR-G-04, Investigation Derived Waste (IDW) Handling and Disposal. IDW generated during the LRC SSP included sediment residuals from the boat and processing area, spent core liners, contaminated Personal Protective Equipment (PPE), and spent equipment decontamination solutions. These materials were transferred to 55-gallon waste drums within the CPG facility on a daily basis.

Composite waste characterization samples were collected from the sediment and liquid IDW waste drums and analyzed for the following parameters, as appropriate for the matrix: percent moisture, Toxicity Characteristic Leaching Procedure (TCLP) Metals, TCLP Mercury, Total CN, Sulfide, TCLP Pesticides, TCLP VOCs, TCLP SVOCs, TCLP Herbicides, PCB Aroclors, PCDDs/PCDFs, Paint Filter Test (free liquids), pH, TPH and Flashpoint. It was assumed that non-sediment and non-liquid waste including used PPE, spent core liners, etc. would be classified similar to the sediment and liquid waste as a worst case scenario.

Based on the waste classification analytical results, the sediment and liquid IDW were classified as non-hazardous waste materials. These wastes were transported by Environmental Industrial Services Corp of New Jersey as non-hazardous wastes to Clean Venture/Cycle-Chem, Inc. (CVCC) for disposal. **Table 2-5** summarizes the non-hazardous waste drums transported and disposed of by CVCC.

Decontamination fluids nitric acid and solvents were collected in separate containers. A total of one 55-gallon drum of solvent waste (D001) and one 55-gallon drum of nitric acid wastes (D008) were transported by Environmental Industrial Services Corp to CVCC as hazardous wastes (Manifest Tracking Number 002568906 JJK).

Appendix C includes the IDW sample results, bills of lading and manifest records.

2.4 Sample Collection

Field sampling activities were conducted from January 9 to February 10, 2012. Two types of sediment samples were collected during implementation of the LRC SSP: 1) sediment cores and 2) surface grab samples. Sampling activities were documented in field log books and on site-specific field forms. Daily Activity Logs are included in **Appendix D**. Sample collection procedures are discussed in the following sections.

2.4.1 Sediment Coring

Sediment coring was performed using vibracoring techniques in accordance with SOP No. LPR-S-03, Sediment Coring Using a Vibracorer, except as noted below:

- SOP No. LPR-S-03 states that "At the start of the coring program, two attempts will be made at coring without the use of a core catcher. If the sediment cannot be retained in the core tube, then core catchers will be used for the remainder of the program at stations with similar materials." The attempts to collect cores without a core catcher were conducted on the second day of sampling and not the first. These attempts at core collection without a core catcher were not successful, so a core catcher was used for all cores.

Table 2-2 presents a summary of core collection information.

2.4.2 Sediment Grab Sample Collection

Surface sediment grab samples were collected following the procedures outlined in SOP No. LPR-S-01, Sediment Grab Sampling. **Table 2-3** presents a summary of the grab sample collection information.

2.5 Sample Processing

Processing of sediment cores and grab samples was performed in an enclosed processing tent within the CPG field facility. Sample processing procedures are discussed in the following sections.

2.5.1 Sediment Core Processing

Processing of the sediment cores was performed in accordance with SOP No. LPR-S-04, Core Processing, except as noted below:

- SOP No. LPR-S-04 allows retaining of cores in cold storage overnight to allow settlement of suspended sediment. Several cores were retained in cold storage for more than one night either to allow settlement of suspended sediment or because of core processing capacity.
- At station 12A-0484 a core with 75% recovery was used as the secondary core because the secondary core with greater than 80% recovery had loose sediment in the shallow 0 to 0.5 ft interval. At station 12A-0430 all cores had short recovery, less than one foot. A core with 79% recovery was processed as the HRC because it had a longer length than the other available core that was shorter in length but had greater than 80% recovery.
- At select stations (12A-0419, 12A-0426, 12A-0427, 12A-0434, 12A-0457, and 12A-0463) where the recovered core was soupy (i.e., had a high water content) or where the station geology made it difficult to collect multiple cores, only one LRC core was collected and the sample volume for the shallowest sample interval was supplemented with the grab sample. At these stations the analytes butyltins, cyanide, TAL metals and titanium, TPH, and TOC were collected from homogenized grab samples when additional volume was needed for the shallowest sample interval.

During core processing lithology logs were developed for each core. The lithology logs are included as **Appendix E** and the material observed in the deepest processed interval for each station are described in **Table 2-2**, along with depth to native material, if encountered. Each core was also photographed. The core photographs are included in **Appendix F**. The core samples were also screened for VOCs, mercury, and hydrogen sulfide (H_2S). The highest headspace readings recorded for each station are shown in **Table 2-6**.

2.5.2 Sediment Grab Sample Processing

Processing of the sediment grab samples was performed in accordance with SOP No. LPR-S-1, Sediment Grab Sampling.

A description of the material observed in the grab samples for each station is provided in **Table 2-3**.

2.6 Field Measurements

Bulk density and salinity were measured at the CPG field facility at the time of sediment processing. The following procedures were followed to measure these constituents.

2.6.1 Sediment Bulk Density Measurements

The average bulk density of each sediment core was determined for each core by taking the weight of each core, subtracting the average weight of the non-sediment elements (core liner, end-caps and tape) and the weight (based on volume) of the overlying water column, then dividing the result by the calculated volume of sediment. Bulk density measurement results are provided in **Table 2-7**.

2.6.2 Salinity Measurements

The salinity of the pore water at each station was measured using a refractometer as specified by SOP No. LPR-S-01, Sediment Grab Sampling. Where available, the water for each measurement was obtained from overlying water after the grab samples were transported to the CPG facility. With the use of a power grab to collect sediment grab samples many grab samples did not have overlying water. If overlying water was not available from the grab sample, salinity measurements were obtained from overlying water in the core samples after they were transported to the field facility and before processing the top interval. The salinity measurements are tabulated on **Table 2-8**.

2.7 Laboratory Analysis

Samples were analyzed according to the methods specified in the LRC SSP QAPP (AECOM 2012a). **Table 2-1** provides the analytical methods utilized for the LRC SSP sediment sample analysis.

The majority of analyses were performed using the stated SOPs without modification. However, during the program some analyses required modification. This section provides details on modifications, as well as clarifications of the protocols used for specific analyte groups.

2.7.1 PCDD/PCDFs

According to the PCDD/PCDF method SOP (included in Appendix B of the LRC SSP QAPP [AECOM 2012a]), the sample weight used for extraction should be 10 grams dry weight equivalent. Based on Analytical Perspective's experience with samples from the Passaic River in conjunction with the results from some of the first LRC SSP samples analyzed, Analytical Perspectives reduced the sample weight used for extraction to 5 grams dry weight equivalent in order to limit laboratory contamination, analytical data that does not meet the quality objectives of the QAPP, delay in the reporting of the analytical data, and potential health and safety risks to the Analytical Perspectives laboratory personnel. In situations where this modification yielded non-detect results for 2,3,7,8-tetrachlorodibenzodioxin (TCDD) above the QAPP data quality levels (DQLs), Analytical Perspectives further concentrated and re-analyzed the sample extracts, or re-extracted a larger aliquot as needed. The method modification was documented and approved by USEPA in FM-120316-1.

2.7.2 Grain Size

As discussed in Section 2.1.4, the grain size, specific gravity, and moisture content samples from station 12A-0424 were sent to the backup laboratory, PTS Laboratories, Inc., due to elevated mercury vapor

readings observed during core processing. The grain size analysis performed by PTS Laboratories, Inc. used a #200 mesh screen to determine the fines content as opposed to the #230 mesh screen that was used by the primary laboratory, GeoTesting Express, for all the other samples.

2.8 Quality Assurance/Quality Control

2.8.1 Quality Control Samples

Field and laboratory QC samples were collected as part of the LRC SSP. The purpose of these samples was to allow the quality of the data, in terms of accuracy/bias and precision, to be evaluated. Data quality and usability is discussed in Section 4.0.

2.8.1.1 Field Quality Control Samples

Field QC samples included field duplicate samples, equipment rinse blanks, and site-specific matrix spike and matrix spike duplicate (MS/MSD) samples that were collected for analysis by the laboratory. Field QC samples were collected at the frequency required by the program (AECOM 2012a). A discussion of the results for these samples and other QC measures is provided in Section 4.0.

2.8.1.2 Laboratory Quality Control Samples

Laboratory QC samples were analyzed to provide a means of assessing the accuracy and precision of the analytical data. The laboratory QC program for the LRC SSP was based on analytical method requirements and the data quality needs of the program; a summary of the expected laboratory QC samples, frequency, and acceptance criteria was included in the LRC SSP QAPP (AECOM 2012a). These samples included, as appropriate for the method, method/preparation blanks, laboratory control samples (LCSs), surrogates, labeled internal standards, tracers, laboratory duplicates, and MS/MSD samples. Laboratory QC samples were analyzed at the frequency required by the program (AECOM 2012a). A discussion of the results for these samples and other QC measures is provided in Section 4.0.

2.8.1.3 Performance Evaluation Program

Pre-program performance evaluation (PE) samples were submitted to both primary and back-up laboratories and analyzed in August 2011 prior to the start of the RM 10.9 sampling program. A pre-program PE study was not performed prior to the LRC SSP program because the LRC SSP was conducted within six months of the RM 10.9 program and the same analytical laboratories were used for both programs (AECOM 2012a). A summary of the results of the pre-program PE samples can be found in Appendix L of the River Mile 10.9 Characterization Program Summary, Lower Passaic River Study Area (CH2M Hill and AECOM 2012).

In addition to the pre-program PEs, laboratories performing analysis for PCDD/PCDFs, PCB congeners, PAHs, and organochlorine pesticides also analyzed known (i.e., not blind) PE samples during the LRC SSP at a rate of 1 PE sample per 20 field samples. The PCDD/PCDFs and PCB congeners PE samples were obtained from Resource Technology Corporation of Laramie, Wyoming. The PAHs and organochlorine pesticides PE samples were obtained from Wibby Environmental (now Phenova) of Golden, Colorado. The vendors used for the in-program PE samples are consistent with the vendors used for the pre-program PE study and RM10.9 program. The in-program PE samples were not submitted blind; the use of non-blind PE samples is consistent with the RM10.9 sampling program and with the LRC SSP QAPP (AECOM 2012a). The results for the in-program PE samples are included in **Appendix G**.

2.8.2 Data Validation

The laboratory results for the LRC SSP were subjected to formal data validation and data qualification per the program requirements (AECOM 2012a). All validation was performed by AECOM's

subcontractor, LDC. In general, the USEPA Region 2 validation SOPs were used as the basis for validation. If a Region 2 SOP was not available for a specific method, an SOP for a similar method was adopted for guidance. Validation qualifiers and definitions are provided in **Table 2-9** and the data validation reports (DVRs) are contained in **Appendix H**.

At a minimum, all analytical fractions within a sample delivery group (SDG) received a limited validation. Data packages subjected to limited validation received a completeness check to ensure that the data package contained the information necessary for full validation in the event that level of validation was needed at a later date.

Full validation (including review of raw data and verification of selected calculations) was conducted for all PCDD/PCDF and PCB congener analytical fractions. For all other parameters, full validation was performed on the first two SDGs received for each analytical fraction. After the first two SDGs the remaining SDGs were subjected to full validation for every tenth SDG, and limited validation for the other SDGs.

2.8.3 Third-Party Evaluations

2.8.3.1 Field Oversight

USEPA's oversight contractor, CDM Smith, was present at the CPG field facility and on board the vessel(s) to perform oversight of sample collection and processing and to collect split samples.

2.8.3.2 Split Sample Collection

CDM Smith personnel provided the required sample containers for split samples. AECOM personnel filled both the LRC SSP and CDM Smith sample containers from the same grab sample or homogenized sediment mixture collected from cores to ensure comparability. Generally, additional sample cores were required to obtain sufficient volume for split sample analyses. The CDM Smith split samples collected during sampling operations are listed in **Table 2-10**. The information in this table was provided by CDM Smith.

2.9 Data Management

The data generated during the LRC SSP included sample locations, sample collection and processing records, lithological descriptions, water level data, sample custody records, analytical results, and miscellaneous other records associated with field activities. Field data were either recorded manually onto standardized forms or in bound logbooks, or were entered into electronic templates on field laptop computers. Analytical results were received as data reports in Adobe Acrobat file format and as EQuIS® four-file electronic data deliverables (EDDs).

Table 2-11 lists the types of field and laboratory data that have been collected and prepared. For each data type, it is noted whether the data are provided in this report or whether they are included only by reference and are maintained in the project files.

Data is submitted to the USEPA each month, per the Settlement Agreement, in Region 2 multi-media electronic data deliverable (MEDD) format along with the monthly progress report.

2.9.1 Reporting Conventions

All sediment results are reported on a dry weight basis. Specific choices that were made in calculation and reporting of data that require additional explanation to ensure complete understanding of the final reported values are discussed below.

2.9.1.1 PCDDs/PCDFs

All results flagged as Estimated Maximum Possible Concentration (EMPC) due to ion ratio failures were treated as estimated detections (EMPC-J) per USEPA Region 2 validation guidance. Homolog totals in the database include EMPC values.

2.9.1.2 PCB Congeners

The reporting convention used in the SSP dataset for PCB congeners is to report all 209 congeners as separate analytes. All results flagged as EMPCs due to ion ratio failures were treated as estimated detections (EMPC-J) per USEPA Region 2 validation guidance. Coeluters are noted in the laboratory qualifiers by a C flag followed by the lowest congener number in the coeluting group. A separate total PCB sum was added to the database with the Chemical Abstract Service Number ("cas_rn") of 'PCB' and analyte name of 'PCB, TOTAL'. All ND congener results were treated as zeros in calculating this total value and no coeluters were double counted.

Validation of homolog groups with respect to method blanks was performed treating the homolog results as separate analytes. Because the homolog groups were treated as separate analytes during validation, there are some cases where summation of the congeners does not equal the associated homolog group total concentration (due to the manner that blank actions were applied). Therefore, to avoid this discrepancy, after validation was completed, the homolog values were recalculated based on the final blank-corrected individual congener results so that the sums of all homolog results and the sum of all congener results for any given sample would be equal within the limits posed by rounding errors. These corrected homolog values have replaced the original validation results in the database.

Table 2-1
Analytical Methods and Laboratories for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Analysis	Method Reference	Laboratory SOP	Laboratory
Semivolatile Organics	EPA 8270C	GC/MS Analysis Based on Method 8270C, KNOX-MS-0016, Rev. 11, 7/12/11	TestAmerica, Knoxville, TN
	EPA 3500 and 3600 Methods	Extraction and Cleanup of Organic Compounds from Waters, Soils, Solids, Sediments, Tissue, and Wastes Based on SW-846 3500 and 3600 Methods, KNOX-OP-0011, Rev. 13, 1/28/2011	TestAmerica, Knoxville, TN
PAHs-HRGC/LRMS-SIM	NOAA 130	Extraction of Selected Semivolatile Organic Compounds and Alkylated PAHs for Analysis by GC/MS-SIM, KNOX OP-0023, Rev. 1, 2/3/2011	TestAmerica, Knoxville, TN
	NOAA 130, California EPA Air Resources Board Method 429	Isotope Dilution Analysis of Selected Semivolatile Organic Compounds and Alkylated PAHs by Gas Chromatography/Mass Spectrometry-Selected Ion Monitoring (GC/MS-SIM), KNOX-ID-0016, Rev. 8, 8/13/2010	TestAmerica, Knoxville, TN
PCBs (Homologs and Congeners)	EPA 1668A	High Resolution Mass Spectrometry Method 1668A for Solid/Air/Aqueous/Tissue Matrices, AP-CM-7, Rev. 9-1, 10/8/2010	Analytical Perspectives, Wilmington, NC
Ra-226	EPA 600/80-032 Method 901.1	Standard Operating Procedure for the Determination of Gamma Isotopes, GL-RAD-A-013, Rev. 22, 5/2011	GEL, Charleston, SC
	EPA 600/80-032 Method 901.1	Standard Operating Procedure for Gamma Spectroscopy System Operation, GL-RAD-I-001, Rev. 16, 8/2011	GEL, Charleston, SC
	ASTM C999-05; ASTM D6323-98	Standard Operating Procedure for Soil Sample Preparation for the Determination of Radionuclides, GL-RAD-A-021, Rev. 7/2011	GEL, Charleston, SC
Pb-210[1]	HASL-300, 28th Edition, PO-01-RC	Standard Operating Procedure for the Determination of Radiometric Polonium, GL-RAD-A-016, Rev. 13, 5/2011	GEL, Charleston, SC
	ASTM Vol. 12. 02 E181, ASTM C 1128-01, ASTM C1159-03	Standard Operating Procedure for Alpha Spectroscopy System, GL-RAD-I-009, Rev. 12, 7/2011	GEL, Charleston, SC
	ASTM C999-05; ASTM D6323-98	Standard Operating Procedure for Soil Sample Preparation for the Determination of Radionuclides, GL-RAD-A-021, Rev. 7/2011	GEL, Charleston, SC

Table 2-1
Analytical Methods and Laboratories for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Analysis	Method Reference	Laboratory SOP	Laboratory
Organochlorine Pesticides (HRGC/HRMS)	EPA 3640A	Gel-Permeation Cleanup, WS-OP-0012, Rev. 4.2, 3/5/2011	TestAmerica, West Sacramento, CA
	EPA 1699, NYSDEC HRMS-2	Analysis of Organochlorine Pesticides by High Resolution Gas Chromatography/High Resolution Mass Spectrometry, WS-ID-0014, Rev. 5.5, 9/9/2011	Test America West Sacramento, CA
TAL Metals, Titanium	EPA 3050	Metals Digestion, MET-3050, Rev. 11, 6/14/2010	CAS, Kelso, WA
	EPA 6010C	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP), MET-ICP, Rev. 22, 7/9/2010	CAS, Kelso, WA
	EPA 6020A	Determination of Metals and Trace Elements by Inductively Coupled Plasma-Mass Spectrometry, EPA Method 6020, MET-6020, Rev. 14, 3/19/2010	CAS, Kelso, WA
Butyltins	Krone[2]	Extraction of Organotins in Sediment, Water and Tissue Matrices, EXT-OSWT, Rev. 6, 11/10/2009	CAS, Kelso, WA
	Krone[2]	Butyltins, SOC-BUTYL, Rev. 9, 11/5/2010	CAS, Kelso, WA
AVS/SEM	EPA-821-r-91-100 (12/91)	Sulfides, Acid Volatile, GEN-AVS, Rev. 5, 1/26/2005	CAS, Kelso, WA
	EPA 6010C	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP), MET-ICP, Rev. 22, 7/9/2010	CAS, Kelso, WA
	EPA 7470A	Mercury in Liquid Waste; MET-7470A, Rev. 14, 9/16/2009	CAS, Kelso, WA
Ammonia	EPA 350.1	Ammonia by Flow Injection Analysis, GEN-350.1, Rev. 8, 3/23/2010	CAS, Kelso, WA

Table 2-1
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Lower Passaic River Restoration Project

Analysis	Method Reference	Laboratory SOP	Laboratory
Cyanide	EPA 335.2	Total Cyanides and Cyanides Amenable to Chlorination, GEN-CN, Rev. 16, 12/10/2010	CAS, Kelso, WA
Phosphorus	EPA 365.3	Phosphorus Determination Using Colorimetric Procedure, GEN-365.3, Rev. 10, 8/28/2008 (Includes sample preparation)	CAS, Kelso, WA
TKN	ASTM D3590-89A, ASTM D1426-93B	Nitrogen, Total and Soluble Kjeldahl, GEN-TKN, Rev. 12, 2/17/2011 (Includes sample preparation)	CAS, Kelso, WA
TOC	Lloyd Kahn Method	Carbon, Total Organic in Soil, GEN-ASTM, Rev. 6, 10/18/2007	CAS, Kelso, WA
Total Sulfide	EPA 9030B	Total Sulfides by Methylene Blue Determination, GEN-9030, Rev. 10, 12/21/09 (Includes sample preparation)	CAS, Kelso, WA
TPH Extractables	New Jersey OQA-QAM-025-02/08	Quantitation of Semi-Volatile Petroleum Products by GC/FID (New Jersey OQA-QAM-025-02/08), BR-GC-009, Rev. 1, 9/10/2008; SOP Change-In-Process Attachment, Quantitation of SVOA Petroleum Products by GC/FID (CIPA-BR-GC-009_09.25.08)	TestAmerica, Burlington, VT
PCDD/PCDFs	EPA 1613B	Polychlorinated Dibenzo Dioxin/Furans, AP-CM-5, Rev. 15, 10/8/2010	Analytical Perspectives, Wilmington, NC
Low Level Mercury	EPA 1631	BRL Procedure for EPA Method 1631, Total Mercury in Tissue, Sludge, Sediment, and Soil by Acid Digestion and Bromide Chloride (BrCl) Oxidation by Cold Vapor Atomic Fluorescence Spectrometry (CVAFS), BR-0002, Rev. 010c, 2/11/2010	Brooks Rand, Seattle, WA
Grain Size	ASTM D422	Test Method for Particle Size Analysis of Soils, Rev. 7, 9/2010	GeoTesting Express, Acton, MA
	ASTM D422	Grain Size Analysis by Sieve + Hydrometer Method Standard Operating Procedure, ASTMD422-HYDROMETER-SOP, Revision No. 1.0, 05/03/2010	PTS Laboratories, Inc., Santa Fe Springs, CA
Specific Gravity	ASTM D854	Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer, Rev. 5, 9/2010	GeoTesting Express, Acton, MA
	ASTM D854	Specific Gravity of Soils Standard Operating Procedure, ASTMD854-SOP, Revision No. 1.1, 4/5/2010	PTS Laboratories, Inc., Santa Fe Springs, CA

Table 2-1
Analytical Methods and Laboratories for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Analysis	Method Reference	Laboratory SOP	Laboratory
Percent Moisture	EPA 160.3	Percent Solids Determination, AP-SP-C2, Rev. 6, 10/8/2010	Analytical Perspectives, Wilmington, NC
	EPA 160.3 SM2540G	Dry Weight Determination, BR-1501, Rev. 3, 6/6/06	Brooks Rand, Seattle, WA
	EPA 160.3	Total Solids, GEN-160.3, Rev. 11, 4/10/2007	CAS, Kelso, WA
	ASTM D2216	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock Mass, Rev. 5, 9/2010	GeoTesting Express, Acton, MA
	ASTM D2216	Determination of Water (Moisture) Content Standard Operating Procedure, ASTMD2216-SOP, Revision No. 1.1, 7/16/2010	PTS Laboratories, Inc., Santa Fe Springs, CA
	EPA 160.3	Percent Moisture, KNOX-WC-0012, Rev. 8, 1/27/2010	TestAmerica, Knoxville, TN
	ASTM D2216	Determination of Percent Moisture [ASTM D2216], SOP No. WS-OP-0013, Rev. 4.1, 02/16/2011	TestAmerica West Sacramento, CA
	USEPA CLP SOW	Percent Moisture Determination, BR-WC-006, Rev. 6, 10/29/2010	TestAmerica, Burlington, VT

Notes:
[1]Pb-210 activity will be derived from Po-210
[2] Krone, C.A. *et al* 1988.
ASTM - American Society for Testing and Materials
AVS/SEM - Acid Volatile Sulfides/Simultaneously Extracted Metals
CLP - Contract Laboratory Program
CVAFS - Cold Vapor Atomic Fluorescence Spectrometry
EPA - United States Environmental Protection Agency
GC/FID - Gas Chromatography/Flame Ionization Detector
GC/MS - Gas Chromatography/Mass Spectrometry
GEL - General Engineering Laboratories, LLC
HASL - Health and Safety Laboratory
HRGC/HRMS - High Resolution Gas Chromatography-High Resolution Mass Spectrometry
HRGC/LRMS - High Resolution Gas Chromatography-Low Resolution Mass Spectrometry
ICP - Inductively Coupled Plasma
NOAA - National Oceanic and Atmospheric Administration
NYSDEC - New York State Department of Environmental Conservation
PAH - Polycyclic Aromatic Hydrocarbons
Pb-210 - Lead Isotope 210
PCB - Polychlorinated Biphenyl
PCDD - Polychlorinated Dibenzodioxins
PCDF - Polychlorinated Dibenzofurans
Ra-226 - Radium Isotope 226
SIM - Selective Ion Monitoring
SOP - Standard Operating Procedure
SOW - Statement of Work
SVOA - Semivolatile Organic Analysis
TAL - Target Analyte List
TKN - Total Kjeldahl Nitrogen
TOC - Total Organic Carbon
TPH - Total Petroleum Hydrocarbons
USEPA - United States Environmental Protection Agency

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0401	2/9/12	0.17	C1	LRC	597950.93	684780.25	4.5	4.2	93.3	0.5	7.1	-3		SILT, little clay trace fine sand, (2.5Y 2.5/1) black, low plasticity, soft, wet, trace organics, clam @ 0.3'
12A-0401	2/9/12	0.17	C2	LRC	597949.69	684776.6	4.5	4.3	95.6	3.79	7.2	-3		clayey SILT, trace fine sand trace organics, (2.5Y 2.5/1) black, low plasticity, stiff, wet to moist, clams @ 0.9', 2.0'
12A-0401	2/9/12	0.17	C3	HRC	597948.72	684768.96	4.5	4.1	91.1	3.91	7.3	-3.1		fine to medium SAND, trace silt, (10YR 3/1) very dark gray, medium dense, moist
12A-0402	2/8/12	0.25	C2	HRC	596830.91	684765.58	4.5	4.2	93.3	3.67	21.4	-22.2		SILT, some clay little organics, (10YR 2/1) black, low plasticity, very soft, wet
12A-0402	2/8/12	0.25	C3	LRC	596828.01	684764.03	4.5	3.8	84.4	0.5	21.4	-22.4		organics little silt, (10YR 2/1) black, loose, wet, trace fine sand.
12A-0402	2/8/12	0.25	C4	LRC	596830.26	684760.63	4.5	4	88.9	3.46	20.9	-22.1		SILT, some clay some organics, (10YR 2/1) black, low plasticity, very soft, wet
12A-0403	2/7/12	0.5	C1	LRC	597352.62	686414.25	4.5	4.5	100	3.92	6.1	-2.9		SILT, some clay trace organics, (2.5Y 3/1) very dark gray, soft to medium stiff, wet, low to med. plasticity, slight SLO, black staining & moderate SLO 0.86-1.7', shells with some fine sand @ 2.2'
12A-0403	2/7/12	0.5	C2	HRC	597356.92	686413.65	4.5	4.5	100	4.02	6.3	-3		SILT, some clay trace organics, (2.5YR 3/1) dark reddish gray, (2.5Y 3/1) very dark gray, soft to medium stiff, wet, low to medium plasticity, slight SLO, black staining and moderate SLO @ 0.99-1.67'
12A-0403	2/7/12	0.5	C3	LRC	597357.12	686418.88	4.5	4.2	93.3	0.5	6.3	-2.9		SILT, little clay trace fine sand, (2.5Y 3/1) very dark gray, low plasticity, very soft, wet, trace organics, slight SLO
12A-0404	2/1/12	0.68	C2	LRC	597581.69	687380.81	4.5	3.9	86.7	3.41	4.1	-2.3		SILT, little clay, (5Y 2.5/1) black, low plasticity, medium stiff, moist, SILT/v.fine SAND
12A-0404	2/1/12	0.68	C3	LRC	597578.73	687381.55	4.5	4	88.9	2.56	4.4	-2.4		SILT, little clay, (5Y 2.5/1) black, low plasticity, medium stiff to stiff, moist, SILT/v.fine SAND, fine shells 2.1-2.2', 3.4'
12A-0404	2/1/12	0.68	C4	HRC	597572.26	687379.48	4.5	4	88.9	3.42	4.5	-2.4		SILT, little clay, (5Y 2.5/1) black, low plasticity, medium stiff, moist, SILT/v.fine SAND, clay content increases with depth, thin layer of wood @ 2.3'
12A-0405	2/1/12	1.31	C2	LRC	597751.75	690601.46	4.5	3.9	86.7	3.36	16	-15.9		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, non plastic, very soft to soft, wet, becomes low plastic with depth, organics w/little silt 0-0.2', glass debris (syringe cap) @ 0.15', organic content decreases with depth, black staining in bands 0.7-0.81', 1.02-1.2', 1.38-1.53', 2.1-2.2'
12A-0405	2/1/12	1.31	C3	LRC	597754.56	690603.38	4.5	3.8	84.4	0.5	16.2	-15.9		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, non plastic, very soft, wet, organic layer at surface, plastic debris @ 0.2'
12A-0405	2/1/12	1.31	C4	HRC	597754.07	690607.56	4.5	3.7	82.2	3.1	16.2	-15.6		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, very soft, wet, nonplastic - low plasticity, organics w/ little silt 0-0.2', organic content decreases w/ depth, black staining 0.96-1.2', 1.43-1.6', 1.97-2.13'
12A-0406	1/28/12	1.68	C1	HRC	598176.11	692481.78	4.5	3.9	86.7	3.25	20.1	-18.6		SILT, some clay little organics, (N 2.5/) black, low plasticity, medium stiff, moist, black HC-like staining and odor 1.85-3.25'
12A-0406	1/28/12	1.68	C2	LRC	598179.79	692480.68	4.5	4	88.9	3.37	19.8	-18.7		SILT, some clay little organics, (N 2.5/) black, low plasticity, medium stiff, moist, slight HCLO & black HC-like staining throughout
12A-0406	1/28/12	1.68	C3	LRC	598185.1	692483.9	4.4	4	90.9	0.5	19.5	-18.8		SILT, some organics little fine to medium sand, (10YR 3/1) very dark gray, non plastic very soft, saturated
12A-0407	1/26/12	1.83	C1	HRC	597954.74	693315.93	4.5	3.8	84.4	3.22	4.2	-0.7		clayey SILT, trace fine sand, (7.5YR 2.5/1) black, low plasticity, medium stiff, moist
12A-0407	1/26/12	1.83	C2	LRC	597955.16	693318.86	4.5	4.3	95.6	0.5	4.5	-0.8		SILT, and organics trace fine sand, (10YR 2/1) black, low plasticity, very soft, saturated to wet
12A-0407	1/26/12	1.83	C3	LRC	597963.72	693317.54	4.5	4.3	95.6	3.46	4.4	-0.6		clayey SILT, trace fine sand, (7.5YR 2.5/1) black, low plasticity, firm, moist
12A-0408	2/3/12	1.97	C1	LRC	598294.48	694033.69	4.5	3.9	86.7	0.5	27	-27.7		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, low plasticity, very soft, wet
12A-0408	2/3/12	1.97	C2	HRC	598285.36	694033.15	4.5	4.2	93.3	3.7	27.1	-27.7		SILT, some clay trace fine sand, (2.5Y 2.5/1) black, soft to medium stiff, wet, slight HCLO, low to medium plasticity, intermittent black HC-like staining and moderate HCLO 0.5-1.42', 1.83-2.21', black HC-like staining throughout and moderate HCLO 1.42-1.83', 2.21-3.70'
12A-0408	2/3/12	1.97	C3	LRC	598287.88	694030.78	4.5	4.2	93.3	3.68	27.3	-27.8		SILT, little clay trace organics, (2.5Y 2.5/1) black, low plasticity, soft, wet, slight HCLO, black HC-like staining & moderate HCLO 1.1-1.51' & 1.9-3.68', intermittent black HC like staining 1.51-1.9'
12A-0409	2/6/12	1.96	C2	HRC	598095.08	693948.88	4.5	3.7	82.2	3.19	7.1	-4.7		SILT, and organics trace fine sand, (10YR 2/1) black, very soft to soft, saturated to wet, little clay, non-plastic to low plasticity, organic content decreases to little organics @ 1.3', organics (leaves) layer @ 1.25', 2.75-2.84'
12A-0409	2/6/12	1.96	C7	LRC	598093.83	693962.67	4.5	4.2	93.3	3.62	5.1	-4.9		organics little silt, (10YR 2/1) black, stiff, wet, large plastic debris 3.15-3.22'
12A-0409	2/6/12	1.96	C8	LRC	598094.96	693959.02	4.5	3.8	84.4	0.5	4.6	-4.7		SILT, and organics trace fine sand, (10YR 2/1) black, non plastic, very soft, wet
12A-0410	2/6/12	1.98	C1	HRC	598357.35	694073.61	4.5	4.7	104.4	4.32	23	-24.8		SILT, little clay trace organics, (5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, clay content increases w/ depth to 'some', color change to Gley (2.5/N), staining in bands @ 1.83-3.68, black staining throughout and moderate HCLO @ 3.68-4.32
12A-0410	2/6/12	1.98	C2	LRC	598355.4	694071.46	4.5	3.7	82.2	3.2	23.6	-25.6		SILT, little clay, (5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, clay content increases with depth grading to med. plasticity, color banding 5Y 2.5/1 to Gley 2.5/N @ 1.25-2.13', black stained with moderate HCLO 2.13-3.20'.
12A-0410	2/6/12	1.98	C3	LRC	598360.5	694067.98	2.4	2.1	87.5	0.5	22.2	-24.5		SILT, little clay and fine sand, (5Y 2.5/1) black, low plasticity, very soft, saturated, trace organics and fine gravel
12A-0411	2/2/12	2.02	C1	HRC	598222.89	694265.35	4.5	3.9	86.7	3.4	26.7	-26.5		SILT, little clay trace fine sand, (N 2.5/) black, low plasticity, soft to medium stiff, moist, trace organics, black staining and moderate TLO throughout, staining heavy @ 2.85-3.40'
12A-0411	2/2/12	2.02	C2	LRC	598222.79	694269.24	4.5	4.6	102.2	4.08	26.8	-26.7		SILT, little clay, (N 2.5/) black, low plasticity, soft to medium stiff, wet to moist, black staining & slight to moderate TLO 1.32-4.08', staining heavy 3.1-4.08'
12A-0411	2/2/12	2.02	C3	LRC	598219.29	694263.37	4.5	4	88.9	3.36	25.5	-25.6		SILT, some clay trace fine sand, (N 2.5/) black, low plasticity, soft to medium stiff, wet to moist, little to trace organics, slight TLO, wood frag @ 1.2'

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0412	2/2/12	2.55	C1	HRC	595887.29	695259.39	4.5	4.1	91.1	3.63	3.4	-1.4		SILT, trace organics, (2.5Y 3/1) very dark gray, non plastic, very soft to soft, wet, non-plastic to low-plasticity, shell fragment @ 0.6', lenses of brown silty fine sand @ 2.71-2.82', 2.99-3.05', 3.42-3.5', slight SLO 0.5-1.25', black staining and slight HCLO 1.5-2.7', 3.12-3.63'
12A-0412	2/2/12	2.55	C2	LRC	595883.85	695258.94	4.5	4	88.9	3.55	3.5	-1.4		SILT, trace organics trace fine sand, (2.5Y 2.5/1) black, very soft to soft, wet, nonplastic to low plasticity, slight SLO 0-0.5', plastic bag 1.5-2.5', lenses of silty fine sand 2.93-
12A-0412	2/2/12	2.55	C3	LRC	595884.23	695265.14	4.5	3.9	86.7	0.5	3.7	-1.5		SILT, trace organics trace fine sand, (2.5Y 2.5/1) black, low plasticity, very soft, wet, slight SLO
12A-0413	1/28/12	2.53	C4	LRC	596066.76	695834.51	4	3.8	95	2.88	6	-3.7		fine to coarse silty SAND, little fine to coarse gravel, (10YR 2/1) black, medium dense, wet, slight HCLO, coarse gravel @ 1.4', large piece of construction debris (mortar?) @ 1.45', clayey silt inclusion @ 1.8', 2.3-2.45', coal slag @ 2.1', sticky consistency 1.45-2.88'
12A-0413	1/28/12	2.53	C6	LRC	596061.66	695832.12	4	3.75	93.8	0.5	6	-4.2		SILT, trace fine sand trace organics, (10YR 2/1) black, low plasticity, very soft, saturated
12A-0413	1/28/12	2.53	C7	HRC	596071.56	695828.75	4	3.2	80	2.65	6	-4.7		fine to medium silty SAND, trace fine to coarse gravel, (N 2.5/) black, medium dense, wet, black staining and slight HCLO, large rock fragments @ 0.7', large coal fragment @ 1.6', lense of black stained clayey silt @ 1.8-1.93', 2-2.2', 2.33-2.41'
12A-0414	1/25/12	2.69	C1	HRC	595206.67	695526.73	4.5	4.7	104.4	3.58	19	-15.4		SILT, trace organics, (10YR 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, slight HCLO, black HC-like staining 0.5-0.9' & 1.2-1.8', interbedded silty fine sand 0.5-0.95', lenses of silty fine sand @ 1.18', 1.7' and 1.77', little organics 1.2-1.8'
12A-0414	1/25/12	2.69	C2	LRC	595208.96	695524.36	4.5	4.6	102.2	3.47	18.9	-15.6		SILT, trace organics, (7.5YR 2.5/1) black, low plasticity, very soft to medium stiff, saturated to wet, slight HCLO, lenses of silty fine sand @ 0.68', 0.8-0.92', 1.2'; black HC-like staining 0.5-3.47'
12A-0414	1/25/12	2.69	C3	LRC	595211.66	695522.02	4.5	4.8	106.7	3.8	18.1	-15.2		SILT, little organics, (7.5YR 2.5/1) black, low plasticity, very soft to medium stiff, saturated to wet, slight HCLO, lenses of silty fine sand, @ 0.75', 0.88', 1.06', 1.8'; black HC-like staining throughout
12A-0415	1/26/12	2.69	C1	LRC	595159.74	695644.56	4.5	4.3	95.6	3.9	21.5	-18.2		SILT, little clay trace fine sand, (10YR 2/1) black, low plasticity, very soft to soft, saturated to wet, black HC-like staining and slight HCLO throughout, trace organics, 2 large pieces of wood @ 0.5-0.7', thin sand lense @ 0.85', plastic debris @ 1.9'
12A-0415	1/26/12	2.69	C2	HRC	595162.51	695642.88	4.5	4	88.9	3.43	20.7	-17.9		SILT, some clay trace fine sand, (10YR 3/2) very dark grayish brown, low plasticity, soft, wet, trace organics (sticks, leaves), black HC-like staining and slight HCLO throughout, thin layer of medium grain sand w/ small pieces of slag @ 1.6'
12A-0415	1/26/12	2.69	C3	LRC	595166.92	695647.31	4.5	3.7	82.2	0.5	20.1	-17.8		SILT, trace clay trace fine sand, (10YR 2/1) black, low plasticity, soft, saturated to wet, trace organics, black staining and slight HCLO
12A-0416[5]	1/31/12	2.84	C1	LRC	594380.48	695435.15	5.5	4.6	83.6	0.5	14.1	-15		SILT, little fine sand trace clay, (10YR 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, trace organics
12A-0416[5]	1/31/12	2.84	C3	HRC	594385.15	695439.34	6	5.8	96.7	5.17	14.2	-14.9		clayey SILT, trace organics, (10YR 3/1) very dark gray, medium plasticity, medium stiff to stiff, wet to moist, slight HCLO, lenses of silty fine sand @ 0.67', 0.97-1.07', black HC-like staining w/ slight HCLO in bands at 0.5-0.95', 1.25-1.55', 3.2', 3.8', 4.37-4.47', 4.85-5.17'
12A-0416[5]	1/31/12	2.84	C4	LRC	594384.07	695429.84	6	5.2	86.7	4.66	14.2	-14.7		clayey SILT, trace organics, (10YR 2/1) black, medium plasticity, medium stiff to stiff, wet, black staining & HCLO @ 0.9-1.05', 1.3-1.65', 2.5-3.4', 4.1-4.55'
12A-0417[5]	1/31/12	2.85	C3	LRC	594372.77	695471.96	6	5.3	88.3	4.89	16.5	-15.9		clayey SILT, trace fine sand and organics, (10YR 2/2) very dark brown, low plasticity, soft to medium stiff, moist, black staining & slight HCLO 0.95-1.35', 2.9-3.9', 4.7-4.89'
12A-0417[5]	1/31/12	2.85	C4	LRC	594371.65	695479.52	6	5.5	91.7	5.04	16.9	-16.1		clayey SILT, trace organics, (10YR 2/2) very dark brown, low plasticity, medium stiff, moist, moderate HCLO & black staining (Gley 2.5/N) @ 2.7-5.04'
12A-0418[5]	1/30/12	2.84	C1	LRC	594384.37	695395.16	5.5	5.3	96.4	4.83	11.4	-12.9		SILT, some clay trace fine sand, (2.5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, interbedded organics, tar-like odor & black staining throughout
12A-0418[5]	1/30/12	2.84	C2	LRC	594388.49	695384.23	5.5	4.7	85.5	0.5	11.5	-12.3		SILT, little fine sand, (7.5YR 3/2) dark brown, non plastic, very soft, saturated
12A-0418[5]	1/30/12	2.84	C3	LRC	594390.8	695387.96	5.5	4.6	83.6	4.07	12.1	-12.4		clayey SILT, trace organics trace fine sand, (N 2.5/) black, low plasticity, medium stiff, moist, tar-like staining & odor throughout, clay content decreases with depth
12A-0419	1/20/12	2.86	C2	HRC	594269.29	695575.61	4	3.5	87.5	2.83	12.4	-15.7		SILT, some organics, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated, some black staining 0.98-1.04',1.7', 1.8-2.83'; organic layers 2.42-2.65', 2.73-2.78'
12A-0419	1/20/12	2.86	C4	LRC	594272.96	695576.34	4	3.8	95	3.07	12.8	-15.8		SILT, some organics, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated, some black staining @ 1.45' & 1.65-3.07', organic layers 2.15-2.2', 2.65-2.7'
12A-0420	1/20/12	2.96	C1	LRC	593762.32	695337.8	4	4.6	115	3.57	14.4	-14.3		SILT, little organics trace fine sand, (10YR 4/1) dark gray, low plasticity, very soft to soft, saturated to wet, slight HC-like odor, color change to 10YR 2/1 at 0.5', some organics 0.8-1.0', lenses of silty fine sand 1.1-1.3' & 2.22-2.36'
12A-0420	1/20/12	2.96	C2	LRC	593760.11	695340.67	4	3.9	97.5	3.03	14.1	-14.3		SILT, little organics trace fine sand, (10YR 2/1) black, low plasticity, soft, wet, slight HC-like odor, plastic debris @ 1.15', lense of silty fine sand @ 1.6', organic lense (sticks, leaves) @ 1.8', black HC-like staining 0.5-1.9'
12A-0420	1/20/12	2.96	C3	HRC	593759.53	695339.13	4	3.9	97.5	2.93	13.7	-14.1		SILT, little organics trace fine sand, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, grades to (2.5Y 2.5/1), slight HC-like odor 1.2-2.93', black staining throughout, organic layer 0.75-0.87', lense of silty fine sand @ 1.28' & 2.4'
12A-0421	2/7/12	3.14	C1	LRC	592763.71	695438.05	4.5	3.7	82.2	0.5	6.8	-8.7		clayey SILT, trace fine sand, (N 2.5/) black, medium plasticity, stiff, moist, sloped sediment surface in top of core, black stained with slight HCLO

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0421	2/7/12	3.14	C2	HRC	592762.35	695435.59	4.5	4	88.9	3.48	6.8	-8.9		clayey SILT, trace fine sand, (N 2.5/) black, medium stiff to stiff, moist, slight CLO, medium to low plasticity, black staining 0-1.23' & 2.28-3.48', trace organics (hair-like fibers) 1.2-2.28', becomes very stiff w/ depth
12A-0421	2/7/12	3.14	C3	LRC	592760.91	695437.39	4.5	4.3	95.6	3.59	6.3	-8.7		clayey SILT, and fine to medium sand, (5Y 3/2) dark olive gray, moist, trace fine gravel, angular deposition of SILT and SAND
12A-0422	1/24/12	3.14	C3	LRC	592860.38	695226.77	4.1	3.4	82.9	2.72	15.8	-15		SILT, little clay, (2.5Y 2.5/1) black, low plasticity, soft, wet to moist, trace fine sand and organics, black HC-like staining & slight HCLO 1.1-1.95', becomes slightly firm & clay content increases to some clay 1.95-2.6', organic layer with HC-like staining 2.6-2.72'
12A-0422	1/24/12	3.14	C4	HRC	592850.64	695228.51	4.5	4.1	91.1	3.22	12.9	-15.1		SILT, little clay, (2.5Y 2.5/1) black, low plasticity, soft, wet to moist, trace fine sand and organics, black HC-like staining and slight odor 1.45-2.6', becomes slightly firm 2.6'-3.22'
12A-0422	1/24/12	3.14	C5	LRC	592850.21	695225.25	4.5	4	88.9	3.6	12.7	-14.9		SILT, trace fine sand trace organics, (2.5Y 2.5/1) black, low plasticity, soft, wet to moist, little-trace clay, black HC-like staining & slight HCLO 2.05-3.60'
12A-0423	1/25/12	3.3	C2	HRC	591947.72	695113.86	4.2	3.4	81	2.72	10.7	-11.3		SILT, some clay trace fine sand, (10YR 3/1) very dark gray, low plasticity, stiff, wet, lense of fine silty sand @ 2.6'
12A-0423	1/25/12	3.3	C3	LRC	591946.85	695117.38	2.5	2.3	92	0.5	9.6	-10.6		SILT, with fine to coarse gravel trace fine sand, (10YR 2/1) black, low plasticity, medium stiff to loose, wet, concrete debris 0.3-0.5', slight sewer-like odor
12A-0423	1/25/12	3.3	C4	LRC	591955.35	695113.03	4	3.9	97.5	3.85	11	-12.4		SILT, some clay trace fine sand, (10YR 3/1) very dark gray, low plasticity, stiff, wet, trace organics, lense of silty fine sand @ 3.7'
12A-0424	1/25/12	3.3	C1	HRC	591922.81	695170.61	4.5	3.8	84.4	2.87	4.2	-0.6		SILT, some coarse gravel trace clay, (10YR 4/1) dark gray, low plasticity, medium stiff, moist, trace organics and fine sand, sewer-like odor, coarse subangular-subrounded gravel, large rock within coarse gravel 0.2-0.3', lense of organics @ 0.6', sand content decreases w/ depth starting @ 0.5'
12A-0424	1/25/12	3.3	C2	LRC	591922.62	695168.85	4.5	4	88.9	0.5	4.6	-0.8		SILT, some organics trace clay, (10YR 4/1) dark gray, low plasticity, medium stiff, moist, some coarse subangular gravel, trace fine sand, large rock at surface and @ 0.2-0.35'
12A-0424	1/25/12	3.3	C3	LRC	591912.92	695165.54	4.5	3.9	86.7	2.94	4.6	-0.7		SILT, trace clay trace fine sand, (10YR 4/1) dark gray, low plasticity, medium stiff, moist, some subangular coarse gravel, sand content decreases with depth starting @ 0.5'
12A-0425	1/24/12	3.45	C2	LRC	591337.52	694616	4.5	4.3	95.6	3.36	17	-18		SILT, some organics, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, organic content becomes trace @ 0.8', black HC-like staining & slight HCLO 0.9-3.36'
12A-0425	1/24/12	3.45	C3	HRC	591339.19	694612.56	4.5	4.8	106.7	3.76	16.7	-18.1		SILT, some organics, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, black HC-like staining and slight HCLO @1.15-3.76', organics content decreases to trace @ 0.5'
12A-0425	1/24/12	3.45	C4	LRC	591336.87	694607.13	4.5	4.7	104.4	3.9	16.3	-18		SILT, some organics, (2.5Y 3/1) very dark gray, low plasticity, very soft to soft, saturated to wet, black HC-like staining & slight HCLO 0.78-0.82' & 1.1-3.90', organics content decreases to trace @ 0.55', lense of silty fine sand @ 3.55'
12A-0426	1/24/12	3.64	C1	HRC	591004.97	693639.65	4	3.4	85	2.8	15	-12.7		SILT, little fine sand trace organics, (10YR 3/2) very dark grayish brown, low plasticity, very soft to soft, saturated to wet, few shells in top 1', black HC-like staining and slight odor @ 1.35'-2.80'
12A-0426	1/24/12	3.64	C6	LRC	590996.92	693651.36	4	3.5	87.5	2.83	13.2	-13.2		SILT, some clay trace fine sand, (2.5Y 2.5/1) black, low plasticity, medium stiff, moist, black HC-like staining & HCLO 2.1-2.83'
12A-0427	1/25/12	3.64	C2	HRC	590892.93	693679.8	2.5	3.6	144	2.7	23	-23.3		fine to coarse SAND, little silt, (10YR 4/1) dark gray, medium dense, moist, well graded, few silty sand lenses, clay inclusions @ 2.1 and 2.4', slight HCLO
12A-0427	1/25/12	3.64	C5	LRC	590901.32	693676.22	3.5	4.2	120	3.19	21.1	-22.7		fine to coarse SAND, trace fine gravel trace silt, (10YR 4/1) dark gray, medium dense, moist, well graded
12A-0428	1/25/12	3.64	C3	LRC	590802.27	693723.59	4	4.1	102.5	3.61	15.3	-13.7		SILT, trace organics trace clay, (10YR 2/1) black, low plasticity, soft, wet, slight HCLO, black HC-like staining 2.5-3.4', organic layers 1.96-2.15', 2.35', & 2.9'
12A-0428	1/25/12	3.64	C4	HRC	590799.26	693725.34	4	4.1	102.5	3.41	14.6	-13.4		SILT, trace organics and clay, (10YR 2/1) black, low plasticity, medium stiff to soft, black HC-like staining and odor 2.5-3.14', lenses of silty fine sand 3.17' and 3.31-3.35'
12A-0428	1/25/12	3.64	C5	LRC	590799.76	693727.11	4	4.4	110	0.5	14.3	-13.4		fine silty SAND, (7.5YR 3/1) very dark gray, medium dense, moist, homogeneous
12A-0429	1/24/12	3.64	C1	LRC	590641.1	693808.76	3.7	3	81.1	2.5	3.1	1.3		fine silty SAND, (10YR 2/1) black, medium dense, moist, homogeneous, slight HCLO, trace coarse gravel @ 2.2'
12A-0429	1/24/12	3.64	C2	LRC	590639.02	693806.44	3.6	3	83.3	2.63	3.1	1.3		fine silty SAND, (10YR 3/1) very dark gray, medium dense, moist, homogeneous, lenses of med sand @ 2.3', 2.4-2.43'; plastic debris @ 2.4'; rock fragment @ 2.45'
12A-0429	1/24/12	3.64	C3	HRC	590644.02	693812.6	2.79	2.6	93.2	2.51	3	1.3		fine silty SAND, (10YR 3/1) very dark gray, medium dense, moist, homogeneous, thin lenses of medium sand @ 2.2' and 2.35-2.4'
12A-0430	1/24/12	3.7	C1	LRC	590768.3	693404.23	1.6	1.6	100	0.94	22.5	-23.7		fine to coarse SAND, with gravel, (10YR 2/1) black, loose, wet, subrounded, well graded, slight tar-like odor
12A-0430	1/24/12	3.7	C3	LRC	590765.29	693407.14	1.3	1.2	92.3	0.9	21.4	-23.3		fine to coarse SAND, trace fine to coarse gravel, (10YR 2/1) black, loose, wet
12A-0430	1/24/12	3.7	C5	HRC	590753.24	693393.25	1.9	1.5	78.9	0.95	21	-23.2		CLAY, little silt trace fine sand, (5Y 2.5/1) black, medium plasticity, very stiff, thin fine sand lense @ 0.6', fine gravel at bottom w/ black staining and tar-like odor @ 0.9'
12A-0431	1/26/12	3.77	C4	LRC	590346.66	693266.55	3.2	2.7	84.4	2.1	3.7	0.3		fine silty SAND, trace organics, (10YR 2/1) black, dense, moist, homogeneous, some med sand @ 1.57' & 1.85', plastic debris @ 1.65'
12A-0431	1/26/12	3.77	C5	LRC	590348.49	693269.44	3	2.4	80	0.5	3.6	0.4		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, low plasticity, very soft, wet
12A-0431	1/26/12	3.77	C6	HRC	590348.26	693267.27	3	2.8	93.3	2.38	3.5	0.4		fine silty SAND, and medium sand, (10YR 2/1) black, dense, moist, interbedded, trace fine gravel @ 2.3'
12A-0432	1/27/12	3.83	C1	HRC	590372.68	692786.27	4.4	5	113.6	4.18	26.1	-22.5	2.03	fine silty SAND, (5YR 4/2) dark reddish gray, dense to very dense, moist

Table 2-2
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Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0432	1/27/12	3.83	C2	LRC	590371.32	692789.06	4.4	4.7	106.8	3.99	25.3	-22.3	3.2	fine silty SAND, (5YR 4/2) dark reddish gray, very dense, wet, homogeneous
12A-0432	1/27/12	3.83	C3	LRC	590369.91	692792.1	3.8	3.5	92.1	0.5	24.1	-21.8		SILT, some clay, (N 2.5/) black, medium plasticity, medium stiff, wet, slight HCLO
12A-0433	1/27/12	3.94	C1	HRC	589698.12	692781.59	4.5	4	88.9	3.33	7.3	-2.6		clayey SILT, trace fine sand and organics, (5Y 2.5/1) black, low plasticity, medium stiff, moist, organics (roots) @ 2.6', sand content increases to 'some' at 2.95'
12A-0433	1/27/12	3.94	C2	LRC	589697.84	692776.5	4.5	3.9	86.7	0.5	7.4	-2.8		fine to coarse sandy SILT, trace gravel, (N 2.5/) black, non plastic, soft, wet, trace organics
12A-0433	1/27/12	3.94	C3	LRC	589699.62	692773.3	4.5	3.9	86.7	3.4	7.4	-3		fine silty SAND, some clay trace roots, (5Y 2.5/1) black, dense, moist, clay lense @ 3.2-3.4'
12A-0434	1/25/12	4.05	C2	LRC	589269.76	692195	4	4.75	118.8	3.76	8.5	-4.6		SILT, trace fine sand trace fine gravel, (10YR 3/1) very dark gray, low plasticity, very soft to medium stiff, saturated to wet, stick at surface, moderate HCLO, trace fine gravel 0 0.5', intermittent black HC-like staining 0.5-1.35', black HC-like staining throughout 1.35-3.76', some coal slag 0.8', 1.5', and 1.75-2.2'
12A-0434	1/25/12	4.05	C4	HRC	589269.32	692191.56	4	3.6	90	2.92	7.6	-3.5		SILT, some clay trace organics, (N 2.5/) black, low plasticity, medium stiff to stiff, wet, black stained, moderate HCLO
12A-0435	1/27/12	4.09	C1	HRC	589033.93	692551.53	4	4.8	120	4.17	12.6	-9.8		SILT, trace clay and organics, (10YR 2/1) black, low plasticity, soft, wet, slight HCLO, black HC-like staining 1.8-4.17'
12A-0435	1/27/12	4.09	C2	LRC	589033.54	692549.83	4	3.3	82.5	0.5	12	-9.6		sandy SILT, little organics, (10YR 2/1) black, low plasticity, very soft, wet
12A-0435	1/27/12	4.09	C3	LRC	589031.72	692552.04	4	4.5	112.5	3.7	11.8	-9.8		SILT, trace clay trace organics, (10YR 2/1) black, low plasticity very soft to soft, wet, slight HCLO, black HC-like staining 1.6-3.70'
12A-0436	1/27/12	4.14	C1	LRC	588785.31	692673.94	4	4.1	102.5	3.01	6.3	-1.7		silty CLAY, trace organics, (5Y 2.5/1) black, medium plasticity, stiff, wet, HC-like stained, moderate HCLO
12A-0436	1/27/12	4.14	C4	HRC	588793.19	692674.93	4	4.5	112.5	4.09	6.4	-1.8		silty CLAY, (5Y 4/1) dark gray, medium plasticity, stiff, moist, HC-like staining and moderate HCLO 2.83-3.35,' coal slag fragment @ 2.3'
12A-0436	1/27/12	4.14	C6	LRC	588783.6	692681.91	2	2.2	110	0.5	5.2	-1.6		SILT, trace organics trace fine sand, (10YR 2/1) black, low plasticity, very soft, wet
12A-0437	2/6/12	4.24	C1	HRC	588248.15	692697.27	4.5	3.8	84.4	3.39	2.2	1.6		silty CLAY, some organics trace fine sand, (N 3/) very dark gray, medium plasticity, stiff, moist, changes to little organics (roots, grass)
12A-0437	2/8/12	4.24	C3	LRC	588245.4	692697.13	4.5	3.8	84.4	0.5	2.9	1.7		SILT, trace organics trace fine sand, (10YR 3/1) very dark gray, low plasticity, very soft, wet, trace clay
12A-0437	2/8/12	4.24	C4	LRC	588242.08	692694.89	4.5	3.9	86.7	3.21	3	1.7		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, medium stiff to stiff, wet, intermittent black staining 1.4-2.55', organics (plant matter) 2.8-3.1'
12A-0438	2/9/12	4.52	C1	LRC	586837.37	692615.87	4.5	3.8	84.4	0.5	6	-2.4		SILT, some organics trace fine sand, (2.5Y 3/1) very dark gray, low plasticity, very soft, wet
12A-0438	2/9/12	4.52	C2	HRC	586840.06	692614.05	4.5	4.1	91.1	3.72	5.9	-2.6		SILT, some organics trace fine sand, (2.5Y 3/1) very dark gray, low plasticity very soft to medium stiff, wet, plastic debris (sheeting) at 2.97' and 3.71', little organics 2.2-3.72', elastic band @ 2.95'
12A-0438	2/9/12	4.52	C3	LRC	586846.18	692613.43	4.5	4	88.9	3.44	5.5	-2.5		SILT, some organics trace fine sand, (2.5Y 2.5/1) black, low plasticity, very soft to medium stiff, wet, lense of silty fine sand 0.81-0.92', some fine sand 0.92-1.44', plastic wrap debris @ 1.96 & 2.09', little organics 2.1-2.91'
12A-0439	2/8/12	4.53	C1	HRC	586775.07	692542.41	4.5	3.9	86.7	3.32	19.6	-15.7		clayey SILT, trace organics, (5Y 2.5/1) black, low plasticity, medium stiff, wet, slight HCLO, black staining and slight HCLO 3.11-3.32', metal debris and trace coarse sand @ 3.2-3.3'
12A-0439	2/8/12	4.53	C3	LRC	586777.76	692540.52	4.5	3.8	84.4	3.22	19.4	-16.1		clayey SILT, (5Y 2.5/1) black, low plasticity, medium stiff, wet, lense of silty fine sand 3.14-3.2'
12A-0439	2/8/12	4.53	C4	LRC	586778.49	692537.92	4.5	4	88.9	3.59	19.5	-16.6		clayey SILT, little organics, (5Y 2.5/1) black, low plasticity, medium stiff, wet, organics throughout 2.83-3.29', lense of silty fine sand @ 3.29-3.47', sticks @ 3.5'
12A-0440	2/7/12	4.54	C1	HRC	586668.79	692415.08	4.1	4.1	100	3.54	21.8	-19.9		fine to medium SAND, (7.5YR 4/1) dark gray, medium dense, moist, homogeneous, slight TLO, some coarse rounded gravel @ 2.98-3.54'
12A-0440	2/7/12	4.54	C2	LRC	586669.32	692418.16	4.5	3.7	82.2	3.01	21.1	-19.7		fine silty SAND, (N 2.5/) black, very dense, wet, homogeneous, black stained with product visible throughout
12A-0440	2/7/12	4.54	C3	LRC	586673.5	692422.63	3.8	3.2	84.2	0.5	20.4	-19.7		SILT, trace fine sand trace organics, (N 2.5/) black, low plasticity, very soft, wet, moderate TLO with HC-like sheen on surface
12A-0441	1/28/12	4.63	C1	LRC	586408.93	692892.5	4.1	3.5	85.4	0.5	5.5	-2.6		SILT, little organics trace fine sand, (10YR 2/1) black, low plasticity, very soft, wet
12A-0441	1/28/12	4.63	C2	LRC	586413.22	692888.69	4.5	3.7	82.2	3.19	5.3	-2.4		SILT, little organics trace fine sand, (10YR 2/1) black, medium plasticity, very soft to medium stiff, wet to moist, organic content decreases w/depth, plastic debris @ 1.28', black staining @ 1.64-1.83', 2.07-2.35'
12A-0441	1/28/12	4.63	C4	HRC	586412.98	692893.15	4.5	4	88.9	3.46	5.1	-2.3		SILT, little organics trace fine sand, (10YR 2/1) black, medium plasticity, very soft to medium stiff, wet, organic content decreases w/ depth, black staining and slight HCLO 2.08-2.13', plastic debris @ 1.7', lenses of silty fine sand @ 2.73-2.79', 3.1', 3.16', 3.23'
12A-0442	1/26/12	4.63	C1	LRC	586367.1	692841.41	4	4.7	117.5	0.5	15	-11.7		SILT, and organics trace fine sand, (10YR 2/1) black, non plastic, very soft, saturated to wet, sewer-like odor
12A-0442	1/26/12	4.63	C2	HRC	586363.52	692842.4	4	4.5	112.5	3.8	14.9	-12.1		SILT, organics, (10YR 2/1) black, medium stiff, wet, interbedded layers of dark brown silt and organics
12A-0442	1/26/12	4.63	C3	LRC	586360.52	692842.29	4	3.7	92.5	2.99	14.8	-12.3		SILT, and organics little fine sand, (10YR 2/1) black, low plasticity, medium stiff, wet, interbedded, lenses of silty fine sand @ 1.1' and 1.5-1.65'; foil debris @ 1.15'
12A-0443	1/26/12	4.63	C3	HRC	586317.66	692807.54	3	2.9	96.7	2.25	17.4	-18.5		SILT, trace clay and organics, (10YR 2/1) black, low plasticity, very soft, wet
12A-0443	1/26/12	4.63	C4	LRC	586319.5	692807.81	3	4.3	143.3	3.35	17.2	-18.4		SILT, trace clay trace organics, (10YR 2/1) black, low plasticity, medium stiff, wet
12A-0443	1/26/12	4.63	C5	LRC	586321.24	692807.54	3	2.5	83.3	1.92	16.8	-18.2		SILT, trace clay trace fine sand, (10YR 2/1) black, low plasticity, soft, wet
12A-0444	1/28/12	4.64	C2	LRC	586196.66	692708.99	4.4	4	90.9	0.5	20	-18.2		SILT, little fine sand trace clay, (N 2.5/) black, low plasticity, very soft, wet, trace organics, black staining and tar-like odor

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0444	1/28/12	4.64	C3	LRC	586198.71	692705.52	4.5	4.2	93.3	3.57	20.4	-18.1		clayey SILT, (N 2.5/) black, low plasticity, very soft, wet, heavy black staining, strong tar-like odor throughout
12A-0444	1/28/12	4.64	C4	HRC	586200.24	692701.41	4.5	4.5	100	3.8	20.6	-18		silty SAND, (N 2.5/) black, medium dense to dense, moist, strong tar-like odor, heavy black staining, lense of wood fragments @ 2.85'
12A-0445	1/30/12	4.96	C1	LRC	585245.82	694169.3	4.4	3.6	81.8	3.1	3.3	-2.3		clayey SILT, trace fine sand, (10YR 2/1) black, low plasticity, soft to medium stiff, moist, intermittent black staining 0.8-2.25', solid black staining & slight HCLO 2.25-3.1'
12A-0445	1/30/12	4.96	C2	HRC	585243.91	694170.78	4.5	3.7	82.2	3.02	2.9	-2.1		clayey SILT, trace fine sand, (10YR 2/1) black, low plasticity, medium stiff, moist, slight HCLO, intermittent black HC-like staining 0.5-2.5', solid black HC-staining and odor 2.52-3.02'
12A-0445	1/30/12	4.96	C3	LRC	585245.81	694175.72	4.5	3.7	82.2	0.5	3.1	-2.4		clayey SILT, trace fine sand trace organics, (N 2.5/) black, low plasticity, soft, wet, slight HCLO
12A-0446	1/31/12	4.96	C1	HRC	585358.31	694198.1	4.5	4.8	106.7	4.38	15	-13		SILT, little trace fine sand, (2.5Y 2.5/1) black, very soft to soft, saturated to wet, trace clay, black color banding, fine sand lense 2.8-2.95', black staining and TLO w/ trace organics 3.05-4.38', med stiff
12A-0446	1/31/12	4.96	C2	LRC	585354.02	694195.27	4.5	3.8	84.4	3.3	15.1	-13		SILT, little clay trace fine sand, (2.5Y 2.5/1) black, low plasticity, soft to medium stiff, wet, slight black color banding to 1.95', black staining & TLO 1.95-3.30', trace organics
12A-0446	1/31/12	4.96	C3	LRC	585350.89	694191.33	4.5	3.8	84.4	0.5	14.9	-12.9		SILT, some fine sand trace clay, (2.5Y 2.5/1) black, low plasticity, very soft to soft, wet, trace organics
12A-0447	1/30/12	5.2	C2	LRC	585028.48	695470.44	4.2	4	95.2	3.36	17.1	-16.6		fine silty SAND, little organics, (10YR 2/1) black, medium dense, wet to moist, large wood fragment @ 2.25', some organics @ 3.15'
12A-0447	1/30/12	5.2	C3	LRC	585033.53	695472.72	4.5	3.6	80	3.02	16.8	-16.5		fine silty SAND, trace organics, (10YR 2/1) black, dense, wet, slight HCLO, lenses of dark brown clayey silt 2.3-2.42' and 2.61-2.72', some organics (sticks, leaves) 2.4-2.7'
12A-0447	1/30/12	5.2	C4	HRC	585031.12	695473.3	4.5	3.9	86.7	3.32	16.8	-16.5		fine silty SAND, some organics, (10YR 2/1) black, medium dense to dense, wet, lenses of clayey silt @ 1.75', 1.88', and 2.38-2.51', organic layer @ 2.15', 2.72-2.86', and 3.1'
12A-0448	2/7/12	5.9	C1	HRC	585082.97	699094.71	4	3.75	93.8	3.09	4.3	-1.7		silty CLAY, (2.5Y 2.5/1) black, medium plasticity, medium stiff to stiff, moist, trace fine sand lenses, intermittent black staining 1.77-2.46' with slight TLO
12A-0448	2/7/12	5.9	C2	LRC	585085.66	699097.42	4	3.42	85.5	2.85	3.9	-1.7		clayey SILT, trace fine to medium sand, (2.5Y 2.5/1) black, low plasticity, medium stiff to stiff, moist, intermittent black staining 1.73-2.6' with slight TLO
12A-0448	2/7/12	5.9	C3	LRC	585081.62	699096.7	4	3.3	82.5	0.5	3.7	-1.8		SILT, trace clay trace fine sand, (10YR 2/1) black, low plasticity, soft, wet to moist
12A-0449	1/31/12	6.33	C4	LRC	585170.89	701394.42	4	3.25	81.3	2.65	19.5	-18.2		SILT, little organics trace fine sand, (N 2.5/) black, low plasticity, very soft to soft, wet, moderate HCLO, becomes slight HCLO with color change to 5Y 2.5/1, plastic debris @ 0.75', lenses of silty fine sand @ 1.2-1.24', 1.31-1.38', 1.55-1.75', 2.01-2.07', 2.59-2.65'
12A-0449	1/31/12	6.33	C5	LRC	585173.96	701393.33	4	3.7	92.5	2.96	20.4	-18.7	2.92	fine silty SAND, (5YR 4/2) dark reddish gray, very dense, wet, homogeneous
12A-0449	1/31/12	6.33	C6	HRC	585177.44	701390.93	4	4.5	112.5	3.84	20.2	-18.4		fine silty SAND, (10YR 2/1) black, loose to medium dense, wet, homogeneous, slight HCLO
12A-0450	1/28/12	6.33	C2	LRC	585265.56	701352.92	4	4	100	3.28	15.4	-13.6		clayey SILT, trace organics, (10YR 2/1) black, medium plasticity, stiff, wet
12A-0450	1/28/12	6.33	C3	HRC	585269.54	701359.88	4	4.4	110	3.55	15.6	-13.4		fine SAND, trace silt little organics, (10YR 2/1) black, medium dense, wet to moist, homogeneous, organics (sticks) 0-0.15,' glass fragment @ 0.8', coal slag and coal fragments @ 0.7-0.9', organics @ 1.8-1.95' and 2.1-2.22', organics and silt @ 2.3-2.45', inclusion of silty clay @ 2.7', lense of clayey silt @ 3.03-3.1' and 3.35-3.46'
12A-0450	1/28/12	6.33	C4	LRC	585268.87	701354.98	4.2	4.5	107.1	3.87	15.8	-13.3		fine silty SAND, (7.5YR 3/1) very dark gray, dense, wet, homogeneous, lenses of organics @ 2.98', 3.57', 3.7-3.75'; lenses of clayey silt @ 3.13', 3.33-3.39', 3.65-3.7', 3.85'
12A-0451	1/13/12	6.33	C1	HRC	585418.8	701290.1	4	3.7	92.5	2.93	5.7	-1.7		SILT, some organics trace fine sand, (10YR 3/1) very dark gray, low plasticity, very soft, wet, trace clay, organics include sticks and roots, some black staining and slight HC-like odor @ 1.6-2.93', plastic debris @2.35'
12A-0451	1/13/12	6.33	C2	LRC	585412.1	701286.2	4.5	4.2	93.3	2.85	6.3	-2.1		SILT, trace clay trace fine sand, (10YR 3/1) very dark gray, low plasticity, very soft to soft, wet, slight HC-like odor, some organics (leaf debris, roots), some black staining throughout, lenses of dark brown silty fine sand @ 2-2.05', 2.2', 2.4-2.5', 2.55-2.6'; debris (linoleum) @ 2.6'
12A-0451	1/13/12	6.33	C3	LRC	585414.7	701283.6	4	3.9	97.5	0.5	6	-1.8		SILT, some organics, (10YR 3/1) very dark gray, low plasticity, very soft, wet, organics include leaves & roots
12A-0452	2/3/12	6.49	C2	HRC	585723.9	702071.47	4	3.6	90	3.1	4	-2.4		SILT, little clay trace organics, (10YR 3/1) very dark gray, soft to medium stiff, wet, low to medium plasticity
12A-0452	2/6/12	6.49	C4	LRC	585722.48	702070.61	4	3.22	80.5	0.5	5.3	-2.5		SILT, little clay trace organics, (10YR 3/1) very dark gray, low plasticity, soft, wet
12A-0452	2/6/12	6.49	C5	LRC	585724.83	702069.45	4	3.4	85	2.86	4.3	-2.3		SILT, little clay trace organics, (10YR 3/1) very dark gray, low plasticity, very soft to medium stiff, wet, plastic debris @ 0.74', trace coarse gravel at surface
12A-0453	2/1/12	6.54	C4	HRC	585651.92	702383.54	4	3.3	82.5	2.65	17.8	-15.8		SILT, little clay trace organics, (10YR 2/1) black, medium stiff, wet, low-medium plasticity, black HC-like staining and slight HCLO 2.42-2.65'
12A-0453	2/1/12	6.54	C5	LRC	585652.31	702382.44	4	3.6	90	2.59	17.5	-15.6		fine silty SAND, trace organics, (10YR 2/1) black, medium dense, wet, poorly graded, slight HCLO
12A-0453	2/1/12	6.54	C6	LRC	585649.83	702384.55	4	4.35	108.7	0.5	17.7	-15.9		SILT, some organics some fine sand, (10YR 2/1) black, low plasticity, very soft, wet
12A-0454	1/11/12	6.62	C3	LRC	585989.1	702669.4	4.2	4	95.2	3.36	16.1	-17.6		SILT, trace clay trace organics, (10YR 3/1) very dark gray, low plasticity, very soft, wet, lense of brown fine-med sand 0.3-0.45'; interbedded organics 0.7-1.2', 1.5', 1.8-2.2', 2.5-2.75'; large wood frags @ 1.0'; plastic debris @ 1.2'; black HC-like staining & slight HC-like odor 1.95-2.3'; fine silty sand lenses 1.24', 2.36-2.43', 2.95-2.9'; trace coal slag @ 2.51'
12A-0454	1/11/12	6.62	C4	LRC	586000.6	702674.1	4	3.7	92.5	0.5	15.9	-17.5		SILT, some fine to medium sand trace fine gravel, (10YR 3/1) very dark gray, low plasticity, very soft, wet, some organics

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0454	1/11/12	6.62	C5	HRC	585998.1	702674.1	4	3.9	97.5	3.17	15.9	-17.8		clayey SILT, trace fine sand, (10YR 3/1) very dark gray, low plasticity, soft to medium stiff, wet to moist, slight HC-like odor, fine sand lense 0.5-0.65'; interbedded organics at 1.15', 1.4-1.6', 1.8-2.1'; sand lense 2.15-2.3'; blk HC-like staining 2.6-3.17'
12A-0455	2/7/12	6.86	C5	LRC	586737.74	703706.09	1.2	1.25	104.2	0.5	20	-22		fine silty SAND, (10YR 3/2) very dark grayish brown, very dense, moist, homogeneous, coal slag @ 0.48', trace coarse gravel @ 0.48-0.5'
12A-0455	2/7/12	6.86	C6	LRC	586733	703708.54	2	2.4	120	1.89	19.5	-22		fine silty SAND, (10YR 3/2) very dark grayish brown, very dense, moist, homogeneous
12A-0455	2/7/12	6.86	C8	HRC	586725.64	703710.81	2.8	3.3	117.9	2.55	18.7	-21.4		fine silty SAND, (10YR 3/1) very dark gray, very dense, moist, homogeneous, coarse red rounded gravel @ 1.95-2.55'
12A-0456	2/9/12	6.76	C1	LRC	586210.25	703393.95	4	3.95	98.8	3.35	7	-2.6		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, medium stiff, wet to moist
12A-0456	2/9/12	6.76	C3	LRC	586209.06	703387.7	4	3.6	90	0.5	7.4	-2.9		SILT, little organics trace fine sand, (10YR 3/1) very dark gray, low plasticity, very soft, wet, trace clay
12A-0456	2/9/12	6.76	C4	HRC	586209.71	703397.31	4	3.9	97.5	3.61	7.1	-2.6		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, medium stiff, wet
12A-0457	1/10/12	6.95	C4	LRC	586937.1	704132.4	3.5	3.1	88.6	2.7	16.7	-18.4		fine SAND, some silt trace clay, (7.5YR 3/2) dark brown, dense, moist, homogeneous
12A-0457	1/10/12	6.95	C6	HRC	586935.1	704124.2	4	3.7	92.5	3.2	15.7	-17.8		fine SAND, some silt, (7.5YR 2.5/1) black, medium dense to dense, moist, moderate HC-like odor, clay inclusion (5YR 4/2) 2.6 - 2.8'
12A-0458	2/1/12	7.1	C1	HRC	587364.23	704804.68	4	3.35	83.8	2.97	2.6	-0.5		SILT, little clay trace organics, (10YR 2/1) black, low plasticity, soft to stiff, wet, slight HCLO, black staining and moderate HCLO 0.75-2.7', lense of medium coarse sand @ 1.16', some sand 0.5-0.6' and 1.4-1.5'
12A-0458	2/1/12	7.1	C2	LRC	587361.8	704802.39	4	3.35	83.8	0.5	2.9	-0.7		SILT, little clay trace fine sand, (10YR 2/1) black, low plasticity, soft, wet, slight HCLO, trace organics, coal frag @ 0.45', some intermittent black HC-like staining
12A-0458	2/1/12	7.1	C3	LRC	587358.94	704800.39	4	3.55	88.8	2.97	3	-0.7		clayey SILT, trace organics, (10YR 2/1) black, low plasticity, soft to medium stiff, wet, slight HCLO, rock frag @ 0.96', black staining & moderate HCLO 0.5-2.46', some fine-med sand @ 0.72', 1.27', 2.3', & 2.65', trace coarse gravel 0.75-1.15'
12A-0459	1/31/12	7.21	C1	HRC	587505.46	705428.6	4	3.7	92.5	3.18	3.1	-1.1		fine silty SAND, (7.5YR 2.5/1) black, medium dense, wet
12A-0459	1/31/12	7.21	C2	LRC	587507.52	705432.94	3.5	3.15	90	2.7	3.1	-1.1		fine silty SAND, (10YR 4/1) dark gray, dense, wet, homogeneous, lense of clayey silt 2.42-2.47'
12A-0459	1/31/12	7.21	C3	LRC	587497.17	705427.73	3.6	3.4	94.4	0.5	3.4	-1.4		fine sandy SILT, (10YR 2/1) black, non plastic, very soft, wet, slight HCLO
12A-0460	1/11/12	7.32	C1	LRC	587688.2	705899.7	4	3.7	92.5	3.15	4.8	-0.7		clayey SILT, trace organics, (10YR 3/1) very dark gray, low plasticity, soft, wet to moist, slight HC-like odor, lense of brown silty fine sand 0.73-0.78', 2.4-2.5', 2.8-2.93'; black staining, moderate HC-like odor 1.3-1.77', large rock @ 2.5', shell frags @ 2.82'
12A-0460	1/11/12	7.32	C2	HRC	587686.7	705904.1	4	3.9	97.5	3.18	5.1	-0.8		clayey SILT, trace organics, (10YR 3/1) very dark gray, low plasticity, soft, wet to moist, slight HC-like odor, lense of brown silty fine sand 0.81-0.93', 2.5-2.6', 3.0-3.08'; black HC-like staining and moderate HC-like odor 1.4-1.9'
12A-0460	1/11/12	7.32	C3	LRC	587690.7	705898.7	4	3.9	97.5	3.14	5.1	-0.6		clayey SILT, trace organics, (10YR 4/1) dark gray, low plasticity, soft, wet to moist, slight HC-like odor, lenses of brown silty fine sand 1.01-1.09', 1.93', 2.68', 3.13-3.14'; black staining & moderate HC-like odor 1.55-1.93'; shell frags @ 2.28'
12A-0461	2/9/12	7.23	C1	LRC	587089.5	705552.98	3.6	2.95	81.9	2.52	5.5	-1.4		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, soft to medium stiff, wet, trace fine sand 0-0.4', black staining with slight HCLO 0.4-2.52'
12A-0461	2/9/12	7.23	C2	HRC	587089	705549.05	4	4.05	101.3	3.33	5.4	-1.4		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, soft to medium stiff, wet, none to slight HCLO, black stained and slight HCLO 0.5-1.99' and 2.5-2.9', cobble @ 1.24-1.41'
12A-0461	2/9/12	7.23	C3	LRC	587091.49	705550.19	4	3.75	93.8	3.2	5.4	-1.6		SILT, some clay trace organics, (10YR 3/1) very dark gray, low plasticity, soft to medium stiff, wet, trace fine sand 0-0.4', black staining with slight HCLO 0.5-3.20', red stone fragment @ 2.8-3.06' (brick)
12A-0462	1/10/12	7.62	C3	HRC	588226.8	707431.1	4	3.3	82.5	2.88	4	0		clayey SILT, trace sand, (2.5Y 2.5/1) black, low plasticity, soft to soft, moist, moderate HC-like odor, black stained, becomes slightly firm w/ depth
12A-0462	1/10/12	7.62	C5	LRC	588236.2	707435.4	4	3.7	92.5	2.91	3.7	0.1		clayey SILT, trace sand, (2.5Y 2.5/1) black, low plasticity, soft, wet to moist, moderate HC-like odor
12A-0462	1/10/12	7.62	C6	LRC	588237	707437.7	4	3.2	80	0.5	3.6	0		SILT, some clay trace sand, (2.5Y 2.5/1) black, low plasticity, soft, wet, moderate HC-like odor, trace organics, black stained
12A-0463	1/9/12	7.62	C1	HRC	588409.1	707319.7	4.3	4.8	111.6	3.5	12.8	-15.2		fine SAND, trace silt, (7.5YR 2.5/1) black, dense, moist, slight HC-like odor
12A-0463	1/9/12	7.62	C2	LRC	588405.9	707312.7	4	3.9	97.5	3.23	14	-15.8		fine to medium SAND, trace fine gravel trace silt, (7.5YR 3/1) very dark gray, dense, moist
12A-0464	1/10/12	7.62	C2	HRC	588564	707195	4	3.3	82.5	2.68	3	-0.9		medium to coarse SAND, medium to coarse gravel, (7.5YR 3/2) dark brown, wet
12A-0464	1/11/12	7.62	C4	LRC	588562.2	707197.1	4	3.8	95	3.05	6	-2		SILT, some clay little fine sand, (2.5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, moderate HC-like odor, black HC-like stained throughout
12A-0464	1/11/12	7.62	C5	LRC	588562.6	707194.8	4	3.5	87.5	2.86	5.6	-1.6		SILT, some clay little fine sand, (2.5Y 2.5/1) black, low plasticity, medium stiff, moist, slight HC-like odor, black HC-like stained throughout
12A-0465	2/3/12	7.86	C1	HRC	589194.02	708294.21	4	3.5	87.5	2.86	9.9	-10.7		fine to coarse SAND, trace fine gravel, (10YR 4/2) dark grayish brown, loose, moist, well graded, rounded to subrounded gravel, trace coarse gravel @ 1.05-1.8'
12A-0465	2/3/12	7.86	C3	LRC	589197.54	708296.67	3.3	2.65	80.3	2.04	10.1	-10.7		fine to coarse SAND, (10YR 4/2) dark grayish brown, loose, moist, well graded, homogeneous, organic layer at surface, trace fine gravel 1.4-2.04', glass frags @ 0.6', small coal frags @ 1.7'
12A-0465	2/3/12	7.86	C4	LRC	589196.02	708292.86	3.3	3.9	118.2	3.36	10.5	-10.8		fine to medium SAND, (10YR 4/2) dark grayish brown, loose, moist, well graded, homogeneous, organic layer @ surface, trace coarse gravel 1.7-2.5', glass frags @ 1.6 & 2.3'
12A-0466	Station abandoned													

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0467	1/16/12	8.25	C3	LRC	589429.43	710214.65	4	3.6	90	2.82	15.8	-15.3	0.45	CLAY, little silt, (2.5YR 3/3) dark reddish brown, low plasticity, stiff, moist
12A-0467	1/16/12	8.25	C5	HRC	589427.72	710218.18	4	5	125	3.03	17.4	-15.4	0.5	CLAY, little silt, (2.5YR 3/3) dark reddish brown, low plasticity, stiff, medium to coarse sand and fine to coarse gravel along liner sides @ 0.5-0.6'
12A-0467	1/16/12	8.25	C6	LRC	589427.83	710216.03	4	3.8	95	2.79	17.7	-15.4	0.52	CLAY, little silt, (2.5YR 3/3) dark reddish brown, low plasticity, stiff, moist
12A-0468	2/9/12	8.42	C1	LRC	589418.78	711180.05	4	3.7	92.5	3.11	8.6	-6.2		clayey SILT, trace fine sand trace organics, (2.5Y 3/1) very dark gray, low plasticity, soft to medium stiff, wet, slight HCLO, coarse angular gravel 0-0.1', lenses of silty fine sand @ 0.8', 1.13', 1.59', 2.09'; black staining 0.5-0.6', 0.83-0.99', 2.06-3.11'
12A-0468	2/9/12	8.42	C2	LRC	589416.66	711177.87	4	3.45	86.3	0.5	7.6	-5.6		clayey SILT, trace fine sand trace organics, (2.5Y 3/1) very dark gray, low plasticity, soft, wet, slight HCLO, coarse angular gravel 0-0.1'
12A-0468	2/9/12	8.42	C3	HRC	589419.4	711177.79	4	4.3	107.5	3.6	8.1	-6.6		clayey SILT, trace fine sand and organics, (2.5Y 3/1) very dark gray, low plasticity soft to medium stiff, wet, slight HCLO, little fine-coarse angular gravel @ 0-0.1', lense of silty fine sand @ 1.52', 1.57', 1.95-2.08', 3.24-3.28', black staining @ 1.93-2.96', flat brick fragment @ 1-1.25'
12A-0469	1/17/12	8.38	C1	HRC	589621.2	710926.18	4	3.5	87.5	2.82	6.8	-4.2		fine silty SAND, some organics, (7.5YR 2.5/1) black, dense, moist, homogeneous, lenses of organic material 2.46-2.52', 2.59'; stick at 2.78'; coal slag fragment at 2.48'
12A-0469	1/18/12	8.38	C2	LRC	589625.26	710928.45	3.3	3.1	93.9	2.84	4.3	-3.3		fine silty SAND, (10YR 3/2) very dark grayish brown, dense, one large gravel at 2.75'
12A-0469	1/18/12	8.38	C5	LRC	589628.2	710920.2	3.7	3	81.1	0.5	3.6	-2.4		SILT, little fine sand trace organics, (2.5YR 2.5/1) reddish black, non plastic, soft to medium dense, wet to moist
12A-0470	1/30/12	8.65	C6	HRC	589947.52	712278.27	2.8	3	107.1	2.11	10.8	-10.5		fine to medium silty SAND, some coarse gravel, (10YR 3/1) very dark gray, medium dense, saturated to wet, subangular, cobble @ 0.95-1.15' and 1.3-1.5'
12A-0470	1/30/12	8.65	C7	LRC	589941.84	712270.14	1.8	2.1	116.7	1.37	11.1	-10.8		fine to medium silty SAND, some coarse gravel trace organics, (10YR 3/1) very dark gray, medium dense, wet, subangular, cobble @ 0.5-0.73'
12A-0470	1/30/12	8.65	C8	LRC	589938.39	712260.99	1.6	1.9	118.7	0.5	11.1	-10.9		fine to medium silty SAND, some coarse gravel trace organics, (10YR 3/1) very dark gray, medium dense, wet, subangular
12A-0471	1/30/12	8.78	C1	LRC	590482.18	712818.56	1.4	1.55	110.7	0.5	5.7	-4.4		fine sandy SILT, trace clay, (10GY 4/1) dark greenish gray, low plasticity, stiff, moist
12A-0471	1/30/12	8.78	C5	HRC	590479.92	712817.4	3.3	3.1	93.9	2.48	4.3	-3.5		fine to medium SAND, trace silt and coarse sand, (2.5Y 3/2) very dark grayish brown, medium dense, moist
12A-0471	1/30/12	8.78	C6	LRC	590480.65	712815.19	3.5	3	85.7	2.42	4.1	-3.4		fine SAND, trace silt, (2.5Y 3/3) dark olive brown, medium dense, moist, grades to fine-coarse sand
12A-0472	1/30/12	8.78	C3	LRC	590353.98	712869.49	2.8	2.6	92.9	2.13	13.2	-15	2.05	fine to medium silty SAND, little fine gravel, (7.5YR 3/1) very dark gray, dense, wet, subangular, well graded, inclusion of native red silty fine sand @ 2.05' (native material)
12A-0472	1/30/12	8.78	C4	HRC	590356.66	712870.02	4	3.95	98.8	3.32	14	-15.3	1.87	fine silty SAND, (5YR 4/2) dark reddish gray, very dense, moist, homogeneous, (native material)
12A-0472	1/30/12	8.78	C5	LRC	590355.84	712873.13	3.4	3.1	91.2	2.46	14.5	-15.4	1.28	fine silty SAND, (5YR 4/2) dark reddish gray, very dense, moist, homogeneous, cobble (rounded) 1.3-1.55' (native material)
12A-0473	1/12/12	9.14	C4	LRC	591280.5	714523.7	3.5	4.5	128.6	0.5	8.2	-2.8		fine sandy SILT, trace organics, (10YR 2/1) black, low plasticity, very soft, saturated, coal frag @ 0.5'
12A-0473	1/12/12	9.14	C5	LRC	591286.1	714525.7	3.5	4.04	115.4	3.09	8.6	-3.7		SILT, trace fine sand, (10YR 3/1) very dark gray, low plasticity, soft, wet, some black HC-like staining throughout, coal slag 1.51-1.9'
12A-0473	1/12/12	9.14	C7	HRC	591284.2	714522.6	3.5	3	85.7	2.5	8.5	-4.1		SILT, trace clay, (10YR 3/1) very dark gray, low plasticity, very soft to soft, wet, slight HC-like odor, some black staining throughout
12A-0474	1/12/12	9.29	C3	HRC	591773.7	715133.5	4.5	4.5	100	2.83	23.4	-21.9		clayey SILT, (2.5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, moderate HC-like odor, black HC-like staining throughout
12A-0474	1/12/12	9.29	C5	LRC	591775.9	715132	4.5	4.5	100	2.96	22.7	-21.8		organic, some silt trace clay, (2.5YR 2.5/1) reddish black, loose, wet to moist, moderate HC-like odor, hydrocarbon staining
12A-0474	1/12/12	9.29	C6	LRC	591778.4	715132.3	3.5	3.3	94.3	0.5	22.4	-21.7		fine to medium SAND, (7.5YR 3/1) very dark gray, medium dense, moist, poorly graded
12A-0475	1/13/12	9.29	C1	HRC	591678.2	715185.9	4.5	4.3	95.6	2.92	10.8	-9.1		SILT, trace organics and clay, (10YR 3/1) very dark gray, low plasticity, very soft to soft, wet to moist, leaves at surface, lense of brown silty fine sand @ 0.85-0.9', black HC-like staining and slight HC-like odor 1.66-2.15'
12A-0475	1/13/12	9.29	C2	LRC	591678.3	715191.6	4	3.7	92.5	2.9	10.4	-8.9		SILT, trace organics trace clay, (10YR 3/1) very dark gray, low plasticity, very soft to soft, wet, trace fine sand @ 0.7', some black staining & HC-like odor 1.45-1.9'
12A-0475	1/13/12	9.29	C3	LRC	591677	715189.3	3.5	3.2	91.4	0.5	10.2	-8.9		SILT, trace organics trace clay, (10YR 3/1) very dark gray, low plasticity, very soft, wet
12A-0476	2/7/12	9.6	C1	HRC	592533.26	716612.99	4	3.85	96.3	3.28	3	0.6		SILT, some clay little organics, (10YR 3/1) very dark gray, low plasticity, stiff, moist, wood fragments @ 2.5', inclusion of medium sand @ 2.82'
12A-0476	2/7/12	9.6	C2	LRC	592532.08	716610.63	3.2	2.7	84.4	2.1	2.9	0.6		SILT, little organics trace clay, (10YR 3/2) very dark grayish brown, low plasticity, stiff, moist, lense of silty fine-med sand 1.94-2.05'
12A-0476	2/7/12	9.6	C3	LRC	592528.6	716611.88	4	3.6	90	2.89	2.9	0.6		SILT, some organics trace clay, (10YR 3/2) very dark grayish brown, low plasticity, very stiff, moist, inclusions of brown med sand @ 2.05', 2.5-2.6', 2.64-2.7'
12A-0477	2/8/12	9.8	C1	HRC	592067.93	717608.45	4	3.58	89.5	3	7.6	-2.9		SILT, little clay trace organics, (2.5Y 2.5/1) black, low plasticity, medium stiff, moist, trace fine sand
12A-0477	2/8/12	9.8	C2	LRC	592065.86	717605.93	4	3.9	97.5	3.42	7.9	-3.2		SILT, some clay trace fine sand, (2.5Y 2.5/1) black, low plasticity, soft to medium stiff, moist, trace organics
12A-0477	2/8/12	9.8	C3	LRC	592061.87	717599.98	4	3.9	97.5	0.5	8.2	-3.5		SILT, some fine sand some organics, (2.5Y 2.5/1) black, low plasticity, soft, wet
12A-0478	1/17/12	10.19	C1	LRC	592031.86	719625.45	4	3.2	80	2.59	6.4	-6.6		SILT, trace clay and organics, (10YR 3/1) very dark gray, low plasticity, soft, wet, slight HC-like odor, some black HC-like staining throughout
12A-0478	1/17/12	10.19	C2	LRC	592033.96	719627.14	4	3.4	85	2.75	8	-7.8		SILT, trace clay and organics, (10YR 2/1) black, low plasticity, soft, wet, slight HC-like odor, black HC-like staining

Table 2-2
Sediment Core Collection Summary for SSP LRC
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Core Collection Date	River Mile	Core ID	Core Processed As[1]	NJ State Plane coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	Core Penetration (feet)	Core Recovery (feet)	Recovery (%)	Processed Length[2] (feet)	Water Depth (feet)	River Bottom Elevation (feet NGVD 29)	Native Material Depth (feet)[3]	Material at Bottom of Processed Length of Core[4]
12A-0478	1/17/12	10.19	C3	HRC	592029.16	719630.7	4	3.8	95	2.79	6.4	-5.8		SILT, trace clay, (2.5YR 2.5/1) reddish black, low plasticity, soft, wet, slight HC-like odor, black HC-like staining, some fine sand @ 1.4', brown/ dark brown color banding 0.7-0.95'
12A-0479	1/17/12	10.26	C1	LRC	592203.34	719996.45	4	4.2	105	2.7	14	-16.4	0.5	SILT, trace clay, (5YR 4/2) dark reddish gray, non plastic, stiff to very stiff, moist to wet
12A-0479	1/17/12	10.26	C2	HRC	592200.09	719997.71	4	3.9	97.5	2.68	13.9	-16.3	0.55	SILT, trace clay, (5YR 4/2) dark reddish gray, non plastic, stiff to very stiff, moist
12A-0479	1/17/12	10.26	C4	LRC	592197.38	719994.38	4	3.95	98.8	2.55	14.2	-16.4	0.45	SILT, (5YR 4/2) dark reddish gray, non plastic, stiff, moist to wet
12A-0480	2/2/12	10.31	C1	HRC	592089.78	720262.65	4	3.35	83.8	2.48	14.2	-14.2	0.5	silty CLAY, (2.5YR 5/2) weak red, high plasticity, very stiff, wet, inclusion of native red red-brown fine silty sand @ 1.48-1.53'
12A-0480	2/2/12	10.31	C7	LRC	592084.13	720263.21	3	3.43	114.3	2.2	13.1	-13.5	1.7	silty CLAY, some fine gravel, (5YR 4/2) dark reddish gray, high plasticity, very stiff, moist, rounded gravel, inclusion of native red brown silty fine sand 1.8-1.95', angular cobble @ 1.7-2.05'
12A-0481	2/6/12	11.24	C2	LRC	594639.62	723725.94	4	3.75	93.8	0.5	11.8	-12		clayey SILT, trace fine sand trace fine gravel, (10YR 2/1) black, low plasticity, soft, wet, subangular gravel, slight HCLO, plastic debris @ 0.15'
12A-0481	2/6/12	11.24	C3	HRC	594637.84	723728.76	4	3.55	88.8	3.04	12.3	-12.9	2.63	silty CLAY, (5YR 5/2) reddish gray, medium plasticity, soft, moist, trace rounded gravel @ 2.8-2.9'
12A-0481	2/6/12	11.24	C4	LRC	594634.5	723724.27	4	3.9	97.5	3.1	11.9	-12.8	2.41	fine silty SAND, (5YR 3/1) very dark gray, dense, wet, homogeneous
12A-0482	2/8/12	11.79	C1	LRC	596496.1	725708.55	1.4	1.5	107.1	0.5	17.5	-13.7		fine silty SAND, (10YR 3/1) very dark gray, medium dense, wet, homogeneous, dark brown silt at top, organics at top of sand
12A-0482	2/8/12	11.79	C3	LRC	596500.22	725713.94	1.4	1.65	117.9	1.21	17	-13.8		fine silty SAND, (10YR 4/2) dark grayish brown, medium dense, moist, homogeneous, silt at top
12A-0482	2/8/12	11.79	C4	HRC	596499.3	725715.09	1.6	1.85	115.6	1.4	16.1	-13.8		fine silty SAND, (10YR 4/2) dark grayish brown, medium dense, moist, homogeneous, silt on top, blue plastic tarp fragment @ 0.5-1.4'
12A-0483	1/18/12	12.21	C1	HRC	596951.08	727881.34	4	3.8	95	3.04	10.5	-12		SILT, trace organics, (10YR 2/1) black, low plasticity, soft, moist, lense of brown fine-medium sand 3.05-3.1'
12A-0483	1/18/12	12.21	C2	LRC	596957.38	727881.83	4	4.1	102.5	3.37	11.1	-12.2		fine to medium SAND, (7.5YR 3/2) dark brown, medium dense, moist, poorly graded, grades to fine sand @ 1.85'
12A-0483	1/18/12	12.21	C3	LRC	596954.62	727884.35	4	3.8	95	3.03	11.4	-12		fine to medium SAND, (7.5YR 3/2) dark brown, medium dense, wet, poorly graded, grades to fine sand with depth, lense of dark brown silt and some organics 2.75-2.84'
12A-0484	1/18/12	12.3	C1	HRC	597066.2	728390.7	4	4.6	115	2.9	15.6	-15.9	1.28	fine silty SAND, (2.5YR 4/4) reddish brown, dense, moist, homogeneous
12A-0484	1/18/12	12.3	C4	LRC	597064.99	728390.4	4	3	75	2.44	14.3	-15.4	1.88	fine silty SAND, (2.5YR 4/3) reddish brown, dense, moist, homogeneous, coarse gravel 1.9-2.1'
12A-0484	1/18/12	12.3	C8	LRC	597061.81	728376.42	3.5	2.9	82.9	2.55	13	-15.3	2.45	fine silty SAND, (2.5YR 4/3) reddish brown, dense, moist, homogeneous
12A-0485	2/8/12	12.71	C1	LRC	596199.32	730348.55	3.2	2.9	90.6	2.23	14.6	-14.6		fine silty SAND, (10YR 3/2) very dark grayish brown, very dense, moist, homogeneous, some organics (sticks) 1.7-2.0', trace fine gravel 2.1-2.23', debris @ 2-2.23' (crayon, rubber shoe heel)
12A-0485	2/8/12	12.71	C2	HRC	596204.23	730351.69	4	4.35	108.7	3.75	13.5	-13.9		fine silty SAND, little organics, (10YR 3/2) very dark grayish brown, dense, moist, homogeneous, trace coal slag @ 0.5-0.62', trace fine rounded gravel @ 2.35', fine to coarse sand and trace fine gravel @ 2.75-3.54'
12A-0485	2/8/12	12.71	C4	LRC	596201.77	730354.47	3	2.6	86.7	0.5	13.1	-14.2		fine silty SAND, (10YR 3/2) very dark grayish brown, dense, moist, homogeneous
12A-0486	2/1/12	13	C1	LRC	596440.42	731800.84	4	3.22	80.5	2.51	6.5	-6.4		clayey SILT, (10YR 2/1) black, low plasticity, medium stiff, moist, slight sewer-like odor
12A-0486	2/1/12	13	C3	LRC	596440.48	731805.31	2.2	2	90.9	1.43	6.2	-6.3		fine to medium SAND, little silt, (7.5YR 3/1) very dark gray, medium dense, moist, little coarse sand & fine-coarse gravel 1.05-1.43'
12A-0486	2/1/12	13	C7	HRC	596442.39	731799.88	4	3.8	95	2.98	6.1	-6.4		SILT, some clay, (10YR 2/1) black, low plasticity, medium stiff, moist, fine sand lense 2.6-2.7'

Notes:

[1]"Core Processed As" Designations as follows:

LRC - Low Resolution Core

HRC - High Resolution Core

[2]Length of core logged/processed only; additional segments or intervals collected may not have been processed if additional sediment volume was not required.

[3]Native material depth provided only if encountered.

[4]Description from deepest processed interval as indicated in the lithology core records (Appendix E).

[5]Location within the footprint of the 2005 Environmental Dredging Pilot Study Area.

HC - Hydrocarbon

HCLO - Hydrocarbon-like odor

NAD 83 - North American Datum of 1983

NGVD 29 - National Geodetic Vertical Datum of 1929

SLO - Sulfur-like odor

TLO - Tar-like odor

Table 2-3
Surface Grab Sample Collection Summary for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Collection Date	River Mile	Grab Sample ID	NJ State Plane Coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	River Bottom Elevation (feet NGVD 29)	General Description of Material in Surface Grab Sample
12A-0401	02/09/12	0.17	G1	597947.98	684772.18	-3	Silt+Sand
12A-0402	02/08/12	0.25	G2	596835.2	684762.02	-21.5	Silt
12A-0403	02/07/12	0.5	G1	597359.1	686414.42	-2.9	Silt
12A-0404	02/01/12	0.68	G1	597575.69	687385.25	-2.3	Silt+Sand
12A-0405	02/01/12	1.31	G1	597747.26	690608.79	-15.9	Silt
12A-0406	01/28/12	1.68	G1	598179.2	692485.72	-18.8	Silt+Sand
12A-0407	01/26/12	1.83	G1	597954.73	693310.27	-0.6	Silt+Sand
12A-0408	02/03/12	1.97	G2	598289.2	694026.95	-27.9	Silt+Sand
12A-0409	02/06/12	1.96	G1	598096.27	693960.78	-5.4	Silt
12A-0410	02/06/12	1.98	G4	598359.6	694080.13	-21.7	Clay+Silt+Sand
12A-0411	02/02/12	2.02	G1	598217.72	694263.44	-25.4	Silt
12A-0412	02/02/12	2.55	G1	595888.18	695264.09	-1.5	Silt
12A-0413	01/28/12	2.53	G1	596090.05	695835.59	-3.4	Silt*
12A-0414	01/25/12	2.69	G1	595213.73	695518.9	-14.9	Clay+Silt
12A-0415	01/26/12	2.69	G1	595170.42	695644.55	-18.2	Clay+Silt
12A-0416	01/31/12	2.84	G1	594372.01	695430.88	-15	Silt+Sand
12A-0417	01/31/12	2.85	G1	594369.54	695479.55	-16.1	Silt+Sand
12A-0418	01/30/12	2.84	G1	594385.29	695387.77	-13.1	Silt
12A-0419	01/20/12	2.86	G1	594271.81	695571.11	-15.5	Silt
12A-0420	01/20/12	2.96	G1	593760.61	695333.24	-13.7	Silt*
12A-0421	02/07/12	3.14	G1	592758.59	695436.93	-8.6	Silt+Sand
12A-0422	01/24/12	3.14	G1	592855.41	695226.15	-15	Silt*
12A-0423	01/25/12	3.3	G4	591940.99	695107.13	-11.4	Silt+Sand
12A-0425	01/24/12	3.45	G1	591333.42	694605.55	-17.9	Silt*
12A-0426	01/24/12	3.64	G2	591006.62	693640.27	-12.2	Silt+Sand
12A-0427	01/25/12	3.64	G1	590902.92	693671.45	-22.1	Silt+Sand
12A-0428	01/25/12	3.64	G2	590808.3	693723.68	-13.8	Sand
12A-0429	01/24/12	3.64	G2	590636.73	693805.31	1.4	Silt+Sand
12A-0431	01/26/12	3.77	G1	590336.46	693252.69	0.4	Silt
12A-0432	01/27/12	3.83	G4	590367.5	692776.47	-22.5	Silt+Sand
12A-0433	01/27/12	3.94	G1	589703.35	692775.23	-2.9	Clay+Silt
12A-0434	01/25/12	4.05	G1	589267.06	692194.73	-3.6	Silt+Sand
12A-0435	01/27/12	4.09	G2	589030.35	692548.66	-9.7	Sand
12A-0436	01/27/12	4.14	G2	588785.39	692678.31	-1.6	Silt
12A-0437	02/06/12	4.24	G1	588244.07	692699.75	1.6	Silt
12A-0438	02/09/12	4.52	G1	586843.14	692612.94	-2.4	Silt+Sand
12A-0439	02/08/12	4.53	G2	586771.76	692538.93	-16.5	Silt+Sand
12A-0440	02/07/12	4.54	G2	586676.42	692415.26	-19.9	Silt+Sand+Gravel
12A-0441	01/28/12	4.63	G1	586418.11	692892.5	-2	Silt+Sand
12A-0442	01/26/12	4.63	G2	586365.79	692848.85	-10.8	Silt+Sand
12A-0443	01/26/12	4.63	G1	586313.6	692810.85	-18.6	Sand
12A-0444	01/28/12	4.64	G1	586203.22	692707.06	-18.6	Silt+Sand
12A-0445	01/30/12	4.96	G1	585245.42	694181.33	-2.5	Silt
12A-0446	01/31/12	4.96	G1	585351.04	694198.95	-12.9	Silt+Sand
12A-0447	01/30/12	5.2	G1	585025.69	695475.16	-16.5	Silt+Sand
12A-0448	02/07/12	5.9	G1	585079.7	699094.09	-1.9	Clay+Silt
12A-0449	01/31/12	6.33	G1	585173.45	701398.25	-18.5	Clay+Silt+Sand
12A-0450	01/28/12	6.33	G1	585272.74	701355.62	-13.6	Sand
12A-0451	01/13/12	6.33	G1	585416.1	701298.3	-1.9	Silt+Sand
12A-0452	02/03/12	6.49	G2	585721.47	702068.44	-2.5	Silt+Sand+Gravel
12A-0453	02/02/12	6.54	G5	585645.57	702392.58	-16.2	Clay+Silt+Sand
12A-0454	01/31/12	6.62	G1	585993.69	702679.05	-17.1	Clay+Silt+Sand
12A-0455	02/07/12	6.86	G1	586723.34	703720.96	-21.6	Clay+Silt+Sand
12A-0456	02/09/12	6.76	G1	586206.61	703397.82	-2.4	Clay+Silt+Sand
12A-0457	01/10/12	6.95	G2	586946.5	704122.6	-17.7	Sand
12A-0458	02/01/12	7.1	G1	587366.37	704804.71	-0.5	Clay+Silt
12A-0459	01/31/12	7.21	G1	587501.32	705430.67	-1.2	Clay+Silt+Sand
12A-0460	01/11/12	7.32	G1	587693.1	705896.6	-0.8	Silt
12A-0461	02/09/12	7.23	G1	587090.06	705554.5	-1.4	Clay+Silt
12A-0462	01/10/12	7.62	G3	588235.9	707433.5	0	Silt+Sand
12A-0463	01/10/12	7.62	G3	588403.8	707313.7	-18.2	Sand
12A-0464	01/11/12	7.62	G1	588562.1	707195.8	-1.7	Silt+Sand
12A-0465	02/03/12	7.86	G1	589196.09	708289.7	-11.3	Sand
12A-0467	01/16/12	8.25	G9	589443.16	710201.08	-15.5	Sand*

Table 2-3
Surface Grab Sample Collection Summary for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	Collection Date	River Mile	Grab Sample ID	NJ State Plane Coordinates (feet NAD 83) Easting (Actual)	Northing (Actual)	River Bottom Elevation (feet NGVD 29)	General Description of Material in Surface Grab Sample
12A-0468	02/09/12	8.42	G3	589423.34	711179.86	-7.6	Clay+Silt+Sand
12A-0469	01/18/12	8.38	G1	589631.22	710915.21	-2.1	Silt
12A-0472	01/30/12	8.78	G1	590354.82	712871.41	-15.6	Sand
12A-0474	01/12/12	9.29	G1	591779.9	715132.8	-21.8	Sand
12A-0475	01/13/12	9.29	G1	591677.9	715187	-9	Silt
12A-0476	02/07/12	9.6	G1	592530.12	716613.86	0.7	Clay+Silt+Sand
12A-0477	02/08/12	9.8	G1	592062.5	717594.09	-3.6	Clay+Silt
12A-0478	01/17/12	10.19	G1	592035.15	719625.94	-7.5	Silt+Sand+Gravel
12A-0479	01/17/12	10.26	G2	592203.31	719997.85	-16.2	Clay+Silt+Sand
12A-0480	02/02/12	10.31	G9	592083.24	720245.2	-14	Silt+Sand+Gravel
12A-0482	02/08/12	11.79	G1	596496.52	725719.02	-13.9	Sand
12A-0483	01/18/12	12.21	G1	596955.33	727876.55	-12.3	Sand
12A-0485	02/08/12	12.71	G1	596203.74	730346.89	-14.2	Sand
12A-0486	02/01/12	13	G6	596432.5	731785.3	-7.1	Sand

Notes:

Table reflects grab samples processed only. Grab samples were not collected from the following locations: 12A-0424, 12A-0430, 12A-0466, 12A-0470, 12A-0471, 12A-0473, 12A-0481, and 12A-0484.

*Description provided is from top of core. Description not noted for grab sample.

NAD 83 - North American Datum of 1983

NGVD 29 - National Geodetic Vertical Datum of 1929

Table 2-4
Bridges within the LRC SSP Program Study Area
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Bridge Name	River Mile	Structure Type
Dismantled Bridge	0.91	Open Dismantled
Lincoln Highway Bridge	1.57	Lift Deck
Pulaski Skyway Bridge	1.75	Fixed Span
Point-No-Point Bridge	2.33	Swing
I95 Bridge	2.41	Fixed Span
Jackson Street Bridge	4.37	Swing
Amtrak Bridge	4.75	Lift Deck
Bridge Street Bridge	5.41	Swing
(Newark- Harrison) Erie Swing Bridge	5.57	Swing
I-280 Stickle Bridge	5.61	Lift Deck
Clay Street Bridge	5.83	Swing
Fourth Avenue Bridge	6.07	Single Leaf Truss Bascule (fixed open)
West Arlington Street Bridge	7.81	Fixed Rail (decommissioned swing)
Rutgers (Rte 7) Bridge	8.53	Lift Deck
DeJesse-Avondale Street (Kingsland Avenue) Bridge	10.37	Opening Truss Swing
Lyndhurst-Delaware Rail Bridge	11.4	Opening Swing
Rutherford Avenue (Rte 3) Bridge	11.65	Double Leaf Bascule
Union Avenue Bridge	12.98	Fixed Span

Table 2-5
Non-Hazardous Waste Shipment Summary (55-gallon Steel Drums)[1] for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Date	Bill of Lading Number	Non-Hazardous Solid – Personal Protective Equipment/ Plastic	Non-Hazardous Solid – Sediment	Non-Hazardous Liquid
3/15/2012	218273	17	12	0
3/16/2012	218275	19	0	8
3/16/2012	208314	12	1	7
3/19/2012	218276	4	2	10
3/19/2012	218277	13	5	0
	Drum Totals	**65**	**20**	**25**

[1] Hazardous liquids consisting of solvents and acids used in the decontamination process were also shipped and included two drums shipped on March 16, 2012 under Hazardous Wast Manifest Number 002568906 JJK.

Table 2-6
Summary of Core Processing for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0401	0.17	3.91	3	Dark gray silt with trace find sand and organics over clayey silt with trace fine sand and organics becoming fine to medium sand with trace silt.	0	0	0.032
12A-0402	0.25	3.67	3	Black organics with little silt and trace fine sand over silt with some clay anc organics.	0	0	0.063
12A-0403	0.5	4.02	3	Black silt with little organics and trace fine sand over dark gray silt with some clay, trace organics, black staining, and shells.	0.1	0	0.096
12A-0404	0.68	3.42	3	Black silt with little fine sand, trace clay, plastic debris, black staining, and shell over black silt with little clay.	0	0	0.012
12A-0405	1.31	3.36	3	Black silt with some organics, trace fine sand, and bands of black staining.	0	0	0.011
12A-0406	1.68	3.37	3	Dark gray silty sand over dark gray silt with little fine sand and clay and black HC-like staining becoming silt with some clay, little organics, and black HC-like staining.	0.6	0	0.01
12A-0407	1.83	3.46	3	Black silt and organics with trace fine sand over silt with little clay, trace organics, fine sand lense, and black HC-like staining becoming clayey silt with trace fine sand.	0	0	0.005
12A-0408	1.97	3.7	3	Black silt and organics with trace fine sand over dark gray fine to coarse silty sand with some organics and shells becoming black silt with some clay, trace fine sand, and intermittent black HC-like staining.	0.7	0	0.006
12A-0409	1.96	3.62	3	Black silt and organics with trace fine sand, little clay, and organic conten decreasing with depth.	0	0	0.022
12A-0410	1.98	4.32	3	Black silt with little fine sand and trace clay over black organics with little silt an heavy black staining becoming black silt with little clay, trace organics, black staining throughout, and clay content increasing with depth.	0.8	0	0.017
12A-0411	2.02	4.08	3	Black silt and organics with some fine sand, trace fine gravel, and black staining over silt with little clay, trace fine sand and organics, and black staining.	0.3	0	0.099
12A-0412	2.55	3.63	3	Dark gray silt with trace organics, shell fragments, lenses of brown silty fine sand, and bands of black staining.	0	0	0.009
12A-0413	2.53	2.88	3	Black silt with trace organics and a lense of some fine-med sand over black fine to coarse silt sand with little fine to coarse gravel, a clayey silt inclusion, and coal slag at 2.1 ft bgs.	0	0	0.012
12A-0414	2.69	3.8	3	Dark gray silt with trace organics, layers of black staining, some interbedded slity fine sand, and lenses of silty fine sand.	1	0	0.014
12A-0415	2.69	3.9	3	Black silt with little clay, trace fine sand and organics, black HC-like staining, a sand lense, and plastic debris at 1.9 ft bgs.	0.3	0	0.015

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Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0416[3]	2.84	5.17	5	Dark gray silt with trace clay and fine sand over clayey silt with trace organics lenses of silty fine sand, and bands of black HC-like staining.	2.2	0	0.019
12A-0417[3]	2.85	5.04	5	Dark brown silt with little clay and trace fine sand over clayey silt with trace fin sand and organics, and layers of black staining.	0.1	0	0.016
12A-0418[3]	2.84	4.83	5	Dark brown silt with little fine sand over black silt with little organics, trace fin sand, a sand lense, little clay at depth, and black staining becoming black silt with some clay, trace fine sand, interbedded organics, and black staining throughout.	3	0	0.012
12A-0419	2.86	3.07	3	Dark gray silt with some organics, layers of organics, and bands of black staining.	1.1	0	0.018
12A-0420	2.96	3.57	3	Dark gray silt with little organics, trace fine sand, and lenses of silty fin sand.	0.5	0	0.016
12A-0421	3.14	3.59	3	Black clayey silt with trace fine sand, trace organics, and layers of black staining.	76.6	0	0.015
12A-0422	3.14	3.6	3	Black silt with organics and trace fine sand over silt with little clay, trace fin sand and organics, and black HC-like staining.	0.1	0	0.01
12A-0423	3.3	3.85	3	Black silt with little fine to coarse gravel, some clay, trace fine sand, lenses o silty fine sand, and black staining over dark gray fine to medium sand with some coarse gravel and trace silt becoming dark gray silt with some clay, trace fine sand, and a lense of silty fine sand.	0.4	0	0.041
12A-0424	3.3	2.94	3	Dark gray silt with some coarse gravel, trace clay, organics, and fine sand, a lense of organics, and sand content decreasing with depth.	14	46	0.379
12A-0425	3.45	3.9	3	Dark gray silt with some organics decreasing with depth, and black HC-like staining.	1	0	0.009
12A-0426	3.64	2.83	3	Dark grayish brown silt with little fine sand, trace organics, few shells towar surface, and a layer of black HC-like staining.	0	0	0.006
12A-0427	3.64	3.19	3	Black silt with organics, and some fine to medium sand becoming black silty clay with trace fine sand and few pieces of slag over black silt with little clay an black HC-like staining becoming dark gray fine to coarse sand with little silt, fe silty sand lenses, and clay inclusions.	2.9	0	0.007
12A-0428	3.64	3.61	3	Dark gray fine silty sand with a clam shell over black silt with trace organics an clay, organic layers, and black HC-like staining.	0	0	0.009
12A-0429	3.64	2.63	3	Black silt with little organics, shell fragments, plastic and metal debris, an black staining over black fine silty sand with lense of trace coarse gravel.	0.4	0	0.011
12A-0430	3.7	0.95	2	Black clay with thin layer of silt at surface, and interbedded fine to coarse san and clay layers over black fine to coarse sand with gravel.	0	0	0.014

Table 2-6
Summary of Core Processing for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0431	3.77	2.38	3	Black silt with some organics and trace fine sand over black fine silty sand with trace organics, lenses of medium sand, and plastic debris.	0	0	0.018
12A-0432	3.83	4.18	3	Dark gray medium to coarse sand with some fine to coarse gravel, trace silt and organics becoming dark gray clayey silt with little fine to medium sand decreasing with depth over native reddish brown fine silty sand becoming nativ rediish brown silt with trace clay, lenses of gray clay, and a layer of black staining becoming native dark reddish gray fine silty sand.	4.8	0	0.007
12A-0433	3.94	3.4	3	Black silt with little fine sand and organics becoming black fine to coarse sandy silt with a lense of fine to medium sand over black silty clay with trace fine sand over black clayey silt with trace fine sand and organics, and sand content increasing with depth.	0	0	0.004
12A-0434	4.05	3.76	3	Dark gray silt with trace fine sand and gravel, intermittent black HC-like staining, and coal slag.	0.3	0	0.046
12A-0435	4.09	4.17	3	Black sandy silt with little organics over black fine silty sand with little organic becominf black silt with trace clay and organics, and black HC-like staining.	0	0	0.012
12A-0436	4.14	4.09	3	Black silt with trace organics, some sand at the surface, and black HC-like staining over black hard tar-like residual material becoming black silty clay with trace organics and HC-like staining.	2	0	0.005
12A-0437	4.24	3.39	3	Black silt with some organics, and trace fine sand over black silt with little clay decreasing with depth, and trace fine sand and organics becoming dark gray silty clay with some organics and trace fine sand.	0	0	0.009
12A-0438	4.52	3.72	3	Dark gray silt with some organics, trace fine sand, plastic debris, and a layer of little organics.	0	0	0.022
12A-0439	4.53	3.59	3	Dark gray fine silty sand and organics becoming dark gray clayey silt with little organics over black fine silty sand with some organics and interbedded layers of organics becoming black clayey silt with trace organics, black staining, and a layer of metal debris and trace coarse sand.	0.1	0	0.021
12A-0440	4.54	3.54	3	Black silt with little fine sand, trace organics, trace coarse gravel at surface, moderate HC-like sheen and black staining, a layer of product saturated material, and a lense of coal fragments over black fine to medium silty sand with trace fine to coarse gravel, product throughout, and a lense of brown clayey silt becoming dark gray fine to medium sand with a layer of some coarse gravel.	111	0	0.04
12A-0441	4.63	3.46	3	Black silt with trace fine sand, little organics decreasing with depth, plastic debris, and layers of black staining.	0.1	0	0.009

Table 2-6
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Lower Passaic River Restoration Project

Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0442	4.63	3.8	3	Black fine sandy silt and organics becoming black silt with some organics over black fine silty sand with plastic debris becoming interbedded dark brown silt and organics.	0.1	0	0.019
12A-0443	4.63	3.35	3	Black organics over dark gray fine silty sand with little organics and a lense of brown silt becoming black silt with trace clay and organics with lenses of brown silty fine sand over black organics with trace silt and fine sand becoming black silt with trace clay and organics.	0	0	0.016
12A-0444	4.64	3.8	3	Black silt with little clay and trace fine sand and organics, black staining, and a layer of trace fine to coarse gravel over black silty sand with little clay, trace organics and gravel, and heavy black staining becoming black clayey silt with black staining.	2.5	0	0.038
12A-0445	4.96	3.1	3	Black silt with some clay, trace fine sand and organics, and black HC-like staining over black clayey silt with trace fine sand, and intermittent black staining.	0.1	0	0.008
12A-0446	4.96	4.38	3	Black silt with little fine sand, trace clay, bands of black staining, and a fine sand lense.	0.7	0	0.011
12A-0447	5.2	3.36	3	Black silt and organics over dark gray fine to medium silty sand with plastic debris becoming black silt with some clay, trace organics, and lenses of silty fine sand over black fine silty sand with little organics.	0	0	0.01
12A-0448	5.9	3.09	3	Black silt with some fine sand, trace clay and organics, and a lense of medium to coarse sand and slag over black silty clay with trace fine sand lenses and intermittent black staining.	0.5	0	0.012
12A-0449	6.33	3.84	3	Black silt with little organics, trace fine sand, plastic debris, and lenses of silty fine sand.	0.3	0	0.005
12A-0450	6.33	3.87	3	Black organics over dark gray fine silty sand with some organics and lenses of dark brown clayey silt becoming black clayey silt with trace organics.	0	0	0.009
12A-0451	6.33	2.93	3	Dark gray silt with some organics, trace fine sand and clay, plastic debris, and some black staining.	0.3	0	0.014
12A-0452	6.49	3.1	3	Dark gray silt with little clay and trace organics	0	0	0.012
12A-0453	6.54	2.65	3	Black sandy silt and organics with plastic debris over black silt with little fine sand and organics and trace clay becoming black fine silty sand with some organics over black silt with little clay, trace organics, and black HC-like staining.	0.8	0	0.007

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Summary of Core Processing for LRC SSP
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Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0454	6.62	3.36	3	Dark gray silt with trace clay and organics, a lense of brown fine to medium sand, interbedded organics, plastic debris, fine silty sand lenses, trace coal slag, and a layer of black HC-like staining.	2.9	0	0.011
12A-0455	6.86	2.55	3	Black silt with little clay, trace fine sand and gravel and coal slag over dark gray clayey silt with intermittent black HC-like staining, and a lense of trace gravel becoming dark grayish brown fine silty sand.	0.7	0	0.004
12A-0456	6.76	3.61	3	Dark gray silt with trace fine sand, organics, and clay over dark gray silt with some clay and trace organics.	0	0	0.011
12A-0457	6.95	3.2	3	Dark brown fine to medium sand with little silt becoming dark gray fine sand with little silt over dark brown fine to coarse sand with some organics becoming banding of dark reddish gray and dark brown clayey silt over dark gray silt with some clay, trace sand, and black staining becoming dark brown fine to coarse sand with little fine gravel over dark brown fine sand with some silt and trace clay.	0	0	0.004
12A-0458	7.1	2.97	3	Black silt with little clay, trace organics, black staining, a lense of medium to coarse sand, and layers of some sand.	3	0	0.012
12A-0459	7.21	3.18	3	Black fine silty sand with trace clay and organics becoming black clayey silt with little fine sand and clay over black fine to medium silty sand with small fragments of coal slag becoming dark gray clayey silt over black fine silty sand.	0	0	0.006
12A-0460	7.32	3.18	3	Black silt with trace clay and organics, black staining, and HC-like sheen over dark gray clayey silt with trace organics, lenses of brown silty fine sand, shell fragments, and black staining.	1.1	0	0.014
12A-0461	7.23	3.33	3	Dark gray silt with some clay, trace organics, trace fine sand at the surface, and black staining.	0	0	0.011
12A-0462	7.62	2.91	3	Black organics with some sand and silt becoming black silt with some clay and trace sand and organics, and black staining over black clayey silt with trace sand and black staining.	4	0	0.007
12A-0463	7.62	3.5	3	Dark brown medium to coarse sand with trace fine to medium gravel and organics becoming dark gray fine to medium sand over black fine sand with trace silt and coal slag over dark gray fine to medium sand with trace fine gravel becoming black fine sand with trace silt.	0	0	0.005

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Summary of Core Processing for LRC SSP
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Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0464	7.62	3.05	3	Dark gray fine to medium sand with some silt and fine to medium gravel, trace organics, and HC-like sheen on the water becoming dark gray clayey silt with some fine sand and organics, lenses of brown fine to medium sand, and layers of trace fine to medium gravel over dark gray fine to medium sand and fine to coarse gravel with trace silt becoming dark brown medium to coarse sand and medium to coarse gravel.	18.4	0	0.006
12A-0465	7.86	3.36	3	Dark grayish brown fine to coarse sand with trace fine gravel and a lense of trace coarse gravel.	0	0	0.004
12A-0467	8.25	3.03	1	Dark grayish brown medium to coarse sand with fine to coarse gravel and a wedge of native clay over native dark reddish brown clay with little silt.	0	0	0.006
12A-0468	8.42	3.6	3	Dark gray clayey sil.t with trace fine sand and organics, coarse gravel at surface, lenses of silty fine sand, and layers of black staining.	0.2	0	0.019
12A-0469	8.38	2.84	3	Dark gray silt with trace organics and fine sand becoming dark gray fine to medium sand with trace silt over dark gray silt with some clay, trace organics, layers of black staining, lense of dark brown silty fine sand, and lense of dark brown silty fine sand and organics becoming black fine silty sand with some organics, lenses of organics, and a coal slag fragment.	1.7	0	0.007
12A-0470	8.65	2.11	2	Dark gray fine to medium silty sand with some coarse gravel and few cobbles.	0	0	0.003
12A-0471	8.78	2.48	3	Dark olive brown fine to coarse sand with some fine to coarse gravel, trace silt becoming dark grayish brown fine to medium sand with little silt and trace fine gravel and coarse sand over dark grayish brown fine silty sand with lenses of clayey silt becoming dark grayish brown fine sand with trace silt becoming dark grayish brown silt with some clay over dark grayish brown fine to medium sand with trace silt and coarse sand.	0	0	0
12A-0472	8.78	3.32	3	Dark brown fine silty sand with organics at surface over dark gray fine to medium silty sand with little fine gravel and an inclusion of native red silty fine sand.	0	0	0.006
12A-0473	9.14	3.09	3	Dark gray fine to medium sandy silt with trace fine to medium gravel becoming black medium to coarse sandy gravel with trace silt, some fine to medium sand, large porcelain debris, coal and coal slag, and glass fragments over dark gray silt with trace fine sand, some black HC-like staining, and coal slag.	0	0	0.012

Table 2-6
Summary of Core Processing for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0474	9.29	2.96	3	Dark gray fine to medium sand and organics becoming dark gray fine to coarse sand and trace organics over black organics with medium to coarse sand and little silt becoming black silt with some clay and organics, trace fine sand, and HC-like staining over black organics with some silt and black HC-like staining becoming black clayey silt with black HC-like staining.	0.1	0	0.012
12A-0475	9.29	2.92	3	Dark gray silt with trace organics and clay, lense of brown silty fine sand, anc black HC-like staining.	1	0	0.007
12A-0476	9.6	3.28	3	Dark gray silt with little fine sand, trace organics, and black staining becoming dark gray fine to coarse sand with construction debris over black silt with little clay and trace organics becoming dark gray fine to medium silty sand with lenses of clayey silt with organics over dark gray silt with some clay, little organics, and an inclusion of medium sand.	0.2	0	0.01
12A-0477	9.8	3.42	3	Black silt with some fine to medium sand decreasing with depth, little organics, trace clay and debris over black silt with little clay and trace organics.	0.2	0	0.011
12A-0478	10.19	2.79	3	Dark gray silt with trace organics and coarse gravel becoming dark gray fine to medium silty sand with bands of brown silty fine sand and dark brown sandy silt and a layer of some coarse gravel over dark gray silt with trace clay and organics and some black HC-like staining.	1	0	0.011
12A-0479	10.26	2.7	1	Dark brown fine to medium sand with trace organics becoming native dark reddish gray silt over native dark reddish gray clayey silt becoming native dark reddish gray silt with trace clay.	0.2	0	0.01
12A-0480	10.31	2.48	3	Dark gray silt with trace fine sand and gravel becoming dark grayish brown fine to medium silty sand with some fine to coarse gravel over native dark reddish gray clayey silt with some coarse gravel and fine to medium sand becoming native weak red silty clay with an inclusion of native red-brown fine silty sand.	0.3	0	0.009
12A-0481	11.24	3.1	3	Dark gray fine to medium silty sand with trace coarse gravel becoming black clayey silt with some black staining, glass fragments, and cobbles over native reddish gray silty clay with a layer of trace rounded gravel.	0.5	0	0.008
12A-0482	11.79	1.4	2	Dark grayish brown fine silty sand with silt at surface	0	0	0.003
12A-0483	12.21	3.37	3	Dark gray silt with trace fine sand and organics and a lense of brown medium sand becoming dark grayish brown fine to medium sand over black silt with trace organics and a lense of brown fine to medium sand.	0.3	0	0.013
12A-0484	12.3	2.9	3	Brown fine to medium silty sand with trace organics over native reddish brown fine silty sand.	0	0	0.01

Table 2-6
Summary of Core Processing for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	River Mile	Maximum Processed Length (feet)[1]	Number of Sample Intervals Processed	General Overall Sediment Description and Observations from Cores at Each Location[2]	Total VOCs (ppm)[4]	H_2S (ppm)[4]	Hg (mg/m^3)[4]
12A-0485	12.71	3.75	3	Black organics with some fine sand over dark grayish brown fine silty sand with layers of some organics and trace fine gravel and debris at depth.	0	0	0.004
12A-0486	13	2.98	3	Dark gray silt with some organics and fine to medium sand becoming dark gray fine to medium sand with little silt, trace coarse sand, and angular deposit of fine to coarse sand with trace fine gravel and brick fragments over black sandy silt with some organics, trace debris, and a cobble becoming black clayey silt.	0	0	0.007

Notes:

[1]Processed Length = Length of core logged/processed only; additional segments collected may not have been processed for secondary cores if sediment volume not required.

[2]Sediment descriptions are generalized over the length of the core and incorporate primary and secondary cores, refer to the Lithology Records (Appendix E) for specific sediment classifications, observations, and depths.

[3]Location within the footprint of the 2005 Environmental Dredging Pilot Study Area.

[4]Total VOCs, H_2S, and Hg values are maximum readings per station during vapor screening of sediment.

H_2S - Hydrogen Sulfide

HC - Hydrocarbon

Hg - Mercury

mg/m^3 - milligrams per cubic meter

ppm - parts per million

VOC - Volatile Organic Compound

Table 2-7
Bulk Density for LRC SSP Sediment Core Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location ID	Core Number	Core Segment ID	Bulk Density (g/cm^3)
12A-0401	C1	AB	1.54
12A-0401	C2	AB	1.51
12A-0401	C3	AB	1.53
12A-0402	C2	AB	1.08
12A-0402	C3	AB	1.06
12A-0402	C4	AB	1.09
12A-0403	C1	AB	1.38
12A-0403	C2	AB	1.34
12A-0403	C3	AB	1.39
12A-0404	C2	AB	1.41
12A-0404	C3	AB	1.39
12A-0404	C4	AB	1.38
12A-0405	C2	AB	1.13
12A-0405	C3	AB	1.12
12A-0405	C4	AB	1.12
12A-0406	C1	AB	1.21
12A-0406	C2	AB	1.19
12A-0406	C3	AB	1.24
12A-0407	C1	AB	1.28
12A-0407	C2	AB	1.29
12A-0407	C3	AB	1.28
12A-0408	C1	AB	1.19
12A-0408	C2	AB	1.18
12A-0408	C3	AB	1.16
12A-0409	C2	AB	1.18
12A-0409	C7	AB	1.14
12A-0409	C8	AB	1.19
12A-0410	C1	AB	1.19
12A-0410	C2	AB	1.22
12A-0410	C3	AB	1.21
12A-0411	C1	AB	1.20
12A-0411	C2	AB	1.25
12A-0411	C3	AB	1.25
12A-0412	C1	AB	1.12
12A-0412	C2	AB	1.22
12A-0412	C3	AB	1.22
12A-0413	C4	AB	1.11
12A-0413	C6	AB	1.46
12A-0413	C7	AB	1.33
12A-0414	C1	AB	1.23
12A-0414	C2	AB	1.27
12A-0414	C3	AB	1.23
12A-0415	C1	AB	1.19
12A-0415	C2	AB	1.20
12A-0415	C3	AB	1.20
12A-0416	C1	AB	1.24
12A-0416	C3	AB	1.23
12A-0416	C4	AB	1.26
12A-0417	C3	AB	1.23
12A-0417	C4	AB	1.22
12A-0418	C1	AB	1.14
12A-0418	C1	BC	1.16
12A-0418	C2	AB	1.23
12A-0418	C3	AB	1.20

Table 2-7
Bulk Density for LRC SSP Sediment Core Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location ID	Core Number	Core Segment ID	Bulk Density (g/cm^3)
12A-0419	C2	AB	1.17
12A-0419	C4	AB	1.18
12A-0420	C1	AB	1.34
12A-0420	C2	AB	1.32
12A-0420	C3	AB	1.27
12A-0421	C1	AB	1.32
12A-0421	C2	AB	1.29
12A-0421	C3	AB	1.33
12A-0422	C3	AB	1.21
12A-0422	C4	AB	1.24
12A-0422	C5	AB	1.22
12A-0423	C2	AB	1.67
12A-0423	C3	AB	1.65
12A-0423	C4	AB	1.61
12A-0424	C1	AB	1.34
12A-0424	C2	AB	1.41
12A-0424	C3	AB	1.33
12A-0425	C2	AB	1.23
12A-0425	C3	AB	1.20
12A-0425	C4	AB	1.24
12A-0426	C1	AB	1.26
12A-0426	C6	AB	1.17
12A-0427	C2	AB	1.46
12A-0427	C5	AB	1.38
12A-0428	C3	AB	1.55
12A-0428	C4	AB	1.40
12A-0428	C5	AB	1.63
12A-0429	C1	AB	1.36
12A-0429	C2	AB	1.33
12A-0429	C3	AB	1.38
12A-0430	C1	AB	1.76
12A-0430	C3	AB	1.60
12A-0430	C5	AB	1.31
12A-0431	C4	AB	1.40
12A-0431	C5	AB	1.34
12A-0431	C6	AB	1.44
12A-0432	C1	AB	1.73
12A-0432	C2	AB	1.59
12A-0432	C3	AB	1.50
12A-0433	C1	AB	1.44
12A-0433	C2	AB	1.46
12A-0433	C3	AB	1.43
12A-0434	C2	AB	1.32
12A-0434	C4	AB	1.34
12A-0435	C1	AB	1.27
12A-0435	C2	AB	1.28
12A-0435	C3	AB	1.23
12A-0436	C1	AB	1.31
12A-0436	C4	AB	1.27
12A-0436	C6	AB	1.23
12A-0437	C1	AB	1.27
12A-0437	C3	AB	1.27
12A-0437	C4	AB	1.27
12A-0438	C1	AB	1.17

Table 2-7
Bulk Density for LRC SSP Sediment Core Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location ID	Core Number	Core Segment ID	Bulk Density (g/cm^3)
12A-0438	C2	AB	1.12
12A-0438	C3	AB	1.20
12A-0439	C1	AB	1.23
12A-0439	C3	AB	1.27
12A-0439	C4	AB	1.26
12A-0440	C1	AB	1.68
12A-0440	C2	AB	1.63
12A-0440	C3	AB	1.52
12A-0441	C1	AB	1.26
12A-0441	C2	AB	1.22
12A-0441	C4	AB	1.26
12A-0442	C1	AB	1.26
12A-0442	C2	AB	1.28
12A-0442	C3	AB	1.24
12A-0443	C3	AB	1.35
12A-0443	C4	AB	1.43
12A-0443	C5	AB	1.48
12A-0444	C2	AB	1.36
12A-0444	C3	AB	1.33
12A-0444	C4	AB	1.38
12A-0445	C1	AB	1.28
12A-0445	C2	AB	1.33
12A-0445	C3	AB	1.30
12A-0446	C1	AB	1.26
12A-0446	C2	AB	1.16
12A-0446	C3	AB	1.24
12A-0447	C2	AB	1.34
12A-0447	C3	AB	1.42
12A-0447	C4	AB	1.40
12A-0448	C1	AB	1.30
12A-0448	C2	AB	1.34
12A-0448	C3	AB	1.33
12A-0449	C4	AB	1.35
12A-0449	C5	AB	1.36
12A-0449	C6	AB	1.34
12A-0450	C2	AB	1.58
12A-0450	C3	AB	1.67
12A-0450	C4	AB	1.70
12A-0451	C1	AB	1.47
12A-0451	C2	AB	1.37
12A-0451	C3	AB	1.36
12A-0452	C2	AB	1.20
12A-0452	C4	AB	1.22
12A-0452	C5	AB	1.23
12A-0453	C4	AB	0.96
12A-0453	C5	AB	1.37
12A-0453	C6	AB	1.37
12A-0454	C3	AB	1.25
12A-0454	C4	AB	1.22
12A-0454	C5	AB	1.30
12A-0455	C5	AB	1.38
12A-0455	C6	AB	1.50
12A-0455	C8	AB	1.65
12A-0456	C1	AB	1.22

Table 2-7
Bulk Density for LRC SSP Sediment Core Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location ID	Core Number	Core Segment ID	Bulk Density (g/cm^3)
12A-0456	C3	AB	1.24
12A-0456	C4	AB	1.18
12A-0457	C4	AB	1.60
12A-0457	C6	AB	1.55
12A-0458	C1	AB	1.22
12A-0458	C2	AB	1.26
12A-0458	C3	AB	1.28
12A-0459	C1	AB	1.59
12A-0459	C2	AB	1.59
12A-0459	C3	AB	1.53
12A-0460	C1	AB	1.42
12A-0460	C2	AB	1.43
12A-0460	C3	AB	1.40
12A-0461	C1	AB	1.24
12A-0461	C2	AB	1.28
12A-0461	C3	AB	1.18
12A-0462	C3	AB	0.99
12A-0462	C5	AB	1.11
12A-0462	C6	AB	1.17
12A-0463	C1	AB	1.80
12A-0463	C2	AB	1.77
12A-0464	C2	AB	1.74
12A-0464	C4	AB	1.32
12A-0464	C5	AB	1.34
12A-0465	C1	AB	1.81
12A-0465	C3	AB	1.87
12A-0465	C4	AB	1.81
12A-0467	C3	AB	1.90
12A-0467	C5	AB	1.92
12A-0467	C6	AB	1.81
12A-0468	C1	AB	1.38
12A-0468	C2	AB	1.43
12A-0468	C3	AB	1.39
12A-0469	C1	AB	1.38
12A-0469	C2	AB	1.40
12A-0469	C5	AB	1.30
12A-0470	C6	AB	1.97
12A-0470	C7	AB	1.99
12A-0470	C8	AB	1.97
12A-0471	C1	AB	1.79
12A-0471	C5	AB	1.74
12A-0471	C6	AB	1.69
12A-0472	C3	AB	1.83
12A-0472	C4	AB	1.90
12A-0472	C5	AB	1.87
12A-0473	C4	AB	1.65
12A-0473	C5	AB	1.58
12A-0473	C7	AB	1.44
12A-0474	C3	AB	1.20
12A-0474	C5	AB	1.16
12A-0474	C6	AB	1.29
12A-0475	C1	AB	1.30
12A-0475	C2	AB	1.29
12A-0475	C3	AB	1.31

Table 2-7
Bulk Density for LRC SSP Sediment Core Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location ID	Core Number	Core Segment ID	Bulk Density (g/cm^3)
12A-0476	C1	AB	1.48
12A-0476	C2	AB	1.53
12A-0476	C3	AB	1.41
12A-0477	C1	AB	1.35
12A-0477	C2	AB	1.27
12A-0477	C3	AB	1.48
12A-0478	C1	AB	1.49
12A-0478	C2	AB	1.34
12A-0478	C3	AB	1.41
12A-0479	C1	AB	1.83
12A-0479	C2	AB	1.80
12A-0479	C4	AB	2.00
12A-0480	C1	AB	1.74
12A-0480	C6	AB	1.90
12A-0480	C7	AB	1.67
12A-0481	C2	AB	1.35
12A-0481	C3	AB	1.43
12A-0481	C4	AB	1.50
12A-0482	C1	AB	1.49
12A-0482	C3	AB	1.86
12A-0482	C4	AB	1.75
12A-0483	C1	AB	1.40
12A-0483	C2	AB	1.60
12A-0483	C3	AB	1.43
12A-0484	C1	AB	1.90
12A-0484	C4	AB	1.98
12A-0484	C8	AB	1.94
12A-0485	C1	AB	1.69
12A-0485	C2	AB	1.72
12A-0485	C4	AB	2.23
12A-0486	C1	AB	1.64
12A-0486	C3	AB	1.72
12A-0486	C7	AB	1.65

Notes:
g/cm^3 = grams per cubic centimeter
No cores were collected at location 12A-0466

Table 2-8
Salinity for Porewater from LRC SSP Sediment Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Projec

Location	Collection Date	River Mile	Grab or Core[1]	Salinity Screening Results (parts/thousand)
12A-0401	02/09/12	0.17	G	17
12A-0402	02/08/12	0.25	C	16
12A-0403	02/07/12	0.5	C	17
12A-0404	02/01/12	0.68	C	6
12A-0405	02/01/12	1.31	C	14
12A-0406	01/28/12	1.68	G	13
12A-0407	01/26/12	1.83	C	10
12A-0408	02/03/12	1.97	C	14
12A-0409	02/06/12	1.96	C	8
12A-0410	02/06/12	1.98	C	14
12A-0411	02/02/12	2.02	C	14
12A-0412	02/02/12	2.55	C	0
12A-0413	01/28/12	2.53	C	4
12A-0414	01/25/12	2.69	C	14
12A-0415	01/26/12	2.69	C	11
12A-0416	01/31/12	2.84	C	9
12A-0417	01/31/12	2.85	C	12
12A-0418	01/30/12	2.84	C	3
12A-0419	01/20/12	2.86	C	0
12A-0420	01/20/12	2.96	C	9
12A-0421	02/07/12	3.14	C	2
12A-0422	01/24/12	3.14	C	8
12A-0423	01/25/12	3.3	C	3
12A-0424	01/25/12	3.3	C	10
12A-0425	01/24/12	3.45	C	3
12A-0426	01/24/12	3.64	C	10
12A-0427	01/25/12	3.64	C	5
12A-0428	01/25/12	3.64	G	10
12A-0429	01/24/12	3.64	C	5
12A-0430	01/24/12	3.7	C	2
12A-0431	01/26/12	3.77	C	5
12A-0432	01/27/12	3.83	C	10
12A-0433	01/27/12	3.94	C	4
12A-0434	01/25/12	4.05	C	6
12A-0435	01/27/12	4.09	C	3
12A-0436	01/27/12	4.14	C	4
12A-0437	02/06/12	4.24	C	7
12A-0438	02/09/12	4.52	C	4
12A-0439	02/08/12	4.53	G	8
12A-0440	02/07/12	4.54	C	6
12A-0441	01/28/12	4.63	G	2
12A-0442	01/26/12	4.63	C	2

Table 2-8
Salinity for Porewater from LRC SSP Sediment Samples
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Projec

Location	Collection Date	River Mile	Grab or Core[1]	Salinity Screening Results (parts/thousand)
12A-0443	01/26/12	4.63	C	6
12A-0444	01/28/12	4.64	C	0
12A-0445	01/30/12	4.96	C	1
12A-0446	01/31/12	4.96	C	5
12A-0447	01/30/12	5.2	C	1
12A-0448	02/07/12	5.9	C	0
12A-0449	01/31/12	6.33	C	0
12A-0450	01/28/12	6.33	G	0
12A-0451	01/13/12	6.33	C	0
12A-0452	02/03/12	6.49	C	0
12A-0453	02/02/12	6.54	C	0
12A-0454	01/31/12	6.62	C	0
12A-0455	02/07/12	6.86	C	0
12A-0456	02/09/12	6.76	C	0
12A-0457	01/10/12	6.95	C	0
12A-0458	02/01/12	7.1	C	0
12A-0459	01/31/12	7.21	C	0
12A-0460	01/11/12	7.32	C	0
12A-0461	02/09/12	7.23	C	0
12A-0462	01/10/12	7.62	C	0
12A-0463	01/10/12	7.62	C	0
12A-0464	01/11/12	7.62	C	0
12A-0465	02/03/12	7.86	C	0
12A-0467	01/16/12	8.25	C	0
12A-0468	02/09/12	8.42	C	0
12A-0469	01/18/12	8.38	C	0
12A-0470	01/30/12	8.65	C	0
12A-0471	01/30/12	8.78	C	0
12A-0472	01/30/12	8.78	G	0
12A-0473	01/12/12	9.14	C	0
12A-0474	01/12/12	9.29	C	0
12A-0475	01/13/12	9.29	C	0
12A-0476	02/07/12	9.6	C	1
12A-0477	02/08/12	9.8	C	0
12A-0478	01/17/12	10.19	C	0
12A-0479	01/17/12	10.26	G	0
12A-0480	02/02/12	10.31	C	0
12A-0481	02/06/12	11.24	C	0
12A-0482	02/08/12	11.79	G	0
12A-0483	01/18/12	12.21	G	0
12A-0484	01/18/12	12.3	C	0
12A-0485	02/08/12	12.71	G	0
12A-0486	02/01/12	13	C	0

Notes:
G = grab sample
C = core
[1]Where salinity measurements could not be obtained from the grab samples, salinity data are provided for the top interval of the core.
There was no sample collected at location 12A-0466.

Table 2-9
Data Qualification Codes and Definitions for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Qualifier	Definition[1]
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
JN	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
Q	The associated sample result's combined standard uncertainty exceeded the project required uncertainty (radiochemical data only)[2].
EMPC-J	The analyte was positively identified; the associated numerical value is the estimated maximum potential concentration.

Notes:
[1] Qualifier definitions are consistent with USEPA Region 2 data validation guidance documents except where noted.
[2] Source is Multi-Agency Radiological Laboratory Analytical Protocols Manual, July 2004. EPA 402-B-04-001A.

Table 2-10
Summary of USEPA Split Sampling for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	CPG Sample ID	Core No. /Interval	Date Collected	Depth Interval (feet)	PAHs	Pesticides	PCB Congeners	PCDD/PCDF	SVOCs	TPH	Metals + Titanium	Mercury	TOC
12A-0460	12A-0460-C1AS-C	C1AS	1/11/2012	0 - 0.5	X	X	X	X				X	
12A-0460	12A-0460-C3AS-C	C3AS	1/11/2012	0 - 0.5					X	X	X		X
12A-0460	12A-0460-C1BS-C	C1BS	1/11/2012	0.5 - 1.5	X	X	X	X		X		X	
12A-0460	12A-0460-C3BS-C	C3BS	1/11/2012	0.5 - 1.5					X		X		X
12A-0460	12A-0460-C1CS-C	C1CS	1/11/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0460	12A-0460-C3CS-C	C3CS	1/11/2012	1.5 - 2.5					X		X		X
12A-0478	12A-0478-C2AS-C	C2AS	1/17/2012	0 - 0.5	X	X	X	X				X	
12A-0478	12A-0478-G1AS-C	G1AS	1/17/2012	grab					X		X		X
12A-0478	12A-0478-C1AS-C	C1AS	1/17/2012	0 - 0.5						X			
12A-0478	12A-0478-C2BS-C	C2BS	1/17/2012	0.5 - 1.5	X	X	X	X				X	
12A-0478	12A-0478-C1BS-C	C1BS	1/17/2012	0.5 - 1.5					X	X	X		X
12A-0478	12A-0478-C2CS-C	C2CS	1/17/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0478	12A-0478-C1CS-C	C1CS	1/17/2012	1.5 - 2.5					X		X		X
12A-0484	12A-0484-C8AS-C	C8AS	1/18/2012	0 - 0.5	X	X	X	X		X		X	
12A-0484	12A-0484-C4AS-C	C4AS	1/18/2012	0 - 0.5					X		X		X
12A-0484	12A-0484-C8BS-C	C8BS	1/18/2012	0.5 - 1.5	X	X	X	X	X		X	X	X
12A-0484	12A-0484-C4BS-C	C4BS	1/18/2012	0.5 - 1.5						X			
12A-0484	12A-0484-C8CS-C	C8CS	1/18/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0484	12A-0484-C4CS-C	C4CS	1/18/2012	1.5 - 2.5					X		X		X
12A-0420	12A-0420-C2AS-C	C2AS	1/23/2012	0 - 0.5	X	X	X	X				X	
12A-0420	12A-0420-G1AS-C	G1AS	1/23/2012	grab					X	X	X		X
12A-0420	12A-0420-C2BS-C	C2BS	1/23/2012	0.5 - 1.5	X	X	X	X		X		X	
12A-0420	12A-0420-C1BS-C	C1BS	1/23/2012	0.5 - 1.5					X		X		X
12A-0420	12A-0420-C2CS-C	C2CS	1/23/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0420	12A-0420-C1CS-C	C1CS	1/23/2012	1.5 - 2.5					X		X		X
12A-0425	12A-0425-C2AS-C	CSAS	1/24/2012	0 - 0.5	X	X	X	X				X	
12A-0425	12A-0425-C4AS-C	C4AS	1/24/2012	0 - 0.5					X	X	X		X
12A-0425	12A-0425-C2BS-C	C2BS	1/24/2012	0.5 - 1.5	X	X	X	X		X		X	
12A-0425	12A-0425-C4BS-C	C4BS	1/24/2012	0.5 - 1.5					X		X		X
12A-0425	12A-0425-C2CS-C	C2CS	1/24/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0425	12A-0425-C4CS-C	C4CS	1/24/2012	1.5 - 2.5					X		X		X
12A-0422	12A-0422-C5AS-C	C5AS	1/24/2012	0 - 0.5	X	X	X	X					
12A-0422	12A-0422-G1AS-C	G1AS	1/24/2012	grab					X		X		X
12A-0422	12A-0422-C3AS-C	C3AS	1/24/2012	0 - 0.5						X		X	
12A-0422	12A-0422-C5BS-C	C5BS	1/24/2012	0.5 - 1.5	X	X	X	X		X		X	
12A-0422	12A-0422-C3BS-C	C3BS	1/24/2012	0.5 - 1.5					X		X		X
12A-0422	12A-0422-C5CS-C	C5CS	1/24/2012	1.5 - 2.5	X	X	X	X		X		X	
12A-0422	12A-0422-C3CS-C	C3CS	1/24/2012	1.5 - 2.5					X		X		X
12A-0418	12A-0418-C1AS-C	C1AS	1/30/2012	0 - 0.5	X	X	X	X					

Table 2-10
Summary of USEPA Split Sampling for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Location	CPG Sample ID	Core No. /Interval	Date Collected	Depth Interval (feet)	PAHs	Pesticides	PCB Congeners	PCDD/PCDF	SVOCs	TPH	Metals + Titanium	Mercury	TOC
12A-0418	12A-0418-C3AS-C	C3AS	1/30/2012	0 - 0.5					X		X	X	X
12A-0418	12A-0418-C2AS-C	C2AS	1/30/2012	0 - 0.5						X			
12A-0418	12A-0418-C1BS-C	C1BS	1/30/2012	0.5 - 1.5	X	X	X	X				X	
12A-0418	12A-0418-C3BS-C	C3BS	1/30/2012	0.5 - 1.5					X	X	X		X
12A-0418	12A-0418-C1CS-C	C1CS	1/30/2012	1.5 - 2.5	X	X	X	X				X	
12A-0418	12A-0418-C3CS-C	C3CS	1/30/2012	1.5 - 2.5					X	X	X		X
12A-0417	12A-0417-C4AS-C	C4AS	1/31/2012	0 - 0.5	X	X	X	X					
12A-0417	12A-0417-C3AS-C	C3AS	1/31/2012	0 - 0.5					X		X	X	X
12A-0417	12A-0417-G1AS-C	G1AS	1/31/2012	grab						X			
12A-0417	12A-0417-C4BS-C	C4BS	1/31/2012	0.5 - 1.5	X	X	X	X	X		X	X	X
12A-0417	12A-0417-C3BS-C	C3BS	1/31/2012	0.5 - 1.5						X			
12A-0417	12A-0417-C4CS-C	C4CS	1/31/2012	1.5 - 2.5	X	X	X	X	X		X	X	X
12A-0417	12A-0417-C3CS-C	C3CS	1/31/2012	1.5 - 2.5						X			
12A-0447	12A-0447-C2AS-C	C2AS	1/30/2012	0 - 0.5	X	X	X	X				X	
12A-0447	12A-0447-C3AS-C	C3AS	1/30/2012	0 - 0.5					X	X	X		X
12A-0447	12A-0447-C2BS-C	C2BS	1/30/2012	0.5 - 1.5	X	X	X	X		X		X	
12A-0447	12A-0447-C3BS-C	C3BS	1/30/2012	0.5 - 1.5					X		X		X
12A-0447	12A-0447-C2CS-C	C2CS	1/30/2012	1.5 - 2.5	X	X	X	X				X	
12A-0447	12A-0447-C3CS-C	C3CS	1/30/2012	1.5 - 2.5					X	X	X		X

Notes:
SVOC - Semivolatile Organic Compound
PCB - Polychlorinated Biphenyl
PAH - Polynuclear Aromatic Hydrocarbon
PCDD - Polychlorinated Dibenzodioxins
PCDF - Polychlorinated Dibenzofurans
TPH - Total Petroleum Hydrocarbons
The information in this table was provided by CDM Smith.

Table 2-11
Location of Field and Laboratory Data for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Data Type	Location
Air Monitoring Calibration Forms	Project files at AECOM
Ambient Air Monitoring from CPG Field Facility	Project files at AECOM
Bulk Density Data (field determination)	Project files at AECOM; summarized in **Table 2-7**
Chain of Custody Forms	Project files at AECOM
Core and Grab Photos	Project files at AECOM; included in **Appendix F** on CD
Tide Gage Locations and Water Elevations	Project files at AECOM; summary included in **Appendix B**
Core Field Custody and Transfer Forms	Project files at AECOM
Core Elevation (river bottom)	Project files at AECOM; summarized in **Table 2-2**
Data Quality Objective Tables	Report, Section 1.2
Data Validation Reports	Project files at AECOM; included in **Appendix H**
Field Log Books	Project files at AECOM; included in **Appendix D**
Field Modification Forms	Project files at AECOM
HASP Addendum Acceptance Forms	Project files at AECOM
Health & Safety Daily Briefings	Project files at AECOM
Health & Safety Personnel Records	Project files at AECOM
Investigation Derived Waste Summary	Project files at AECOM; included as **Appendix C**
Laboratory EDD	Submitted electronically in MEDD Region 2 format with monthly progress report
Laboratory Data Reports	Project files at AECOM; submitted monthly to USEPA
Lithology Core Records	Project files at AECOM; included as **Appendix E**
Nonconformance Forms	Project files at AECOM
Performance Evaluation Sample Results	Project files at AECOM; summarized in **Appendix G**
Field QC Results Summary	**Appendix J**
Quality Assurance Project Plan Sign-off	Project files at AECOM
Safety Audit	Project files at AECOM
Salinity Data	Project files at AECOM; summarized in **Table 2-8**
Sample Summary Table	**Appendix A**
Sediment Core Collection Records	Project files at AECOM; summarized in **Table 2-2**
Sediment Core Processing Records	Project files at AECOM; summarized in **Table 2-3**
Sediment Grab Collection Records	Project files at AECOM; summarized in **Table 2-4**
Sediment Sample Results Summary	**Appendix I**
Technical Audits of Field Activities	Project files at AECOM
Walk-in Cooler Daily Temperature Log (at CPG field facility)	Project files at AECOM

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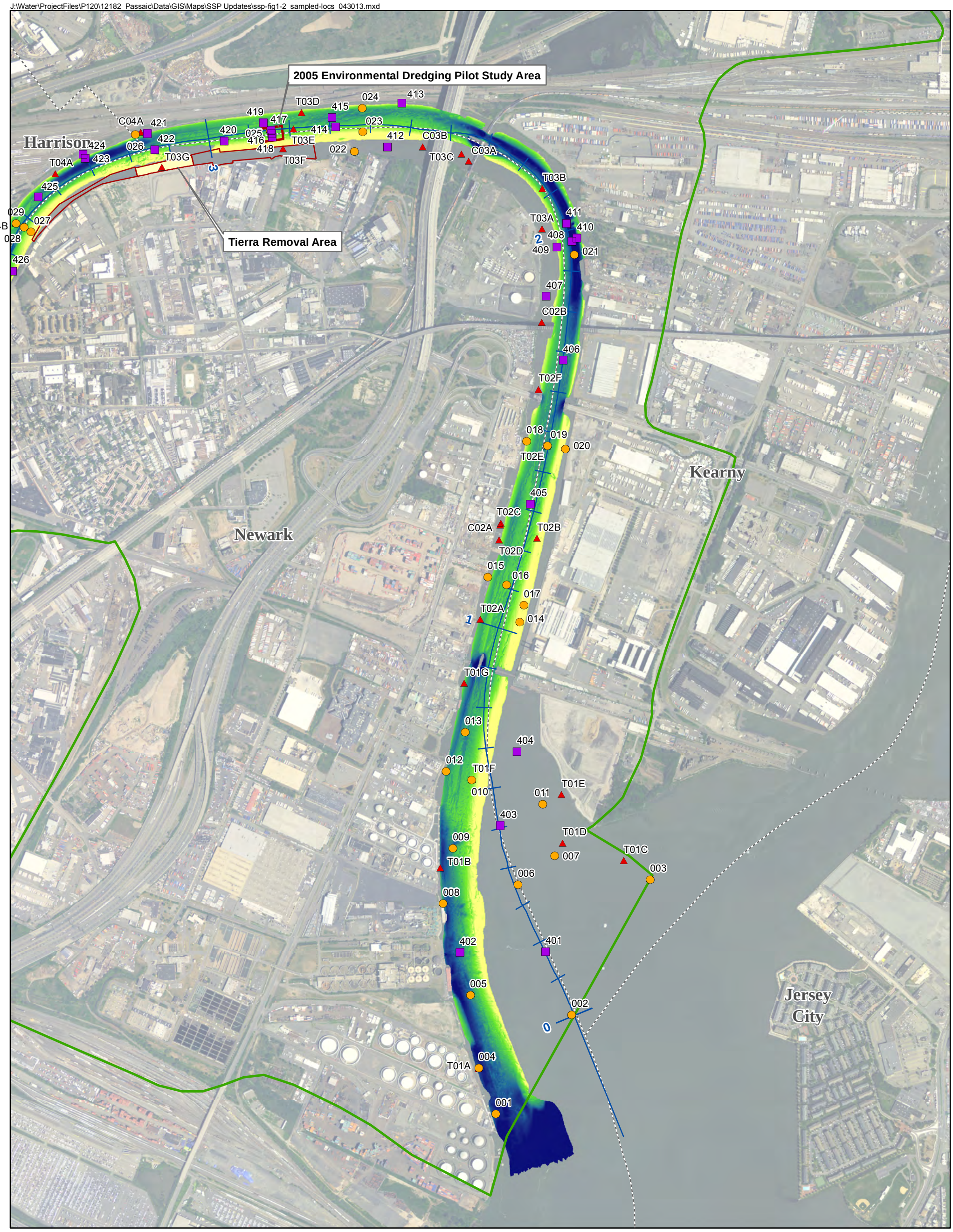

Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure 2-1 Sediment Sample Locations

RM 0 to 3.5

Page 1 of 5

November 2014

AECOM

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

N

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

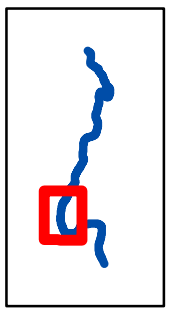
ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure 2-1 Sediment Sample Locations

RM 3.5 to 7.3

Page 2 of 5



November 2014

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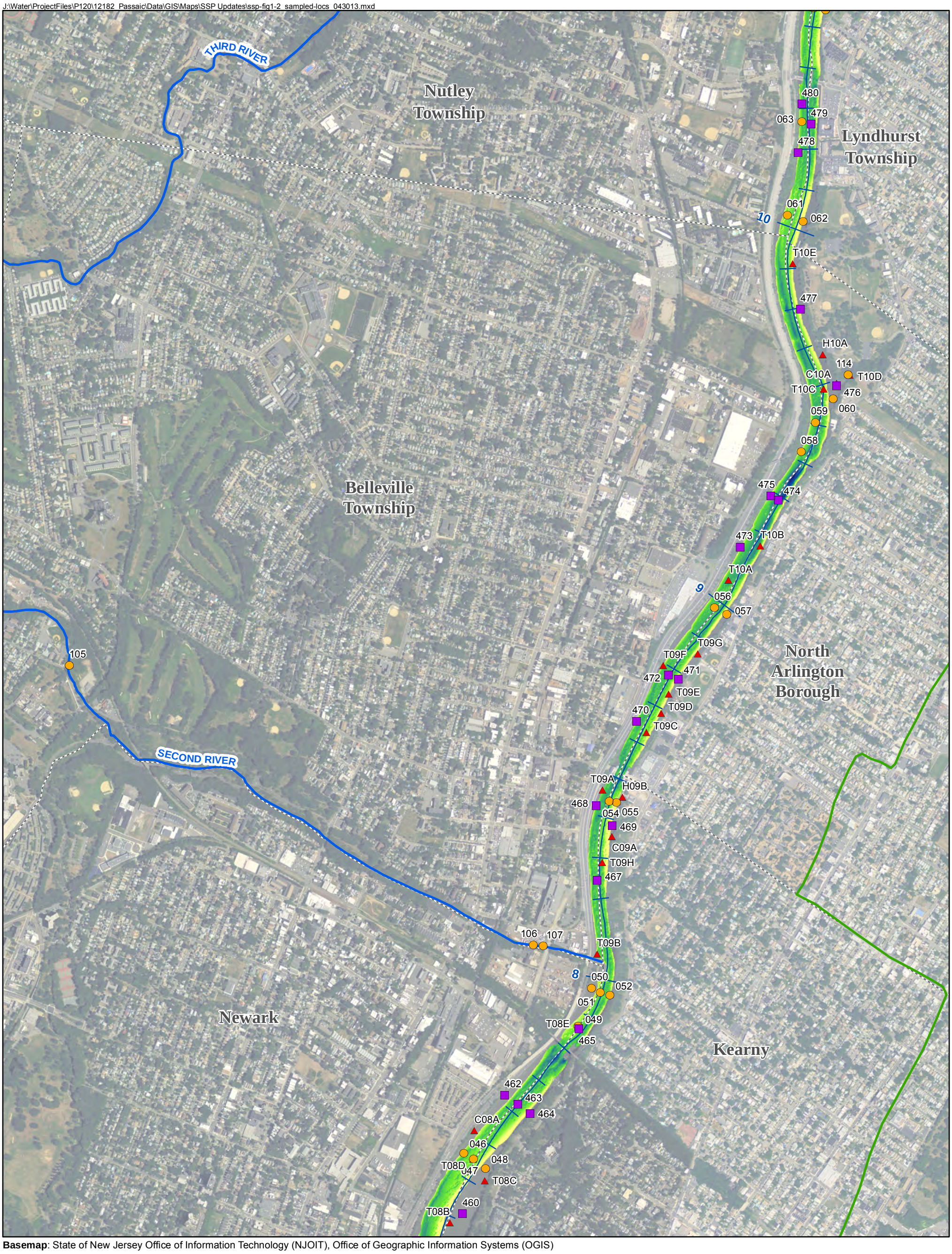

Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure 2-1 Sediment Sample Locations

RM 7.3 to 10.5

Page 3 of 5

November 2014

AECOM

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

N

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure 2-1 Sediment Sample Locations

RM 10.5 to 13.9

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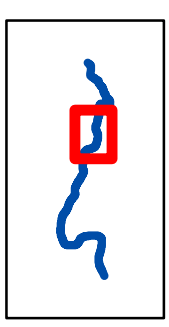

November 2014

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Basemap: State of New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS)

0 500 1,000 2,000 3,000 Feet

- LRC SSP Sampled Locations (2012)
- LRC Sampled Locations (2008)
- Benthic Sampled Locations (2009/10)
- LPRSA

Elevation (2011 Multibeam Bathymetry Survey)

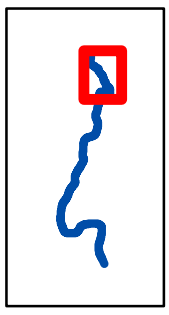
ft NGVD29

-0.0075
-10.4
-20.8
-31.2
-41.5451

Figure 2-1 Sediment Sample Locations

RM 13.9 to 18.4

Page 5 of 5



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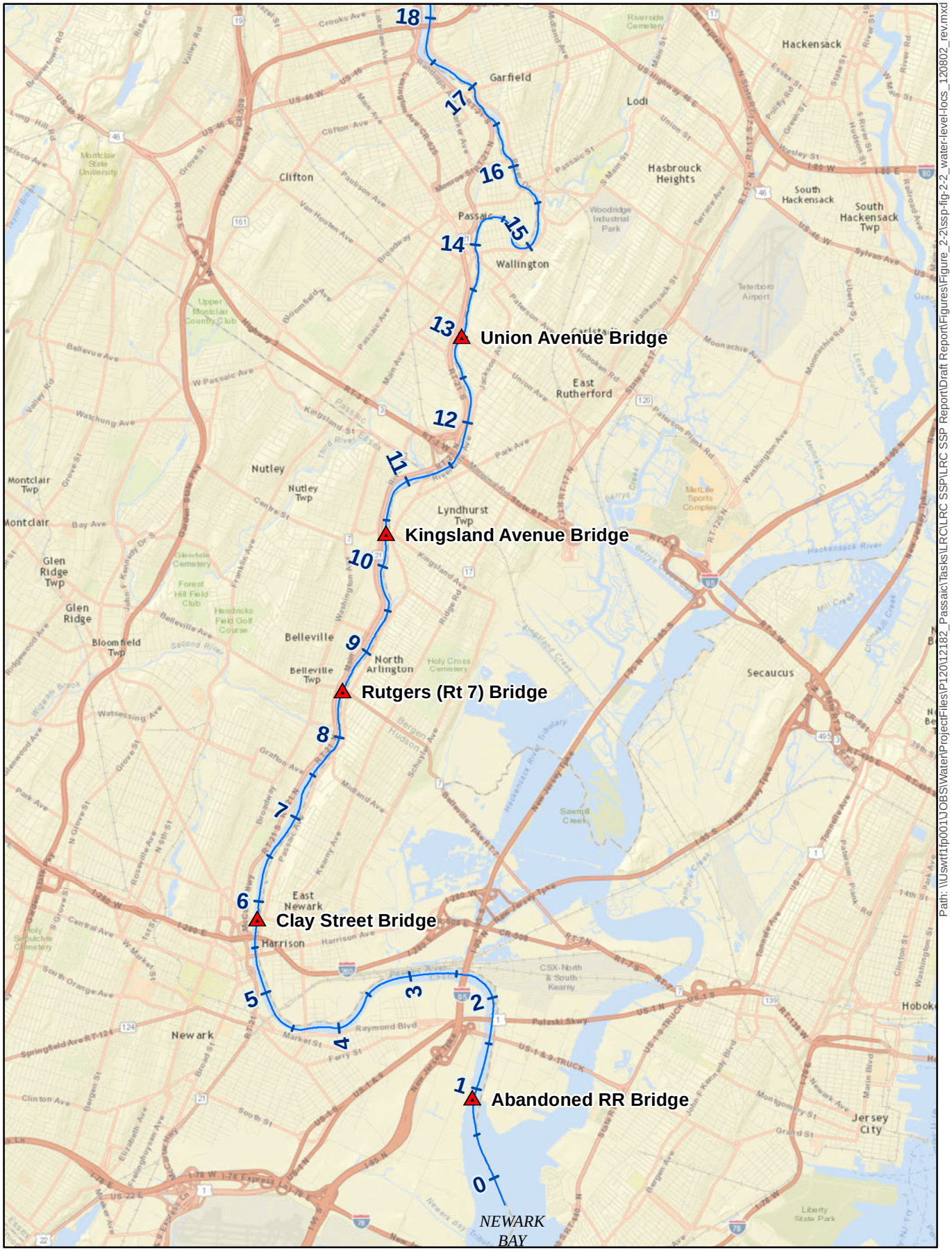

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Figure 2-2 Water Level Monitoring Stations in the Lower Passaic River for LRC SSP

0 0.5 1 2 Miles

AECOM

Water Level Monitoring Station

River Mile

November 2014

Basemap: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

3.0 Sediment Sampling Results

This section contains tables and figures of the LRC SSP data along with the LRC and benthic sampling data. It also includes a summary of significant findings offered following review of the LRC SSP data. All data presented in this section have been validated using the process described in Section 2.8.2. Data qualifiers are not presented in the tables and figures although they are shown in **Appendix I**, which includes complete tables of analytical data for each analyte group for all samples collected. The analytical results are included in the database and were provided to USEPA electronically.

For the purpose of presentation in this section, a subset of analytes was selected to illustrate physical properties and chemical nature and extent within the LPRSA sediments. The subset of analytes and parameters included in these figures is presented in **Table 3-1**. These analytes include those that have been the focus of other data reviews, including the COPCs defined in the Empirical Mass Balance Model of the Focused Feasibility Study (MPI 2007b). For these data presentations, where an analyte was not detected, the concentration is shown as the detection limit (DL). Samples that had associated field duplicates are represented by an average of the detected results; if one result was not detected, the value of the detected result is used, and if both were not detected, the sample concentration is shown as not detected at the average of the DLs.

To provide a complete summary of the sediment analytical data collected to date, the earlier LRC (AECOM 2014) and benthic (Windward, 2011) sediment sampling data have been included on select figures with the LRC SSP data. Each figure identifies if it includes LRC SSP, LRC and benthic data or only the LRC SSP data. Note that the sediment data collected during the River Mile 10.9 Characterization Program (CH2M Hill and AECOM 2012) are not included in the select figures in this report because a Removal Action has been completed for the RM 10.9 area.

To maintain a consistent set of comparable data, the following data sets were not included: grab samples for the LRC, grab samples for the LRC SSP, and the finer segmentation cores for the LRC sampling program. The benthic sediment sampling program only collected grab samples so the benthic grab sample data set is included on these figures.

In the following sections and associated tables and figures surface data represents the 0- to 0.5-foot depth below sediment surface, subsurface data represents sediment depths greater than 0.5 ft and all data contain all of the available data. The following exceptions are noted to the surface sediment data depth interval presented above (0.0 to 0.5 ft): benthic sample LPRH05A (0.0 to 0.2 ft), benthic sample LPRH07B (0.0 to 0.4 ft), LRC SSP sample 12A-0467 (0.0 to 0.45 ft), and LRC sample CLRC-092 (0.0 to 0.7 ft). The same exceptions are noted to the subsurface sediment data depth intervals where the subsurface sediment data begins at the bottom of the surface data.

3.1 Concentration Box and Whisker Plots

Figures 3-1.a through **3-1.n** present box and whisker plots of select analyte concentrations and physical parameters for the sediment sampling stations in the Passaic River (excluding tributary locations) grouped into two mile segments. These plots include the LRC SSP, LRC and benthic data. Box and whisker plots are provided for surface data (Surface Sediments), subsurface data (Subsurface Sediments), and all depths data (All Sediments). The chemical concentrations are presented on a dry weight basis.

3.2 Surficial Sediment Concentrations by River Mile

Figures 3-2.a through **3-2.z** present select analyte concentrations and physical parameters in surficial sediments plotted against the RM of the sampling location. These figures include the LRC SSP, LRC and benthic data. RMs are based on the centerline developed by MPI and were extended above the

Dundee Dam for the LRC and benthic sampling program in Dundee Lake. Core stations in the tributaries are plotted at the RM location at the confluence of the tributary with the LPR. Surficial sediment data from the 0 to 0.5-foot interval (with the exceptions noted above) of the sediment cores are used for these figures. Because chemical concentrations in sediments frequently vary with TOC concentrations (particularly hydrophobic organic carbons such as PCBs and TCDD/TCDF), chemical concentrations are presented both on a dry weight basis and on a TOC-normalized basis. Percent fine data are also presented as TOC-normalized to support evaluations of the presence of a relationship between TOC and percent fines. The plots are presented with both linear and log concentration scales to better depict the variation in the surficial sediment concentrations.

3.3 Surficial Sediment Concentrations Maps

Figures 3-3.a through **3-3.n** present maps of select analyte concentrations and physical parameters in surficial sediments. These maps include the LRC SSP, LRC and benthic data. Data included in these figures are limited to sediment results from the 0- to 0.5-foot interval (with the exceptions noted above). On these figures, locations are identified by program using geometric shapes (i.e., circle for LRC, triangle for benthic, and square for LRC SSP) and use the unique sample code specific to the location. Data are presented in units per kilogram (kg) of dry weight sediment, with no carbon normalization. Color symbology was developed by dividing the concentration range into percentile values (25%, 50%, 75%, and 90%). The COPC concentrations at each station are presented below the station location code. At stations where the analyte was not detected, the concentration is shown as the DL. Included on these maps are the RM markers (as provided by MPI in previous studies and extended above Dundee Dam for the LRC and benthic programs).

3.4 Analyte Concentrations by Depth

Figures 3-4.a through **3-4.n** present plots of analyte concentrations and physical parameters by depth. These plots are included for the LRC SSP data only. For these figures, the locations are identified using the three-digit location code (xxx) only. The RM is included for each core. Data are presented in units per kg of dry weight sediment, with no carbon normalization. Color symbology was developed by dividing the concentration range by percentile values (25%, 50%, 75%, and 90%). At locations where the analyte was not detected, the concentration is shown as the DL. **Figure 3-4.n** presents the grain size profile, where grain size is represented as percent passing either the #200 sieve (one station 12A-0424) or the #230 sieve (all remaining stations); higher percentage values indicate finer sediments. As noted in Section 2.0, sample location 12A-0466 was not sampled.

3.5 Vertical Downcore Profiles

Figures 3-5.a through **3-5.n** show vertical concentration and grain size profiles for select analytes at all LRC SSP locations. These profiles are limited to the LRC SSP data only. For these figures, the stations are identified using the three-digit location code (xxx) only. The RM is included for each core. Each plot presents the analyte concentration depth profile for each segment analyzed in the core, plotted at the mid-depth (based on recovered depth) of the core segment. Each plot also presents the grain size profile, where grain size is represented as percent passing either the #200 sieve (one station 12A-0424) or the #230 sieve (all remaining stations); higher percentage values indicate finer sediments. At some of the locations, only one segment was collected and analyzed for several of the analytes, and only a single point appears in the plots. As noted in Section 2.0, sample location 12A-0466 was not sampled.

3.6 Analytical Summary Tables

A set of summary tables including the LRC SSP, LRC and benthic data for the selected subset of chemical analytes is presented in **Tables 3-2** to **3-3**. These tables summarize the highest concentrations and their locations for each of the chemical analytes identified in **Table 3-1**. **Table 3-2** presents the single highest concentration for each analyte from the 0- to 0.5-foot surficial interval for

LRC, LRC SSP, and benthic data. **Table 3-3** presents the ten highest surficial concentrations for the LRC, LRC SSP, and benthic data.

The full suite of LRC SSP chemical results for each sample is provided in **Appendix I**.

3.7 Radiochemistry Analysis

LRC SSP sediment samples were analyzed for Ra-226 and Pb-210 (measured as Po-210) to calculate net sedimentation rates and evaluate sediment stability. Radionuclide data was obtained from each sediment segment at each station where an HRC was collected. As described in Section 2.0, HRCs were not collected from two stations within the 2005 Environmental Dredging Pilot Study Area (12A-0417 and 12A-0418). The radiochemistry results for each sample are provided in **Appendix I**.

3.8 AVS/SEM

AVS/SEM data were collected to assess the bioavailability of selected divalent metals in sediment as shown in **Table 3-4** and in **Appendix I**. Surficial (0- to 0.5-foot) samples were collected for the AVS/SEM analyses to minimize the potential influence of deeper anoxic sediments on this measure of bioavailability.

The following approach was used to present the AVS/SEM data shown in **Table 3-4**. The SEM concentration represents the metals extracted in the AVS analytical procedure recommended by USEPA. USEPA guidance (USEPA 2005) suggests using the difference (SEM minus AVS) for evaluation of metals bioavailability in sediments, where differences greater than zero suggest excess metals that may be bioavailable. Organic carbon can impact bioavailability, and normalization of the differences provides another evaluation of potential bioavailability, and reduces the uncertainty associated with the prediction. When normalized to the fraction of organic carbon (foc) in the sample, (SEM-AVS)/foc less than 130 micromoles/per gram - organic carbon (umol/g-oc) is unlikely to pose toxicity, and values greater than 3,000 umol/g-oc is likely to pose toxicity (USEPA 2005).

3.9 Significant Observations

The following observations are offered regarding the LRC SSP program:

- Declining concentrations were observed in samples collected above RM 12 for multiple COPCs (e.g., 2,3,7,8-TCDD,total PCBs, and total DDx [sum of Dichlorodiphenyldichloroethane, Dichlorodiphenyldichloroethylene, and Dichlorodiphenyltrichloroethane isomers]) but not for PAHs (**Figures 3-1.a** through **3-1.n** and **3-2.a** through **3-2.z**).
- Shoals were a focus of the LRC SSP, to provide better characterization of these areas. Shoals were observed with both elevated and relatively low concentrations, as summarized below:
  - Previously uncharacterized elevated concentrations of 2,3,7,8-TCDD were observed in sediments of the left bank shoal at RM 4.54 (12A-0440) and RM 4.64 (12A-0444) with concentrations in the surface sediment at 21,900 nanogram per kilogram (ng/kg) and 10,800 ng/kg, respectively. 2,3,7,8-TCDD surface concentrations were at least 1-2 orders of magnitude higher at both locations than adjacent sediments at locations that extend laterally across the channel (**Figure 3-3.a**). 2,3,7,8-TCDD was found in subsurface intervals at elevated concentrations at these two locations (**Figures 3-4.a** and **3-5.a**). Elevated levels of total PCBs (18.6 and 20.4 milligram per kilogram [mg/kg]), High Molecular Weight (HMW) PAHs (342 and 59.3 mg/kg), Low Molecular Weight (LMW) PAHs (749 and 30.2 mg/kg), mercury (10.1 and 15.4 mg/kg) as well as pesticides and metals were observed in these surface sediment samples.
  - Additional confirmation of elevated concentrations of 2,3,7,8-TCDD in sediment located on the right bank shoal in the vicinity of RM 7 to RM 7.5 (12A-0458, 12A-0459, 12A-0460, and

12A-0464) was obtained, with concentrations in the surface sediment ranging from 6,170 to 34,100 ng/kg (**Figure 3-3a**). The surface concentration of 2,3,7,8-TCDD located at 12A-0460 represents the highest concentration detected in surface sediment in the LPRSA. Elevated levels of total PCBs (2.83 to 16.9 mg/kg), mercury (7.8 and 12.2 mg/kg) as well as pesticides and metals were located in these surface sediment locations (**Figures 3-3.a**, **3-3.c**, **3-3.f**, **3-3.g**, **3-3.h**, **3-3.i**, **3-3.j**, **3-3.k**, and **3-3.l**). 2,3,7,8-TCDD surface concentrations were at least 1-2 orders of magnitude higher at these locations than adjacent locations in the deeper portions of the channel (**Figure 3-3.a**). At locations 12A-0458 and 12A-0464, 2,3,7,8-TCDD was found in subsurface intervals at similar elevated concentrations (**Figures 3-4.a** and **3-5.a**). At 12A-0459 and 12A-0460 subsurface 2,3,7,8-TCDD concentrations were several orders of magnitude lower than the surficial concentrations (**Figures 3-4.a** and **3-5.a**).

- Elevated concentrations of several COPCs were observed in the surface sediment at 12A-0476 located at the mouth of Unnamed Creek (2,3,7,8-TCDD – 1,830 ng/kg; total PCBs – 3.51 mg/kg; mercury – 2.97 mg/kg; as well as pesticides and HMW PAHs). Previous data in this area indicated variability, with both elevated and relatively low surficial concentrations observed (**Figures 3-3.a** through **3-3.n**). Elevated concentrations were also observed in the sediment interval (0.5-1.5 feet [ft]) below the surface interval at this location.
- Elevated surficial concentrations of several COPCs were observed within the river bend at RM 3.5. Elevated concentrations were observed at 12A-0427, and for a subset of COPCs at 12A-0426 and 12A-0430 (**Figures 3-3.a** through **3-3.n**)
- Additional characterization above RM 11, where previous data was relatively sparse, indicated relatively low surficial 2,3,7,8-TCDD and total PCBs concentrations, which was generally consistent with data previously collected in this reach (**Figures 3-4a and 3-4c**).
- At several locations between RM 8.3 and RM 9.1 and above RM 11.7, locations were moved and/or grab samples were abandoned due to the presence of hard bottom. The limited surficial sediment and coarsened surface in some areas of the LPRSA was consistent with earlier observations from the LRC probing and sampling activities.
- Within the Dredge pilot area at RM 2.85 (12A-0416, 12A-0417, 12A-0418):
  - Surface COPC concentrations were generally similar to those of nearby samples (**Figures 3-3.a** through **3-3.n**).
  - Silt was observed at the surface in the three cores (**Figures 3-5.a** through **3-5.n**).
  - Surface COPC concentrations were generally lower than those observed at depth (**Figures 3-4.a** through **3-4.n** and **3-5.a** through **3-5.n**).

Table 3-1
Selected Analytes and Physical Parameters for Presentation of Results for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Analyte	Units	Notes
2,3,7,8 – TCDD	nanogram per kilogram (ng/kg)	If ND, the numerical value associated with the detection limit (DL) was reported. For the LRC, as directed by EPA, the dioxin data were adjusted per the recommendations in the CSC Report (CSC 2011): • If a sample had a split sample, the split sample result is reported, • For other samples, results below the Quantitation Limit (QL) are reported as-is, and • Results above the QL were multiplied by the correction factor. LRC SSP and benthic data were not adjusted.
Total TEQ (PCDD TEQ, PCDF TEQ, and PCB TEQ)	ng/kg	The sum of the TEFs (Toxicity Equivalence Factors) from the latest USEPA report (USEPA 2010a) multiplied by detects for the individual group analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF.
Total PCBs Congeners	mg/kg	The sum of all PCB congener (Method 1668A) detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.
Total High Molecular Weight (HMW) PAH by HRGC/LRMS-SIM	mg/kg	The sum of 10 PAH compounds (by HRGC/LRMS-SIM method) with molecular weights greater than 200 grams/mole: Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL. The convention used to summarize high molecular weight (HMW) PAHs for LRC does not include the isomer benzo(j)fluoranthene. Benthic data on HMW PAHs includes reporting of a single value for benzo(b)fluoranthene and benzo(j)fluoranthene because these compounds co-elute.
Total Low Molecular Weight (LMW) PAH by HRGC/LRMS-SIM	mg/kg	The sum of six PAH compounds (by HRGC/LRMS-SIM method): Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.
Total DDx (the sum of the DDD, DDE, DDT isomers)	mg/kg	The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT (by HRGC/HRMS method) detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.
Dieldrin	mg/kg	If ND, the numerical value associated with the DL was reported.
Total Chlordane	mg/kg	The sum of cis−Chlordane, oxy−Chlordane, trans−Chlordane, cis−Nonachlor, and trans−Nonachlor detects. If all ND, reported as the highest individual analyte DL.
Lead-210	pCi/g	Unsupported Lead-210 is Polonium-210 minus Radium-226; if difference is less than zero, reported as zero.
Mercury	mg/kg	If ND, the numerical value associated with the DL was reported.
Cadmium	mg/kg	If ND, the numerical value associated with the DL was reported.
Copper	mg/kg	If ND, the numerical value associated with the DL was reported.
Lead	mg/kg	If ND, the numerical value associated with the DL was reported.
TOC	%	
Percent fines	%	Percent passing Sieve #230 for LRC and LRC SSP (where data available); percent passing Sieve #200 for benthic and one location for LRC SSP (12A-0424, where Sieve #230 data not available); implied sum of silt and clay grain size fractions.

Table 3-2
Highest Surficial (0-0.5 ft) Sediment Concentrations for Selected Chemical Analytes[1] for LRC SSP, LRC, and Benthic Data
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Analyte	Location	River Mile	Result[8]	Units
2,3,7,8-TCDD	12A-0460	7.32	34100	ng/kg
Total TEQ[2]	12A-0460	7.32	34700	ng/kg
Total PCBs[3]	12A-0449	6.33	28.6	mg/kg
Total HMW PAHs[4]	2008 CLRC-103	17.73	542	mg/kg
Total LMW PAHs[5]	12A-0440	4.54	749	mg/kg
Total DDx[6]	LPRT03G	3.13	2.96	mg/kg
Dieldrin	2008 CLRC-047	7.5	0.152	mg/kg
Total Chlordane[7]	2008 CLRC-076	13.47	0.435	mg/kg
Lead	12A-0473	9.14	1030	mg/kg
Mercury	12A-0427	3.64	16.2	mg/kg
Cadmium	12A-0460	7.32	34.7	mg/kg
Copper	12A-0421	3.14	930	mg/kg

Notes:

[1] Considers grab analytical data only for benthic locations and core analytical data only for LRC and LRC SSP locations.

[2] The total TEQ (PCDD TEQ, PCDF TEQ, and PCB TEQ) is sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL.

[3] The sum of all PCB congener (Method 1668A) detects; if all ND, reported as the numerical value associated with the highest individual congener DL.

[4] The sum of 10 PAH compounds (by HRGC/LRMS-SIM method) with molecular weights greater than 200 grams/mole: Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

[5] The sum of six PAH compounds (by HRGC/LRMS-SIM method): Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

[6] The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT (by HRGC/HRMS method) detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

[7] The sum of cis−Chlordane, oxy−Chlordane, trans−Chlordane, cis−Nonachlor, and trans−Nonachlor detects. If all ND, reported as the highest individual analyte DL.

[8] All data presented have been validated. Data qualifiers are presented in Appendix I for all samples and analytes.

Table 3-3

Ten Highest Surficial (0-0.5 ft) Concentrations for Selected Analytes[1] for LRC SSP, LRC, and Benthic Data

Low Resolution Coring Supplemental Sampling Program

Lower Passaic River Restoration Project

Analyte	2,3,7,8-TCDD			Total TEQ[2]			Total PCBs[3]			Total HMW PAHs[4]			Total LMW PAHs[5]			Total DDx[6]		
Unit	ng/kg			ng/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Rank	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]
1	12A-0460	7.32	34100	12A-0460	7.32	34700	12A-0449	6.33	28.6	2008 CLRC-103	17.73	542	12A-0440	4.54	749	LPRT03G	3.13	2.96
2	12A-0481	11.24	23200	12A-0481	11.24	23800	LPRT09B	8.08	24.8	2008 CLRC-104	18.37	522	2008 CLRC-104	18.37	545	12A-0460	7.32	1.29
3	12A-0459	7.21	22400	12A-0459	7.21	22700	12A-0427	3.64	21.3	12A-0408	1.97	359	2008 CLRC-103	17.73	453	LPRT07E	6.94	1.22
4	12A-0440	4.54	21900	12A-0440	4.54	22500	12A-0444	4.64	20.4	12A-0440	4.54	342	2008 CLRC-115	4.21	215	12A-0413	2.53	1.06
5	LPRT09F	8.81	16000	12A-0449	6.33	16500	2008 CLRC-045	7	18.9	2008 CLRC-098	17.46	315	12A-0408	1.97	102	12A-0411	2.02	0.932
6	12A-0449	6.33	15900	LPRT09F	8.81	16200	12A-0440	4.54	18.6	2008 CLRC-115	4.21	266	2008 CLRC-098	17.46	86.6	2008 CLRC-062	10.02	0.93
7	2008 CLRC-045	7	13500	2008 CLRC-045	7	13900	12A-0464	7.62	16.9	12A-0427	3.64	231	2008 CLRC-031	4.25	82.5	2008 CLRC-045	7	0.817
8	12A-0427	3.64	11700	12A-0427	3.64	12300	12A-0481	11.24	16.4	12A-0455	6.86	210	2008 CLRC-079	13.58	63.1	12A-0459	7.21	0.723
9	12A-0464	7.62	10900	12A-0464	7.62	11400	12A-0458	7.1	14.9	2008 CLRC-076	13.47	209	12A-0427	3.64	60.2	LPRT08C	7.43	0.596
10	12A-0444	4.64	10800	12A-0444	4.64	11300	12A-0475	9.29	12.3	2008 CLRC-079	13.58	156	2008 CLRC-086	15.07	59.7	2008 CLRC-076	13.47	0.568

Analyte	Dieldrin			Total Chlordane[7]			Lead			Mercury			Cadmium			Copper		
Unit	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Rank	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]	Location	River Mile	Result[8]
1	2008 CLRC-047	7.45	0.152	2008 CLRC-076	13.47	0.435	12A-0473	9.14	1030	12A-0427	3.64	16.2	12A-0460	7.32	34.7	12A-0421	3.14	930
2	2008 CLRC-045	7	0.13	2008 CLRC-047	7.45	0.354	12A-0460	7.32	906	12A-0444	4.64	15.4	12A-0481	11.24	32.8	12A-0481	11.24	778
3	2008 CLRC-101	17.61	0.061	2008 CLRC-019	1.47	0.322	12A-0481	11.24	818	12A-0449	6.33	14.2	2008 CLRC-045	7	29.9	12A-0460	7.32	706
4	2008 CLRC-076	13.47	0.043	2008 CLRC-042	6.5	0.244	12A-0444	4.64	798	12A-0421	3.14	14	12A-0408	1.97	29.4	2008 CLRC-045	7	577
5	12A-0444	4.64	0.0315	2008 CLRC-060	9.57	0.21	12A-0475	9.29	795	2008 CLRC-045	7	13.4	12A-0475	9.29	24.4	12A-0444	4.64	562
6	2008 CLRC-114	9.6	0.031	2008 CLRC-058	9.42	0.189	12A-0449	6.33	781	12A-0464	7.62	12.2	12A-0449	6.33	16.7	12A-0449	6.33	546
				12A-0474	9.29	0.189							12A-0468	8.42	16.7			
7	12A-0427	3.64	0.0286	2008 CLRC-021	1.94	0.186	2008 CLRC-045	7	763	12A-0481	11.24	11.8	12A-0459	7.21	16.5	12A-0475	9.29	540
8	12A-0475	9.29	0.0276	2008 CLRC-064	10.55	0.178	12A-0421	3.14	703	12A-0458	7.1	10.6	12A-0464	7.62	16	12A-0464	7.62	519
9	2008 CLRC-019	1.47	0.025	2008 CLRC-067	10.93	0.177	LPRH05B	4.35	682	2008 CLRC-101	17.61	10.4	2008 CLRC-115	4.21	15.9	12A-0445	4.96	476
	2008 CLRC-064	10.55	0.025															
10	12A-0413	2.53	0.0244	2008 CLRC-110	11.21	0.175	2008 CLRC-073	12.3	641	12A-0440	4.54	10.1	2008 CLRC-040	6.49	15.7	2008 CLRC-062	10.02	460

Notes:

1 Considers grab analytical data only for benthic locations and core analytical data only for LRC and LRC SSP locations.

2 The total TEQ (PCDD TEQ, PCDF TEQ, and PCB TEQ) is sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual group analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL.

3 The sum of all PCB congener (Method 1668A) detects; if all ND, reported as the numerical value associated with the highest individual congener DL.

4 The sum of 10 PAH compounds (by HRGC/LRMS-SIM method) with molecular weights greater than 200 grams/mole: Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

5 The sum of six PAH compounds (by HRGC/LRMS-SIM method): Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

6 The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT (by HRGC/HRMS method) detects; if all ND, reported as the numerical value associated with the highest individual analyte DL.

7 The sum of cis−Chlordane, oxy−Chlordane, trans−Chlordane, cis−Nonachlor, trans−Nonachlor detects. If all ND, reported as the highest individual analyte DL.

8 All data presented have been validated. Data qualifiers are presented in **Appendix I** for all samples and analytes.

Table 3-4
Sediment Grab Sample SEM and AVS Analytical Results for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

	Grab Sample Data 0 - 0.5 ft								Core Data* 0 - 0.5 ft		Calculated Data			
Location	Sample ID	AVS (umol/g)	SEM Cadmium (umol/g)	SEM Copper (umol/g)	SEM Lead (umol/g)	SEM Mercury (umol/g)	SEM Nickel (umol/g)	SEM Zinc (umol/g)	Sample ID	TOC (%)	sum SEM (umol/g)	sum SEM - AVS (umol/g)	foc	(sum SEM - AVS) / foc (umol/g-oc)
12A-0401	12A-0401-G1AS	0.217	0.0028	0.1649	0.1104	0.000097	0.0159	0.6348	12A-0401-C1AS	3.67	0.928897	0.711897	0.0367	19.39773842
12A-0402	12A-0402-G2AS	6.8	0.0071	0.2741	0.2218	0.000141	0.0365	1.72064	12A-0402-C3AS	14.7	2.260281	-4.539719	0.147	-30.88244218
12A-0403	12A-0403-G1AS	0.146	0.0026	0.1615	0.094	0.000082	0.0147	0.5359	12A-0403-C3AS	5.13	0.808782	0.662782	0.0513	12.9197271
12A-0404	12A-0404-G1AS	0.92	0.0054	0.2741	0.1819	0.000078	0.0254	1.234	12A-0404-C3AS	5.61	1.720878	0.800878	0.0561	14.27590018
12A-0405	12A-0405-G1AS	33.1	0.012	0.3255	0.3553	0.000132	0.0621	2.81646	12A-0405-C3AS	17.7	3.571492	-29.528508	0.177	-166.8277288
12A-0406	12A-0406-G1AS	1.28	0.0065	0.2049	0.2798	0.000097	0.03	1.55039	12A-0406-C3AS	11.5	2.071687	0.791687	0.115	6.884234783
12A-0407	12A-0407-G1AS	41.7	0.0121	0.2319	0.4345	0.000138	0.0662	3.54414	12A-0407-C2AS	8.2	4.288978	-37.411022	0.082	-456.2319756
12A-0408	12A-0408-G2AS	26.5	0.0182	0.4547	0.5403	0.000129	0.0685	4.40479	12A-0408-C1AS	6.81	5.486619	-21.013381	0.0681	-308.5665345
12A-0409	12A-0409-G1AS	110	0.015	0.0267	0.3169	0.000168	0.0467	4.1734	12A-0409-C8AS	8.44	4.578868	-105.421132	0.0844	-1249.065545
12A-0410	12A-0410-G4AS	8.1	0.0139	0.5467	0.3679	0.000197	0.0562	3.17013	12A-0410-C3AS	4.42	4.155027	-3.944973	0.0442	-89.25278281
12A-0411	12A-0411-G1AS	4.68	0.0057	0.2074	0.1708	0.000073	0.0254	1.4162	12A-0411-C3AS	13.9	1.825573	-2.854427	0.139	-20.53544604
12A-0412	12A-0412-G1AS	8	0.0017	0.0306	0.0414	0.000162	0.0088	0.438	12A-0412-C3AS	5.81	0.520662	-7.479338	0.0581	-128.7321515
12A-0413	12A-0413-G1AS	23.8	0.0054	0.1235	0.1372	0.000184	0.0339	1.3763	12A-0413-C6AS	7.21	1.676484	-22.123516	0.0721	-306.8448821
12A-0414	12A-0414-G1AS	20.2	0.0053	0.0268	0.0994	0.000184	0.0293	1.35176	12A-0414-C2AS	6.52	1.512744	-18.687256	0.0652	-286.6143558
12A-0415	12A-0415-G1AS	35.1	0.0202	0.1658	0.5823	0.000146	0.1008	4.04102	12A-0415-C3AS	5.08	4.910266	-30.189734	0.0508	-594.2861024
12A-0416	12A-0416-G1AS	4.7	0.0131	0.5837	0.3789	0.000249	0.0635	2.68274	12A-0416-C1AS	6.95	3.722189	-0.977811	0.0695	-14.06922302
12A-0417	12A-0417-G1AS	7.1	0.0144	0.5915	0.4207	0.000242	0.067	3.0164	12A-0417-C3AS	6.53	4.110242	-2.989758	0.0653	-45.78496172
12A-0418	12A-0418-G1AS	0.476	0.0015	0.1	0.0564	0.000054	0.0095	0.3466	12A-0418-C3AS	6.51	0.514054	0.038054	0.0651	0.584546851
12A-0419	12A-0419-G1AS	44.7	0.0183	0.1956	0.4846	0.000182	0.0867	4.19296	12A-0419-G1AS	5.73	4.978342	-39.721658	0.0573	-693.2226527
12A-0420	12A-0420-G1AS	18.2	0.0077	0.0528	0.1659	0.000167	0.0591	1.63727	12A-0420-G1AS	4.22	1.922937	-16.277063	0.0422	-385.7123934
12A-0421	12A-0421-G1AS	0.204	0.0084	4.77558	1.2301	0.00012	0.1276	4.41057	12A-0421-C1AS	5.24	10.55237	10.34837	0.0524	197.4879771
12A-0422	12A-0422-G1AS	2.02	0.0058	0.1452	0.1702	0.00011	0.0328	1.32918	12A-0422-G1AS	5.83	1.68329	-0.33671	0.0583	-5.775471698
12A-0423	12A-0423-G4AS	24.5	0.0039	0.0169	0.1397	0.000084	0.0312	1.26451	12A-0423-G4AS	4.98	1.456294	-23.043706	0.0498	-462.7250201
12A-0425	12A-0425-G1AS	16.4	0.0075	0.1695	0.1932	0.000193	0.0413	2.00738	12A-0425-C4AS	6.58	2.419073	-13.980927	0.0658	-212.4760942
12A-0426	12A-0426-G2AS	17.7	0.0056	0.1024	0.1416	0.000189	0.03	1.51157	12A-0426-G2AS	5.58	1.791359	-15.908641	0.0558	-285.1010932
12A-0427	12A-0427-G1AS	18.1	0.0121	0.0684	0.3264	0.00014	0.0602	2.45459	12A-0427-G1AS	5.94	2.92183	-15.17817	0.0594	-255.5247475
12A-0428	12A-0428-G2AS	0.13	0.0021	0.0315	0.0779	0.000048	0.0109	0.4825	12A-0428-C3AS	0.278	0.604948	0.474948	0.00278	170.8446043
12A-0429	12A-0429-G2AS	8.6	0.0085	0.2316	0.2544	0.000154	0.0487	2.15157	12A-0429-C1AS	5.79	2.694924	-5.905076	0.0579	-101.9874957
12A-0431	12A-0431-G1AS	19.7	0.0127	0.6308	0.4937	0.000132	0.0966	3.67146	12A-0431-C5AS	6.35	4.905392	-14.794608	0.0635	-232.9859528
12A-0432	12A-0432-G4AS	1.85	0.019	0.2462	0.3156	0.000094	0.0944	3.8789	12A-0432-C3AS	3.96	4.554194	2.704194	0.0396	68.28772727
12A-0433	12A-0433-G1AS	1.08	0.0066	0.4108	0.2354	0.000122	0.0416	1.47391	12A-0433-C2AS	5.13	2.168432	1.088432	0.0513	21.21699805
12A-0434	12A-0434-G1AS	0.271	0.0049	0.2158	0.1623	0.000119	0.0249	1.05901	12A-0434-G1AS	6.51	1.467029	1.196029	0.0651	18.37218126
12A-0435	12A-0435-G2AS	5.55	0.0104	0.3232	0.3679	0.000078	0.0462	2.47691	12A-0435-C2AS	5.09	3.224688	-2.325312	0.0509	-45.68392927
12A-0436	12A-0436-G2AS	4.61	0.0069	0.2685	0.227	0.000121	0.0575	2.05113	12A-0436-C6AS	6.77	2.611151	-1.998849	0.0677	-29.52509601
12A-0437	12A-0437-G1AS	0.89	0.0039	0.1133	0.1207	0.000109	0.0208	0.9345	12A-0437-C3AS	6.23	1.193309	0.303309	0.0623	4.868523274

Table 3-4
Sediment Grab Sample SEM and AVS Analytical Results for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

	Grab Sample Data 0 - 0.5 ft								Core Data* 0 - 0.5 ft		Calculated Data			
Location	Sample ID	AVS (umol/g)	SEM Cadmium (umol/g)	SEM Copper (umol/g)	SEM Lead (umol/g)	SEM Mercury (umol/g)	SEM Nickel (umol/g)	SEM Zinc (umol/g)	Sample ID	TOC (%)	sum SEM (umol/g)	sum SEM - AVS (umol/g)	foc	(sum SEM - AVS) / foc (umol/g-oc)
12A-0438	12A-0438-G1AS	8.2	0.0071	0.217	0.241	0.000149	0.0348	1.87333	12A-0438-C1AS	8.13	2.373379	-5.826621	0.0813	-71.66815498
12A-0439	12A-0439-G2AS	0.154	0.0051	0.1638	0.1921	0.00005	0.0212	0.7543	12A-0439-C3AS	3.23	1.13655	0.98255	0.0323	30.41950464
12A-0440	12A-0440-G2AS	38.5	0.0067	0.0104	0.1099	0.000092	0.0287	1.06135	12A-0440-C3AS	9.4	1.217142	-37.282858	0.094	-396.6261489
12A-0441	12A-0441-G1AS	33.8	0.0177	0.1489	0.5223	0.000168	0.0738	3.99282	12A-0441-C1AS	6.7	4.755688	-29.044312	0.067	-433.497194
12A-0442	12A-0442-G2AS	2.97	0.0081	0.3294	0.3529	0.000136	0.049	2.56378	12A-0442-C1AS	5.11	3.303316	0.333316	0.0511	6.522818004
12A-0443	12A-0443-G1AS	0.147	0.0028	0.0953	0.1577	0.000052	0.0182	0.748	12A-0443-C5AS	3.07	1.022052	0.875052	0.0307	28.50332248
12A-0444	12A-0444-G1AS	144	0.0202	0.0394	0.3625	0.00007	0.0945	3.61669	12A-0444-C2AS	11	4.13336	-139.86664	0.11	-1271.514909
12A-0445	12A-0445-G1AS	14.6	0.0018	0.0469	0.0572	0.000064	0.0117	0.5228	12A-0445-C3AS	6.55	0.640464	-13.959536	0.0655	-213.122687
12A-0446	12A-0446-G1AS	23.9	0.0138	0.0326	0.4177	0.000082	0.0571	2.91315	12A-0446-C3AS	4.93	3.434432	-20.465568	0.0493	-415.1230832
12A-0447	12A-0447-G1AS	0.092	0.0018	0.1099	0.1836	0.00004	0.0148	0.577	12A-0447-C3AS	2.96	0.88714	0.79514	0.0296	26.86283784
12A-0448	12A-0448-G1AS	12.3	0.0127	0.2542	0.3575	0.000136	0.0555	3.09579	12A-0448-G1AS	5.74	3.775826	-8.524174	0.0574	-148.5047735
12A-0449	12A-0449-G1AS	64.7	0.0287	0.0584	0.4825	0.000129	0.1164	4.79657	12A-0449-C4AS	7.87	5.482699	-59.217301	0.0787	-752.4434689
12A-0450	12A-0450-G1AS	0.016	0.0034	0.1354	0.123	0.000051	0.021	0.5886	12A-0450-C2AS	18.4	0.871451	0.855451	0.184	4.649190217
12A-0451	12A-0451-G1AS	14.5	0.0056	0.0768	0.1349	0.000133	0.0297	1.50957	12A-0451-C3AS	5.43	1.756703	-12.743297	0.0543	-234.683186
12A-0452	12A-0452-G2AS	11.3	0.0078	0.129	0.204	0.000139	0.0348	1.7119	12A-0452-C4AS	6.17	2.087639	-9.212361	0.0617	-149.3089303
12A-0453	12A-0453-G5AS	36.2	0.0142	0.0257	0.3117	0.00015	0.0992	2.64467	12A-0453-C6AS	4.98	3.09562	-33.10438	0.0498	-664.7465863
12A-0454	12A-0454-G1AS	1.48	0.0045	0.087	0.1223	0.000056	0.0202	0.8074	12A-0454-C3AS	6.4	1.041456	-0.438544	0.064	-6.85225
12A-0455	12A-0455-G1AS	5.4	0.0041	0.107	0.6458	0.000134	0.4707	3.99333	12A-0455-C5AS	1.19	5.221064	-0.178936	0.0119	-15.03663866
12A-0456	12A-0456-G1AS	3.6	0.0077	0.2765	0.2046	0.000136	0.0334	1.78548	12A-0456-C3AS	5.4	2.307816	-1.292184	0.054	-23.92933333
12A-0457	12A-0457-G2AS	0.076	0.0051	0.2736	0.2738	0.000012	0.0317	1.12286	12A-0457-G2AS	0.374	1.707072	1.631072	0.00374	436.115508
12A-0458	12A-0458-G1AS	55.7	0.0351	0.0647	0.8198	0.00013	0.3036	7.12777	12A-0458-C2AS	5.1	8.3511	-47.3489	0.051	-928.4098039
12A-0459	12A-0459-G1AS	24.6	0.0347	0.074	0.603	0.000112	0.145	3.89233	12A-0459-C3AS	7.42	4.749142	-19.850858	0.0742	-267.531779
12A-0460	12A-0460-G1AS	143	0.0787	0.088	1.36905	0.000198	0.3871	10.5	12A-0460-C3AS	7.92	12.423048	-130.576952	0.0792	-1648.698889
12A-0461	12A-0461-G1AS	8.3	0.0154	0.5705	0.411	0.000135	0.0592	2.77797	12A-0461-C1AS	5.69	3.834205	-4.465795	0.0569	-78.48497364
12A-0462	12A-0462-G3AS	2.54	0.0056	0.2994	0.2529	0.000093	0.0565	2.55883	12A-0462-C6AS	4.92	3.173323	0.633323	0.0492	12.8724187
12A-0463	12A-0463-G3AS	0.021	0.0018	0.245	0.2715	0.000017	0.022	0.5952	12A-0463-C2AS	1.99	1.135517	1.114517	0.0199	56.0058794
12A-0464	12A-0464-G1AS	8.74	0.0153	0.2601	0.3897	0.000107	0.0772	2.38615	12A-0464-C4AS	5.96	3.128557	-5.611443	0.0596	-94.15172819
12A-0465	12A-0465-G1AS	0.017	0.0013	0.0939	0.088	0.000019	0.0213	0.3936	12A-0465-C3AS	1.26	0.598119	0.581119	0.0126	46.12055556
12A-0467	12A-0467-G9AS	0.017	0.0014	0.076	0.0824	0.000012	0.0173	0.5648	12A-0467-C3AS	0.247	0.741912	0.724912	0.00247	293.4866397
12A-0468	12A-0468-G3AS	10.2	0.0371	0.2644	0.4527	0.000108	0.0965	3.22856	12A-0468-C2AS	4.87	4.079368	-6.120632	0.0487	-125.6803285
12A-0469	12A-0469-G1AS	2.51	0.0084	0.2626	0.2264	0.000117	0.0368	1.83574	12A-0469-C5AS	6.18	2.370057	-0.139943	0.0618	-2.264449838
12A-0472	12A-0472-G1AS	0.055	0.0019	0.0641	0.0949	0.000048	0.012	0.4636	12A-0472-C5AS	1.52	0.636548	0.581548	0.0152	38.25973684
12A-0474	12A-0474-G1AS	0.044	0.0034	0.2355	0.213	0.000055	0.0242	0.8436	12A-0474-C6AS	8.24	1.319755	1.275755	0.0824	15.48246359
12A-0475	12A-0475-G1AS	20.2	0.0493	0.6263	1.19026	0.000173	0.2162	5.97056	12A-0475-C3AS	6.16	8.052793	-12.147207	0.0616	-197.1949188
12A-0476	12A-0476-G1AS	0.615	0.0076	0.4277	0.3039	0.000103	0.0447	2.28728	12A-0476-C2AS	4.65	3.071283	2.456283	0.0465	52.82329032

Table 3-4
Sediment Grab Sample SEM and AVS Analytical Results for LRC SSP
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

	Grab Sample Data 0 - 0.5 ft								Core Data* 0 - 0.5 ft		Calculated Data			
Location	Sample ID	AVS (umol/g)	SEM Cadmium (umol/g)	SEM Copper (umol/g)	SEM Lead (umol/g)	SEM Mercury (umol/g)	SEM Nickel (umol/g)	SEM Zinc (umol/g)	Sample ID	TOC (%)	sum SEM (umol/g)	sum SEM - AVS (umol/g)	foc	(sum SEM - AVS) / foc (umol/g-oc)
12A-0477	12A-0477-G1AS	0.93	0.0041	0.159	0.1349	0.000071	0.0205	0.9886	12A-0477-C3AS	4.69	1.307171	0.377171	0.0469	8.042025586
12A-0478	12A-0478-G1AS	7.3	0.0301	1.16573	0.735	0.000131	0.1199	5.04757	12A-0478-G1AS	4.88	7.098431	-0.201569	0.0488	-4.130512295
12A-0479	12A-0479-G2AS	0.019	0.0018	0.123	0.1251	0.000006	0.0259	0.4255	12A-0479-G2AS	1.03	0.701306	0.682306	0.0103	66.24330097
12A-0480	12A-0480-G9AS	1.75	0.01	0.4123	0.2583	0.000133	0.0384	1.55227	12A-0480-G9AS	5.28	2.271403	0.521403	0.0528	9.875056818
12A-0482	12A-0482-G1AS	0.02	0.0019	0.1234	0.1099	0.000007	0.0133	0.4533	12A-0482-C3AS	1.48	0.701807	0.681807	0.0148	46.06804054
12A-0483	12A-0483-G1AS	5.01	0.0178	0.4222	0.5142	0.000091	0.0714	3.12558	12A-0483-C2AS	5.55	4.151271	-0.858729	0.0555	-15.47259459
12A-0485	12A-0485-G1AS	0.018	0.0023	0.1547	0.1564	0.000008	0.0169	0.6347	12A-0485-C1AS	5.48	0.965008	0.947008	0.0548	17.28116788
12A-0486	12A-0486-G6AS	7.91	0.011	0.122	0.2523	0.000065	0.0522	1.48817	12A-0486-C3AS	5.39	1.925735	-5.984265	0.0539	-111.0253247

Notes:

*where core data for 0 - 0.5 ft were not available, grab data are provided

Table reflects grab samples processed only. Grab samples were not collected from the following locations: 12A-0424, 12A-0430, 12A-0466, 12A-0470, 12A-0471, 12A-0473, 12A-0481, and 12A-0484.

AVS - Acid Volatile Sulfide.

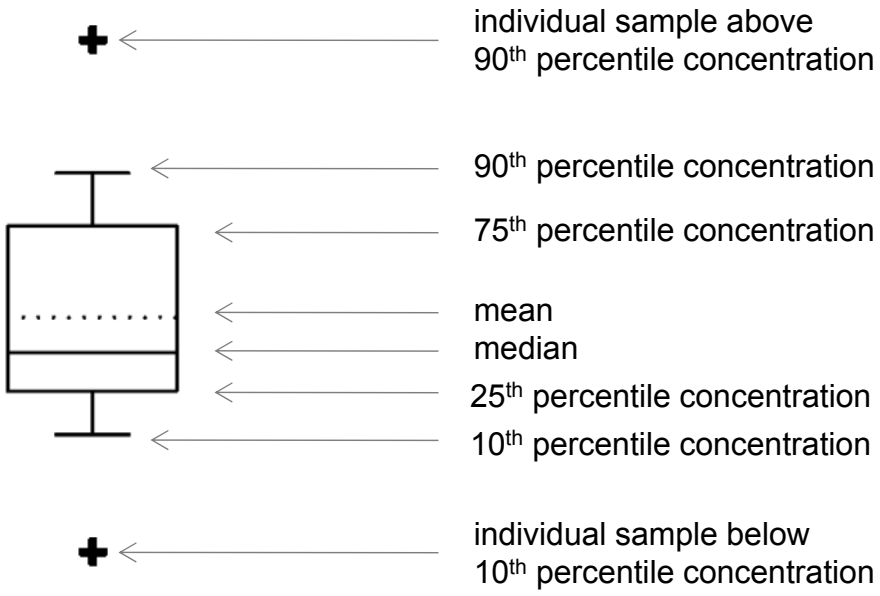
foc - Fraction Organic Carbon (% TOC/100).

SEM - Simultaneously Extracted Metals.

umol/g - micromoles per gram.

% - percent.

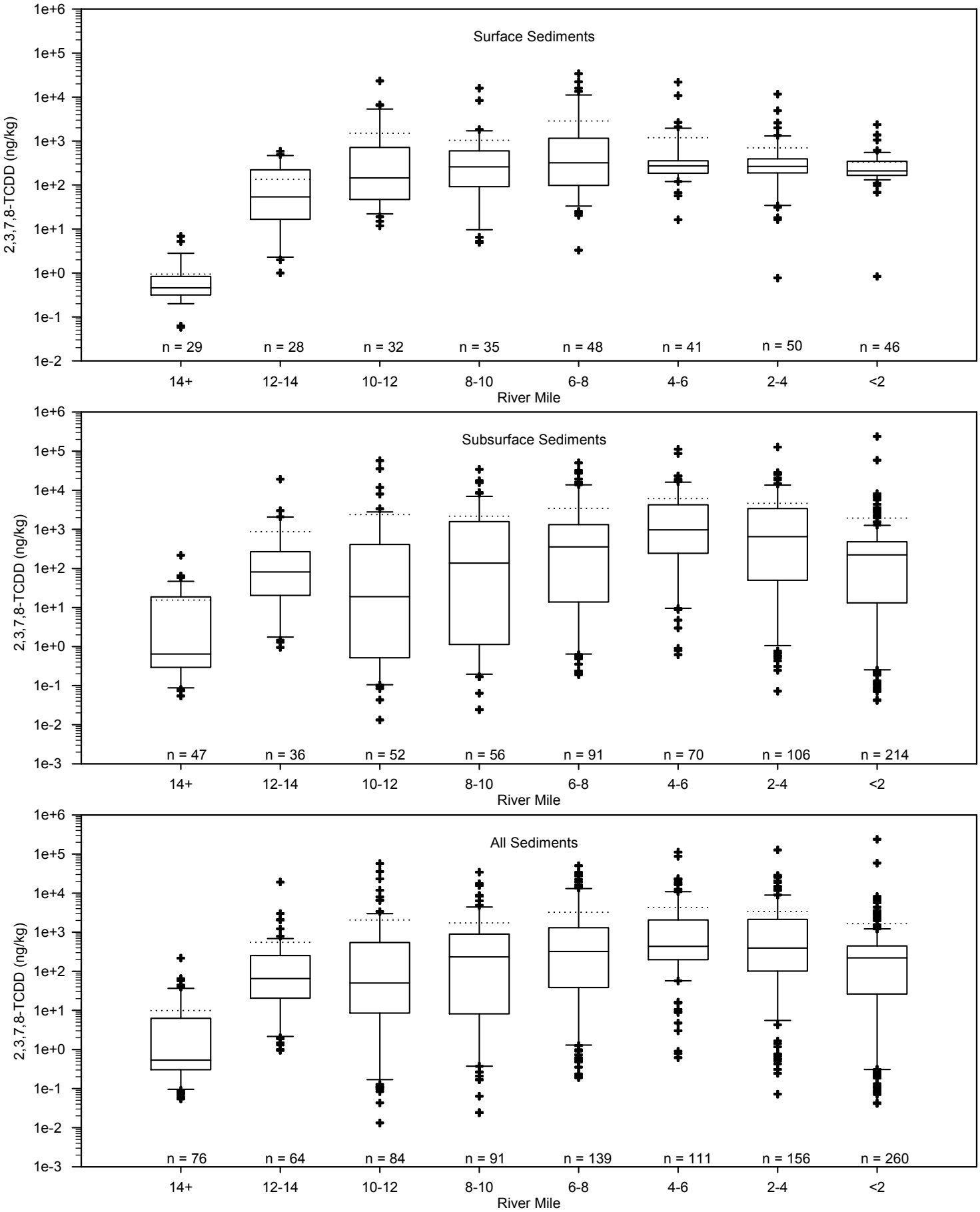
Figure 3-1 Key to Box and Whisker Plots



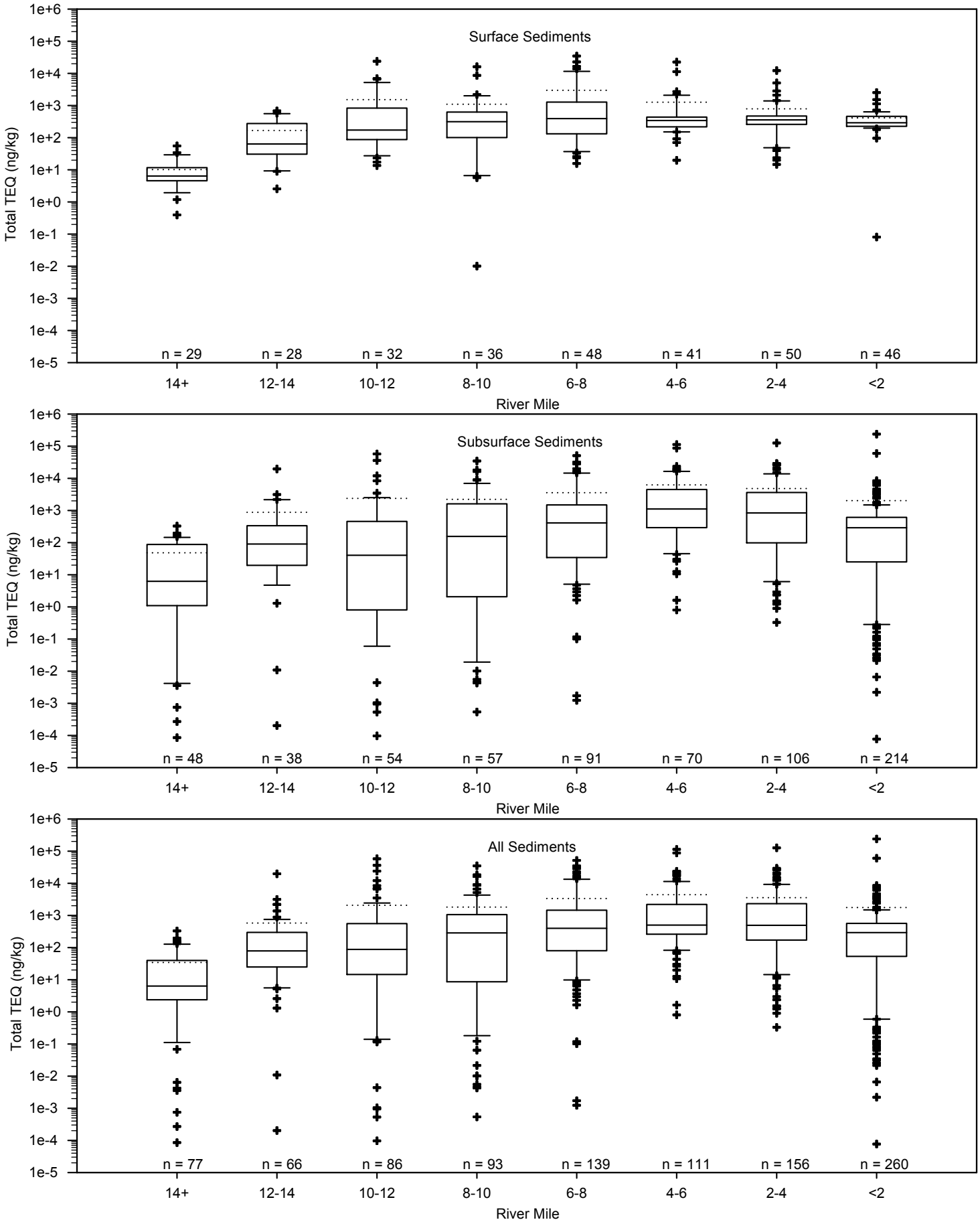
NOTES:

1. Non-detect samples for select chemicals were included and shown on the box and whisker plot at the full detection limit.
2. Box and whisker plots that show sums of multiple chemicals do not include non-detect results, unless all members of the group were not detected, then the sample was shown at the highest individual DL.
3. Surface sediment data consists of samples that have a depth interval of 0.0 to 0.5 ft with the exception of the following samples: LPRH05A (0.0 to 0.2 ft), LPRH07B (0.0 to 0.4 ft), 12A-0467 (0.0 to 0.45 ft), and CLRC-092 (0.0 to 0.7 ft).
4. Subsurface sediment data consists of samples that have a starting depth below 0.5 ft with the exception of the 4 samples mentioned in Note 3 whose subsurface sediment data begins at the bottom of the surface data.
5. All depths sediment data consists of both surface and subsurface samples.
6. Notes for each chemical are included on the appropriate box and whisker diagram.
7. The data is divided into one mile segments. Each river mile segment includes samples up to and including the upper limit of the RM interval.
8. Number of samples (n) are shown for each segment.
9. Tributary and Dundee Lake data are excluded from the data sets.
10. Data presented on a dry weight basis.

3-1.a Box and Whisker Plots: 2,3,7,8-TCDD
LRC, Benthic, and LRC SSP (Passaic River Samples Only)

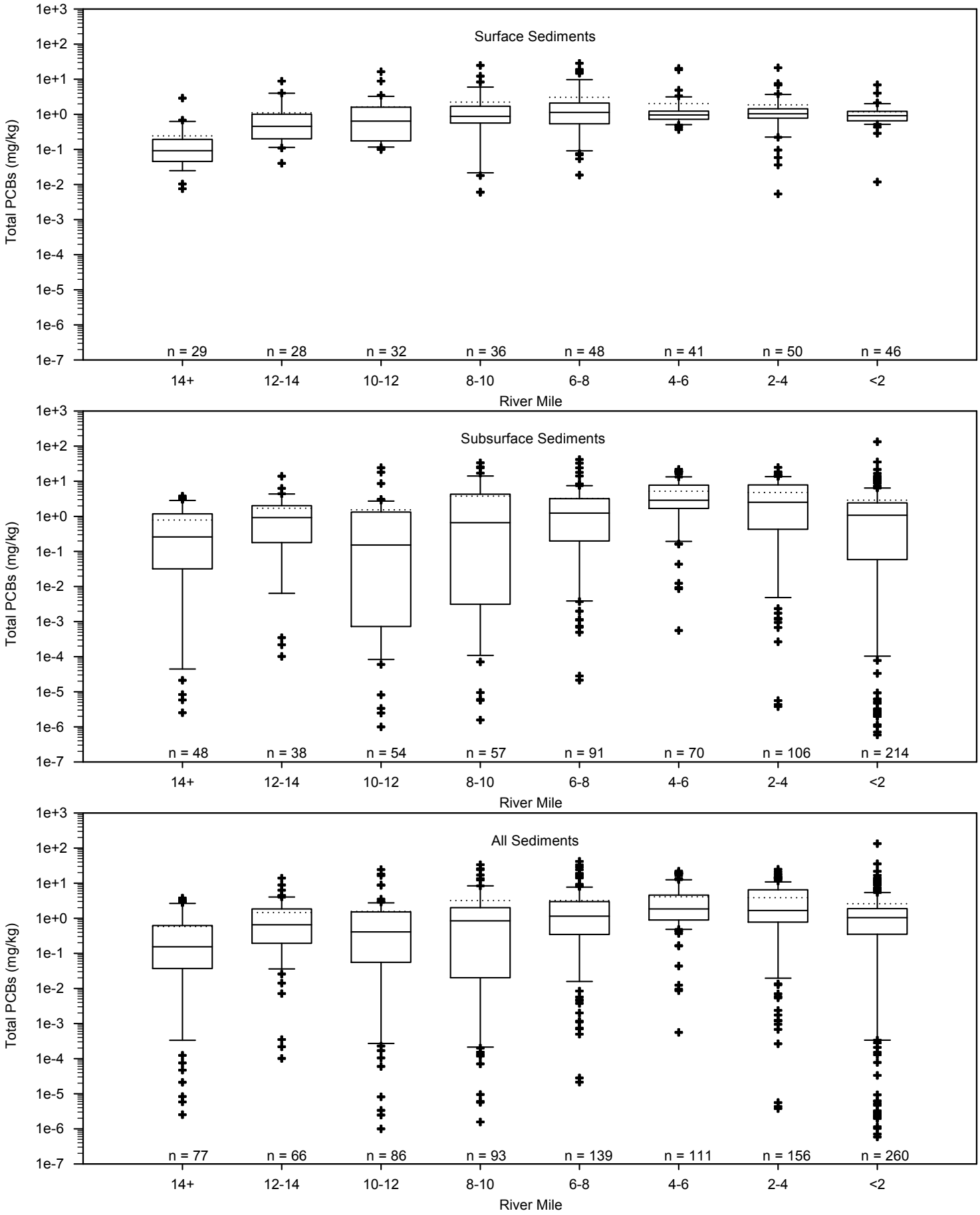


3-1.b Box and Whisker Plots: Total TEQ
LRC, Benthic, and LRC SSP (Passaic River Sample Only)



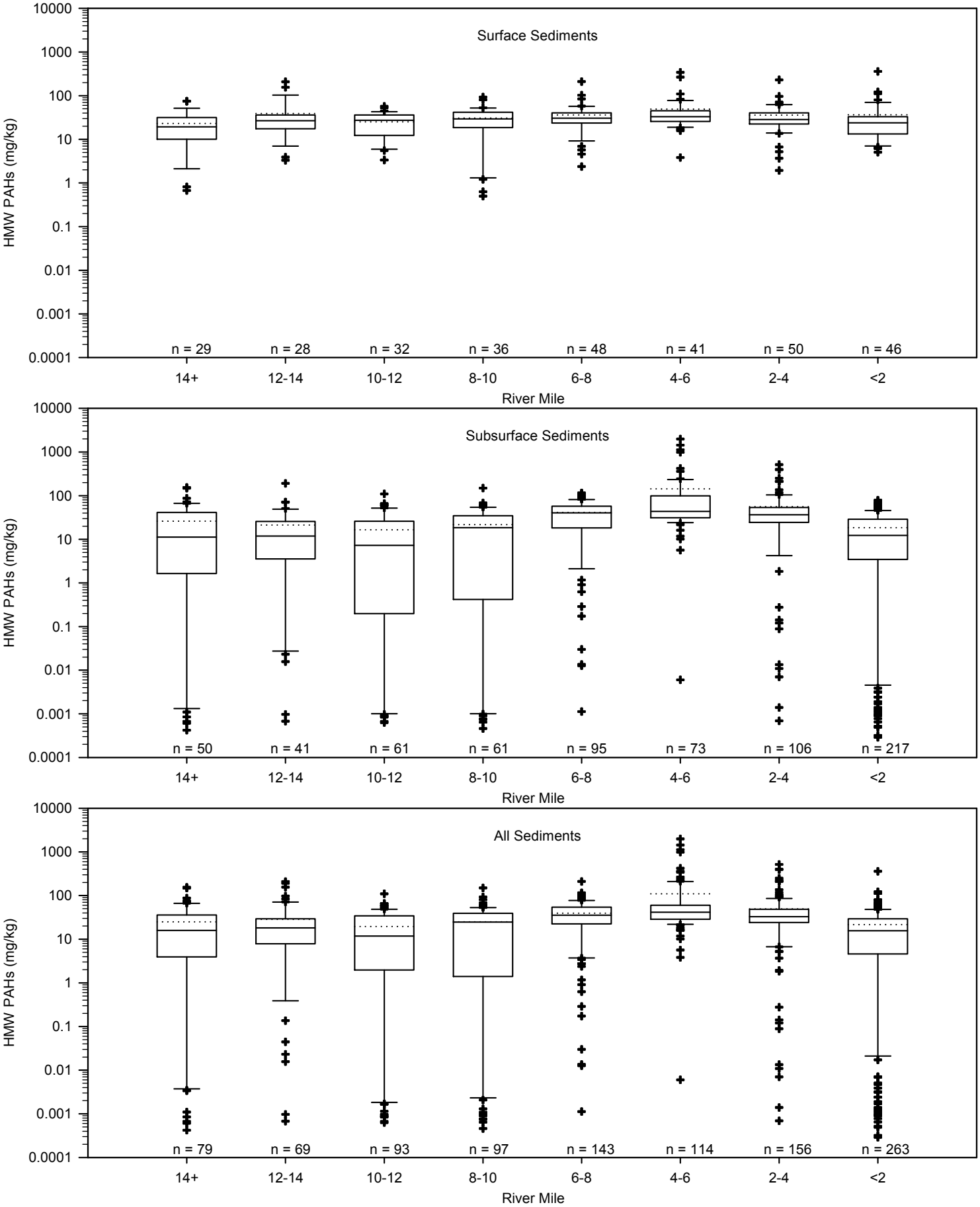
NOTES: Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF (see Table 3-1).

3-1.c Box and Whisker Plots: Total PCBs
LRC, Benthic, and LRC SSP (Passaic River Sample Only)



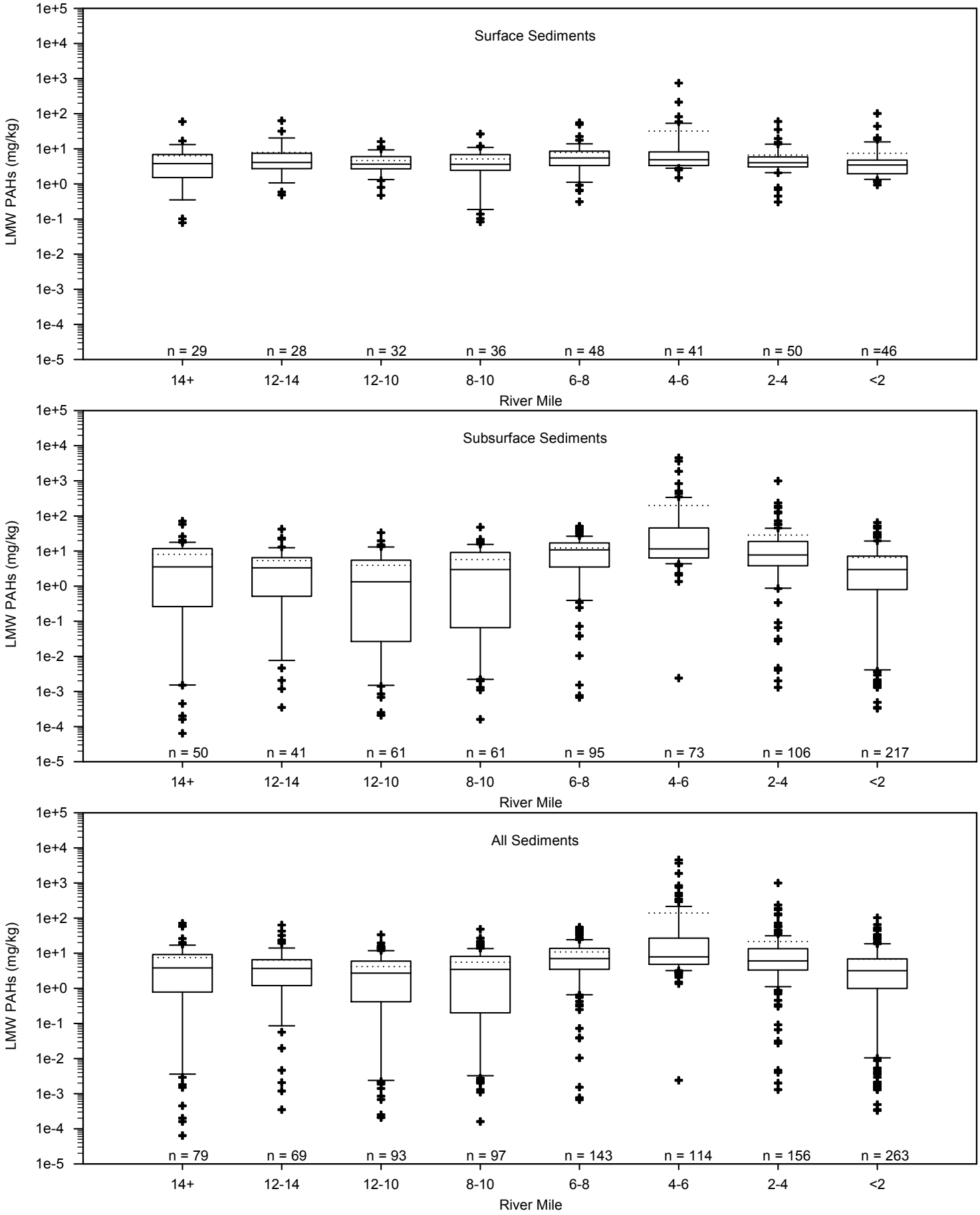
NOTES: Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL (see Table 3-1).

3-1.d Box and Whisker Plots: HMW PAHs
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



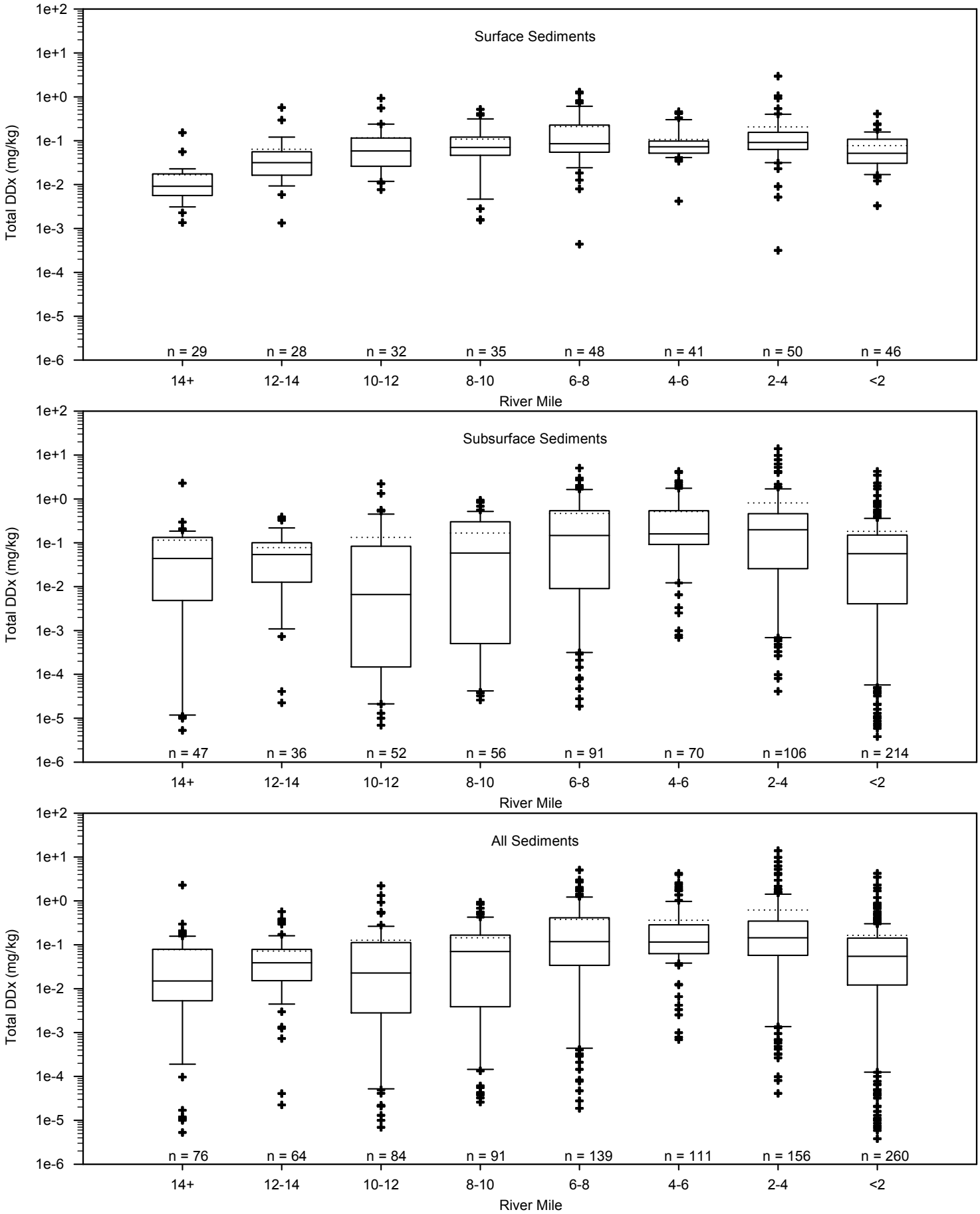
NOTES: Total HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

3-1.e Box and Whisker Plots: LMW PAHs
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



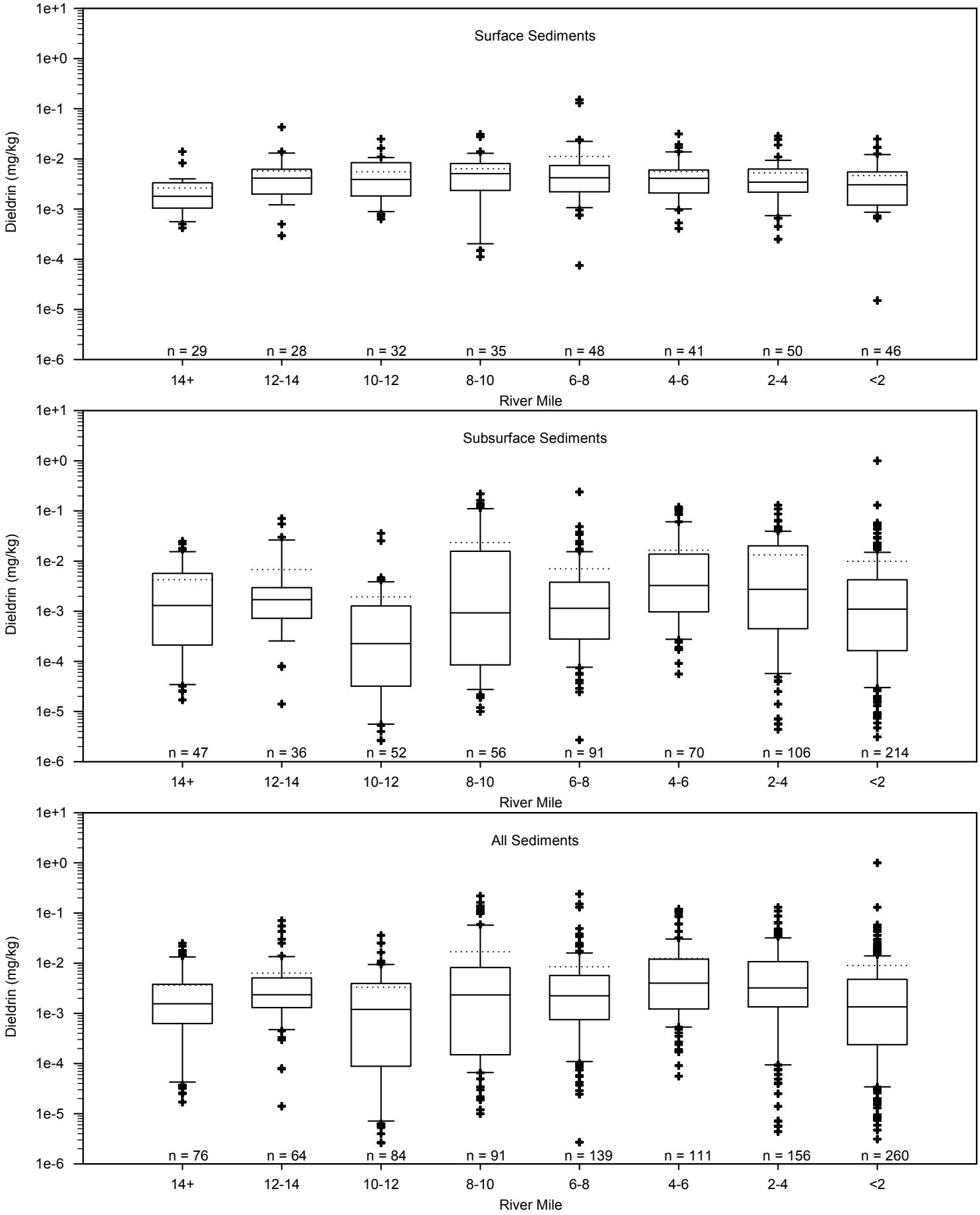
NOTES: Total LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

3-1.f Box and Whisker Plots: Total DDx
LRC, Benthic, and LRC SSP (Passaic River Samples Only)

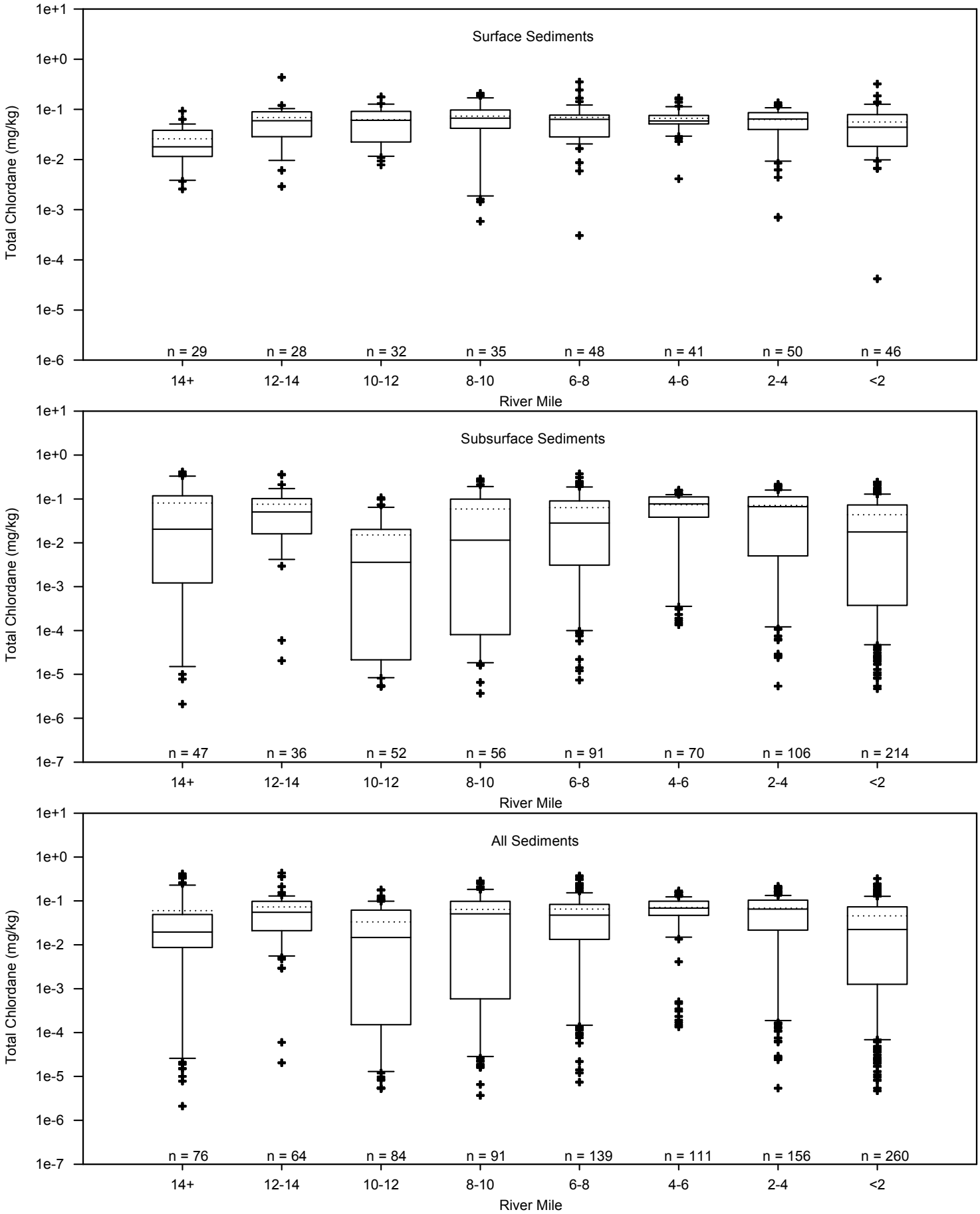


NOTES: Total DDx = The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

3-1.g Box and Whisker Plots: Dieldrin
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



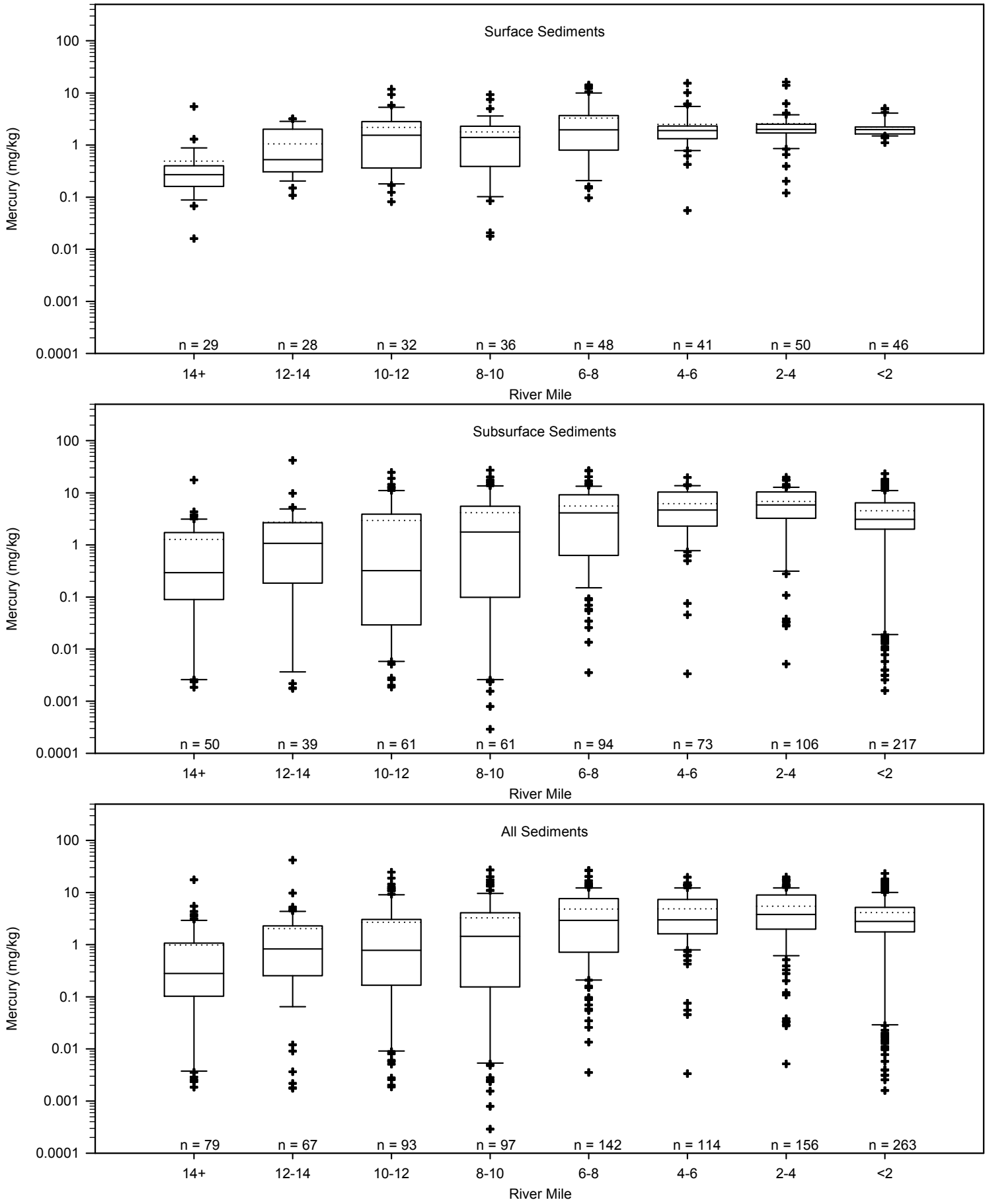
3-1.h Box and Whisker Plots: Total Chlordane
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



NOTES: Total Chlordane = The sum of cis-Chlordane, oxy-Chlordane, trans-Chlordane, cis-Nonachlor, trans-Nonachlor detects.
If all ND, reported as the highest individual analyte DL.

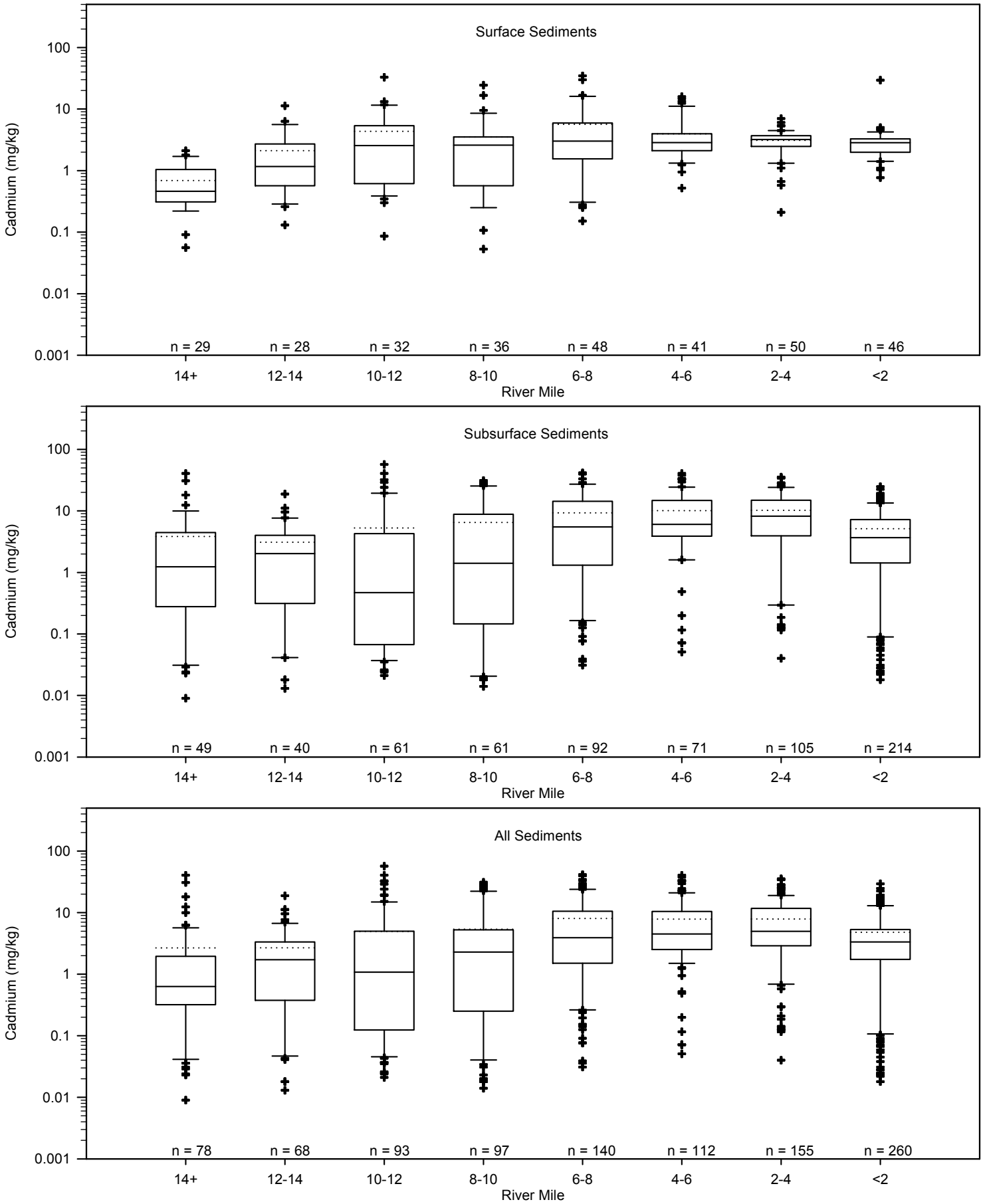
AECOM

3-1.i Box and Whisker Plots: Mercury
LRC, Benthic, and LRC SSP (Passaic River Samples Only)

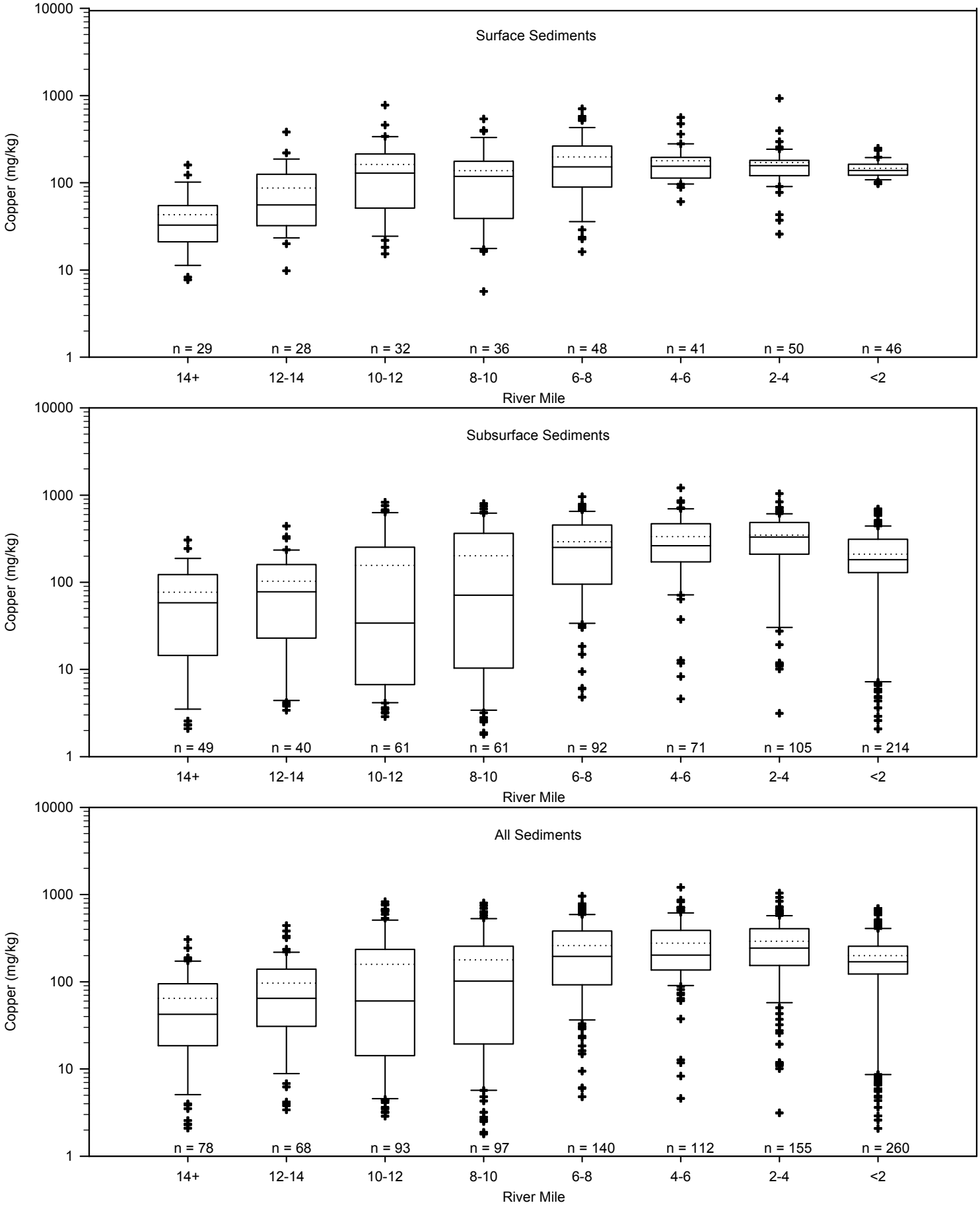


NOTES: If ND, the numerical value associated with the DL was reported.

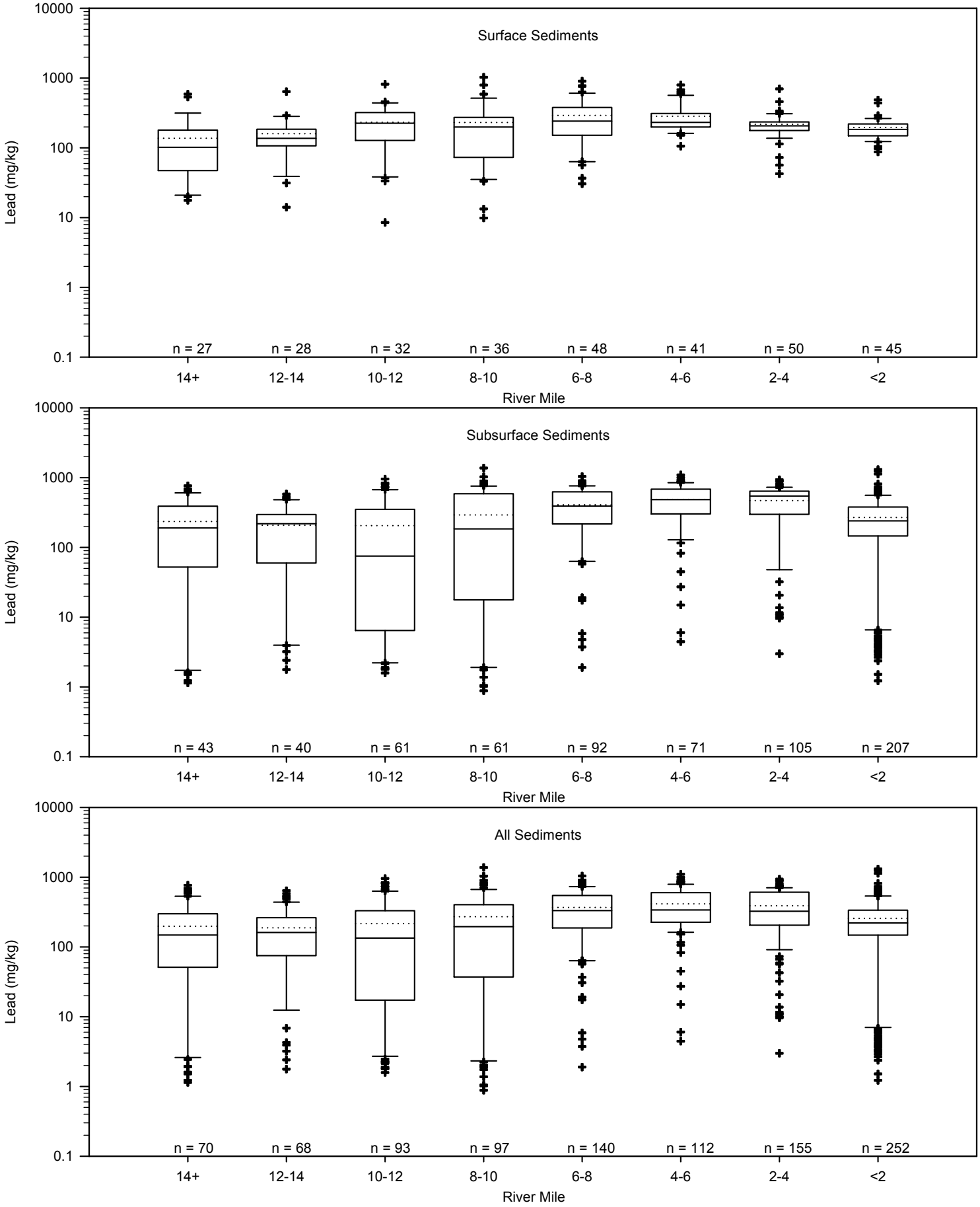
3-1.j Box and Whisker Plots: Cadmium
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



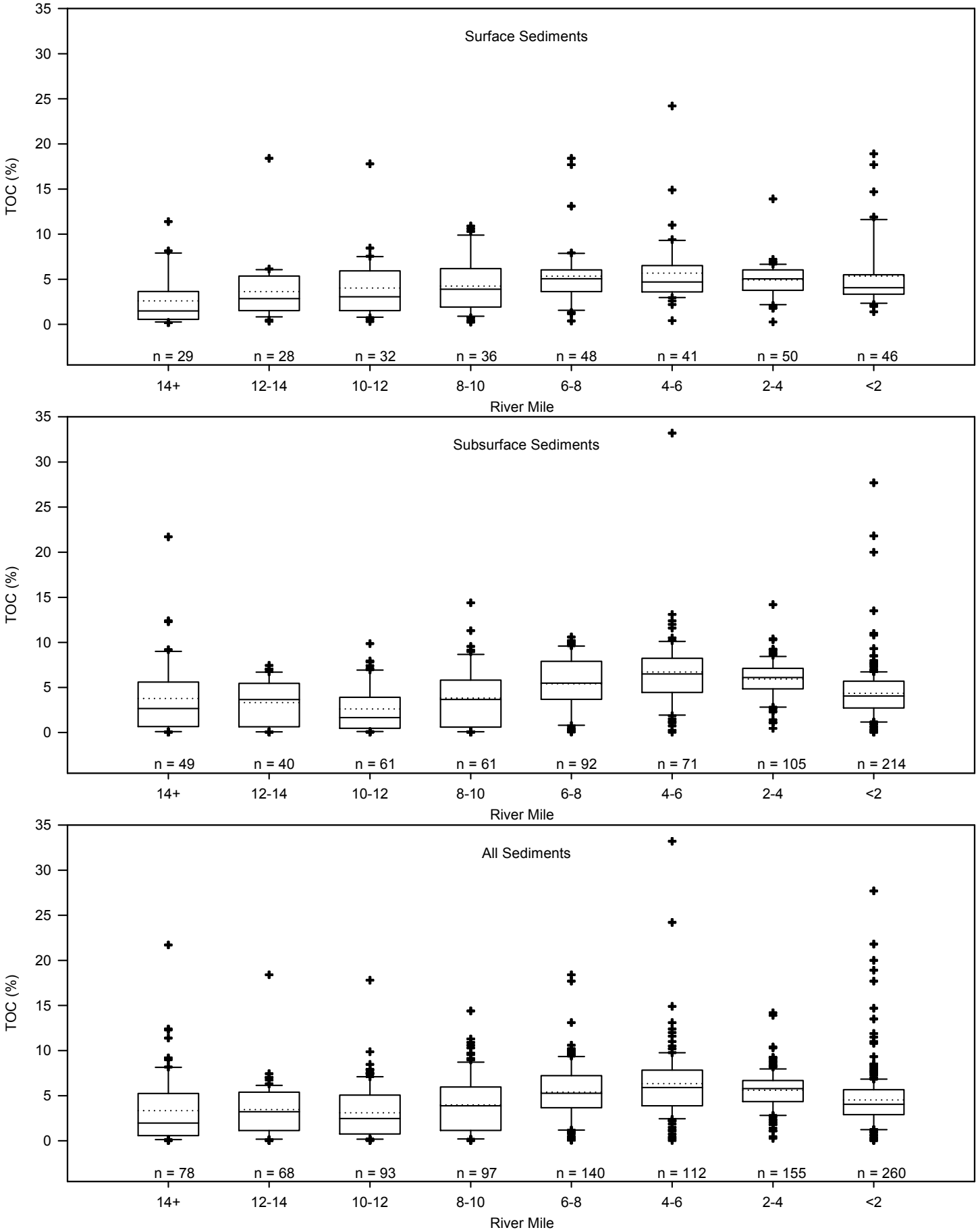
3-1.k Box and Whisker Plots: Copper
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



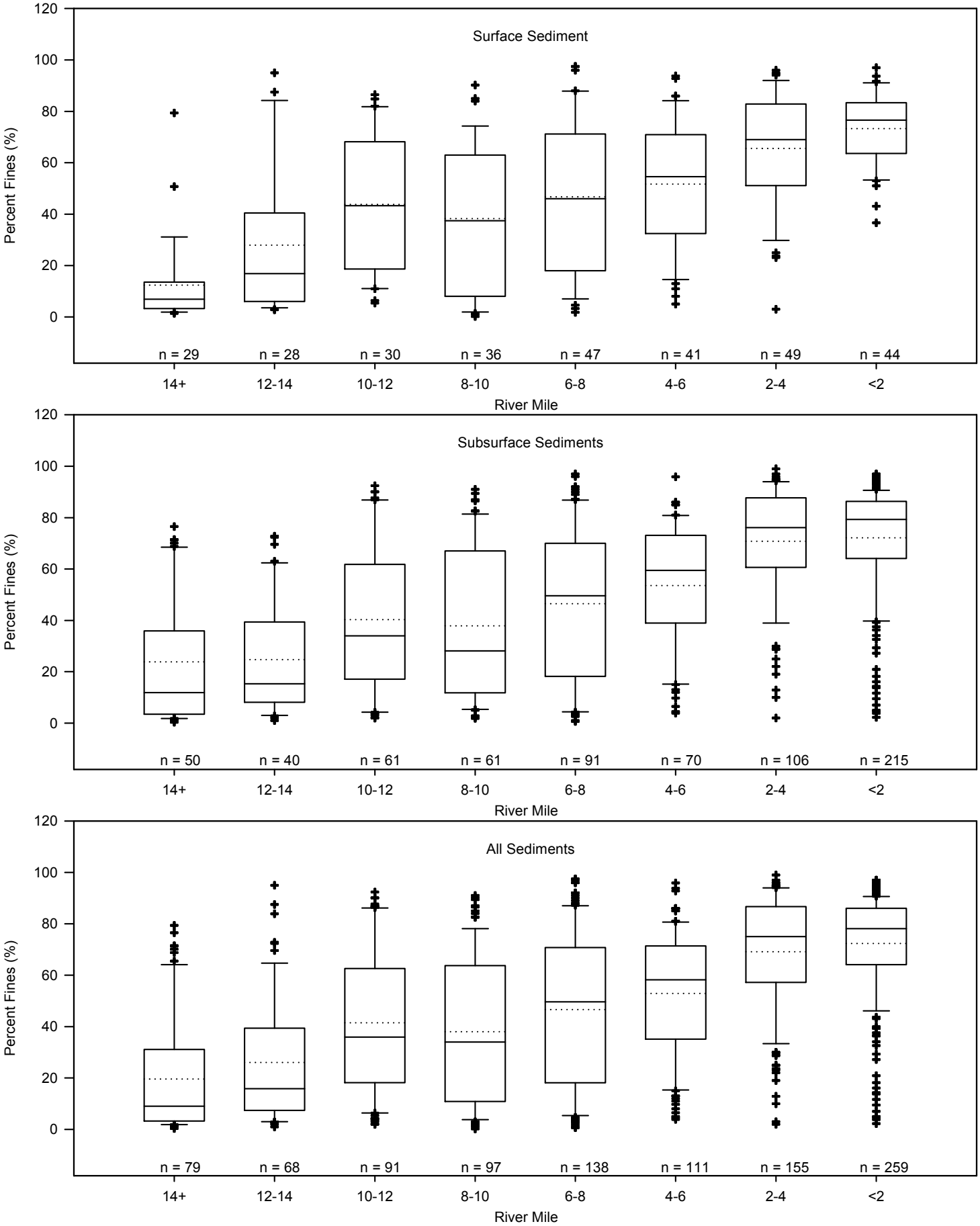
3-1.l Box and Whisker Plots: Lead
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



3-1.m Box and Whisker Plots: TOC
LRC, Benthic, and LRC SSP (Passaic River Samples Only)

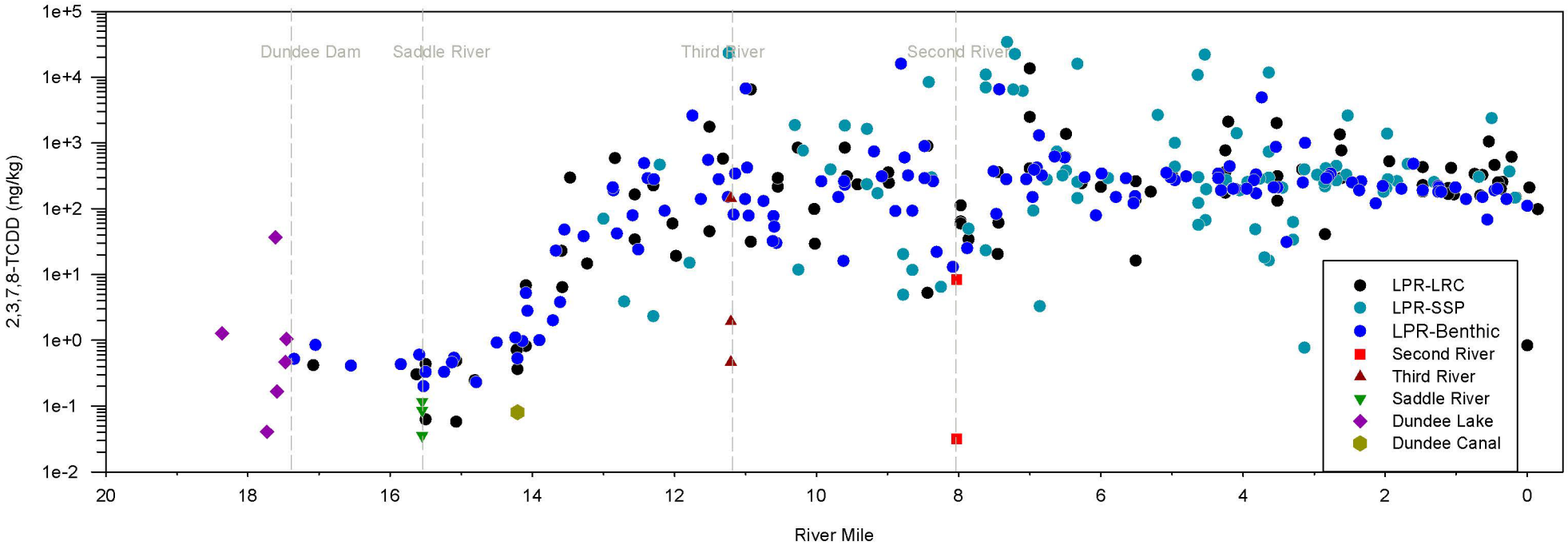


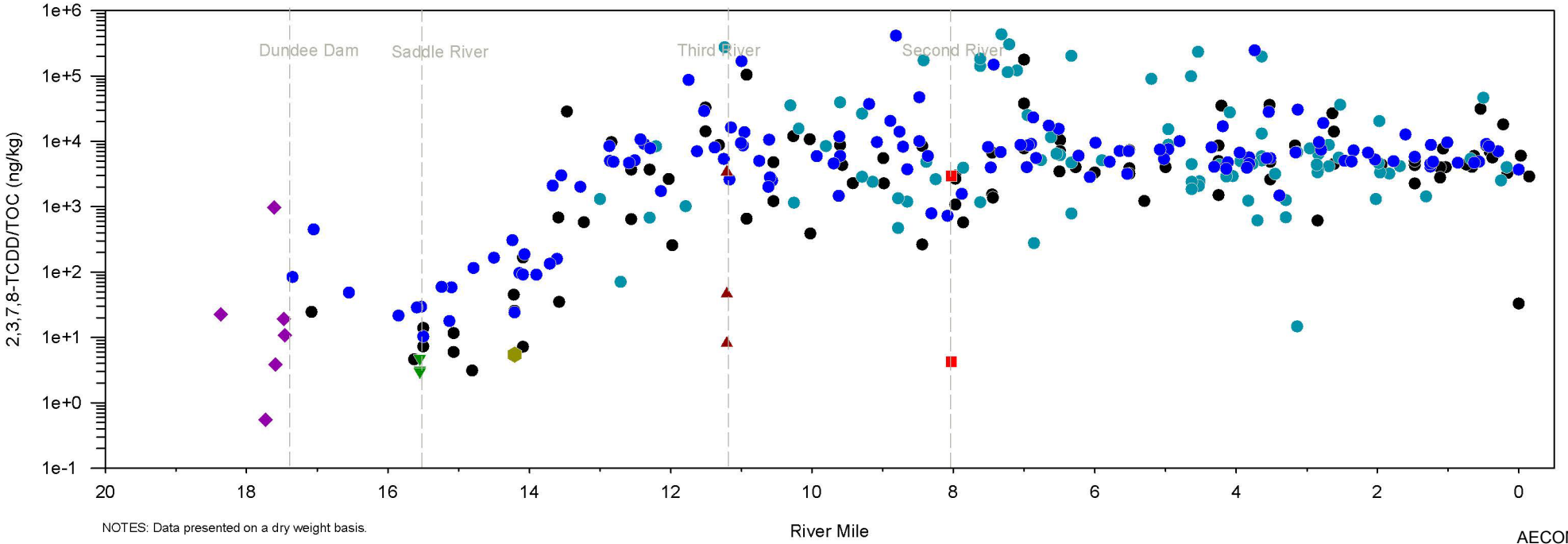
3-1.n Box and Whisker Plots: Percent Fines
LRC, Benthic, and LRC SSP (Passaic River Samples Only)



NOTES: Percent Fines = Percent passing the No. 230 Sieve (particle diameter less than 0.066 mm) except 12A-0424 and benthic.

3-2.a Surficial Concentration vs. River Mile, Log Scale - 2,3,7,8-TCDD
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

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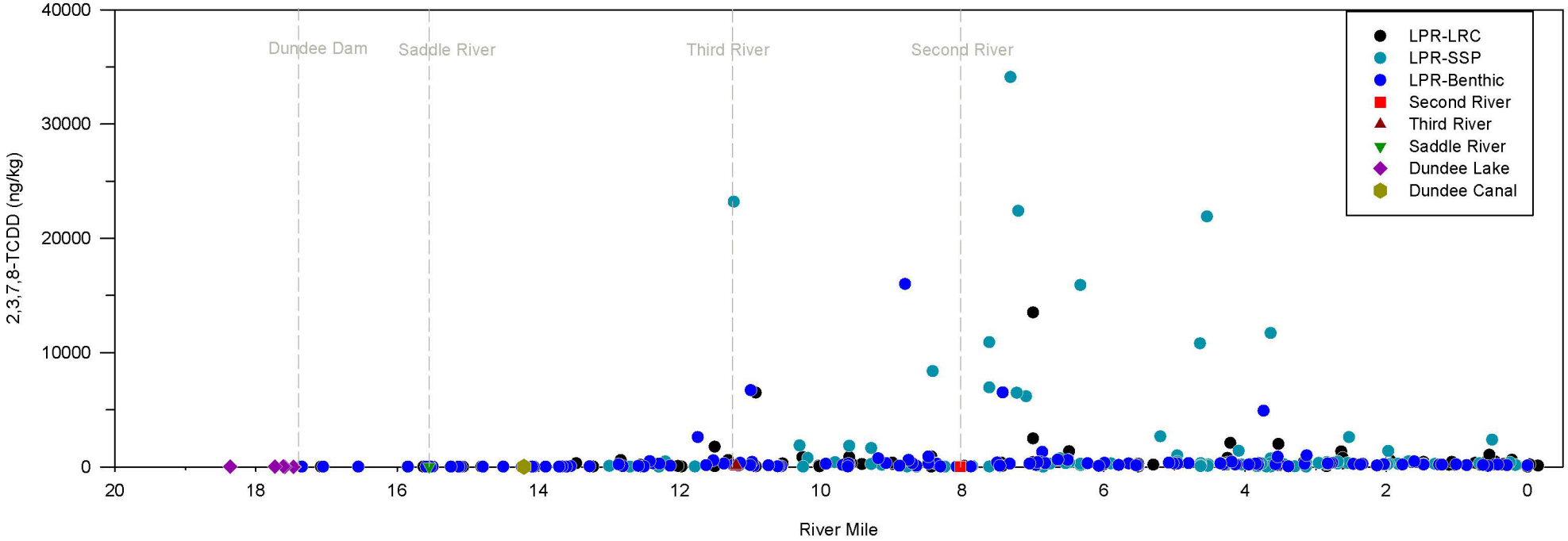
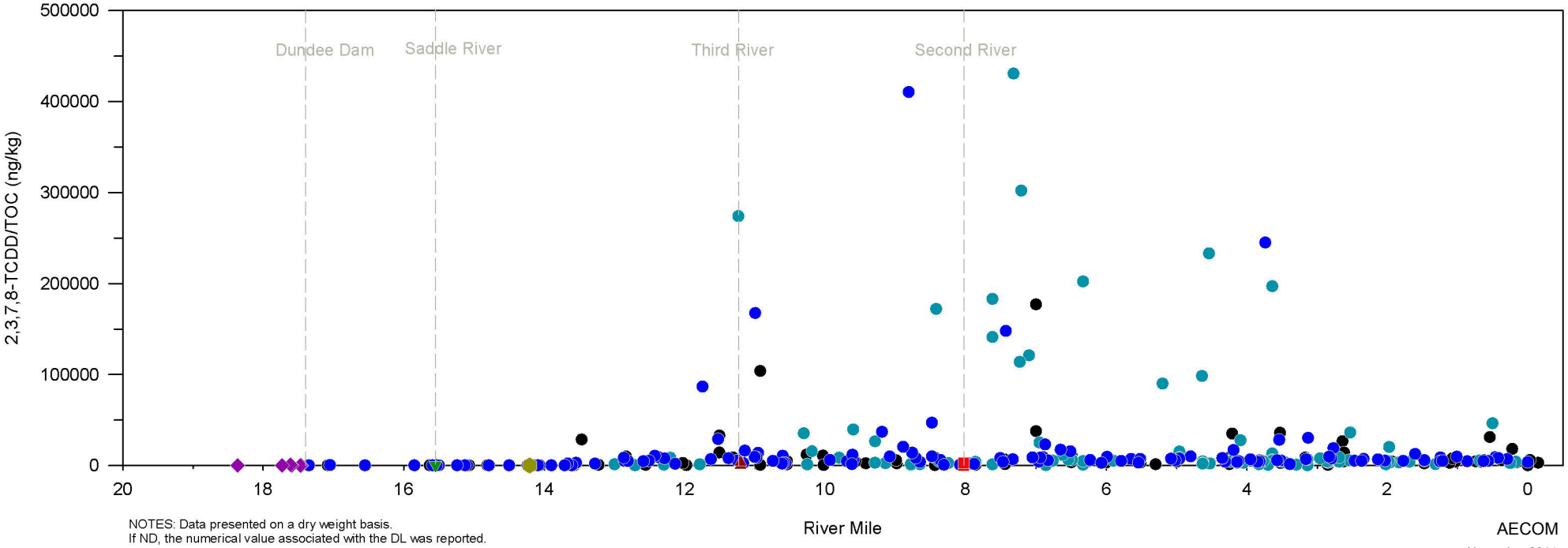
3-2.b Surficial Concentration vs. River Mile, Linear Scale - 2,3,7,8-TCDD
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

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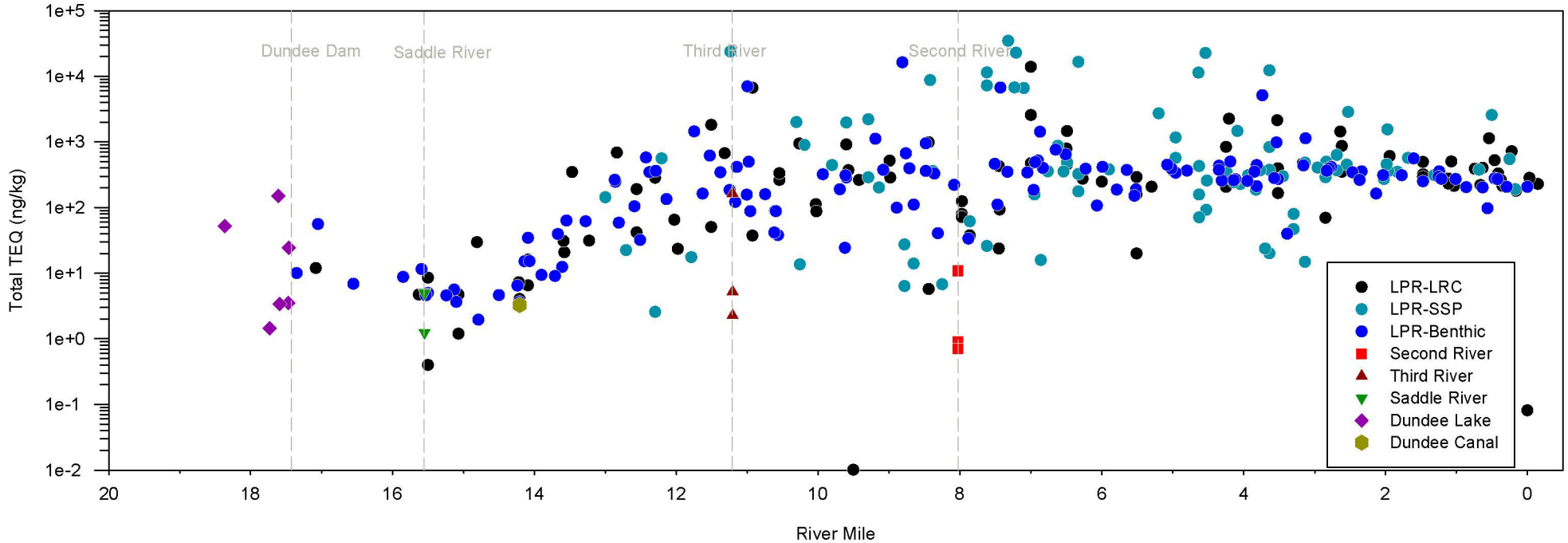
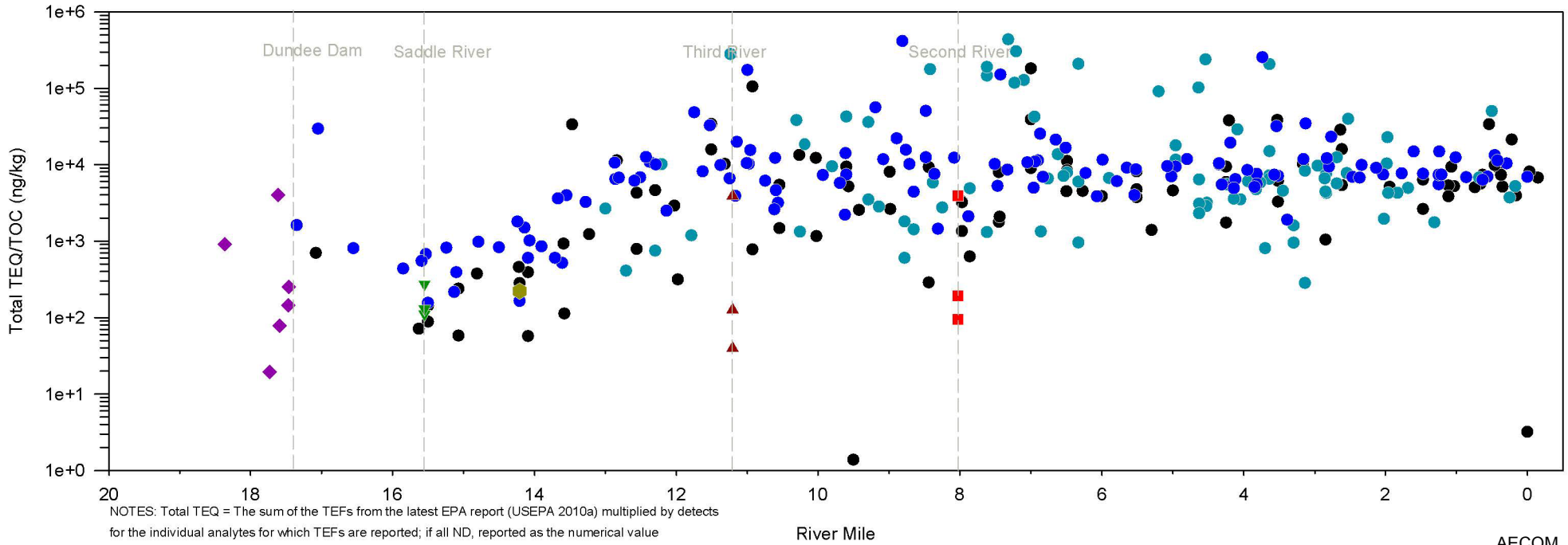
3-2.c Surficial Concentration vs. River Mile, Log Scale - Total TEQ
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF (see Table 3-1).
Data presented on a dry weight basis.

AECOM
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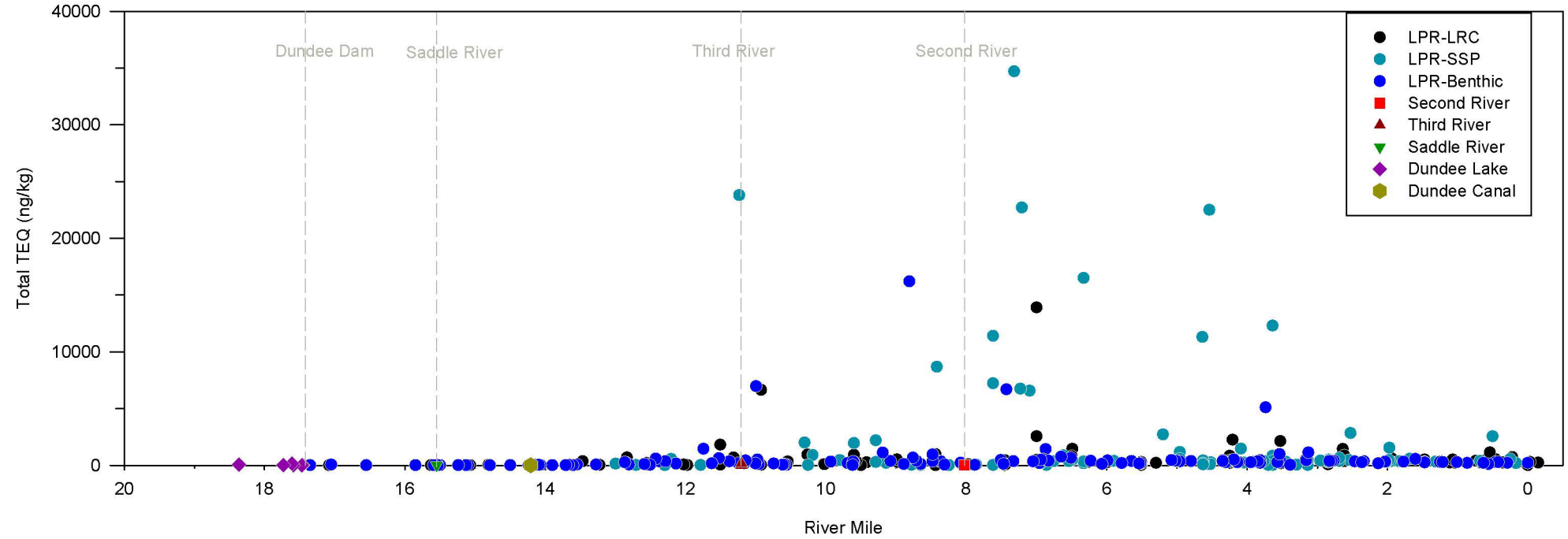
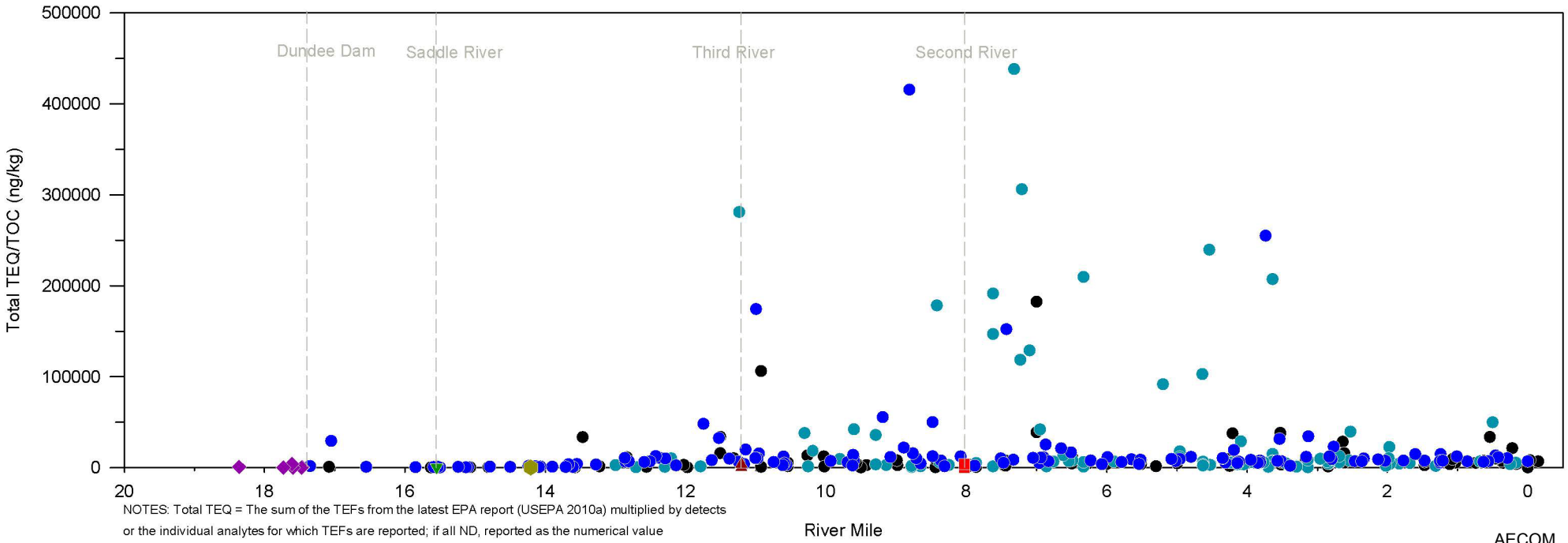
3-2.d Surficial Concentration vs. River Mile, Linear Scale - Total TEQ
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects or the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF (see Table 3-1).
Data presented on a dry weight basis.

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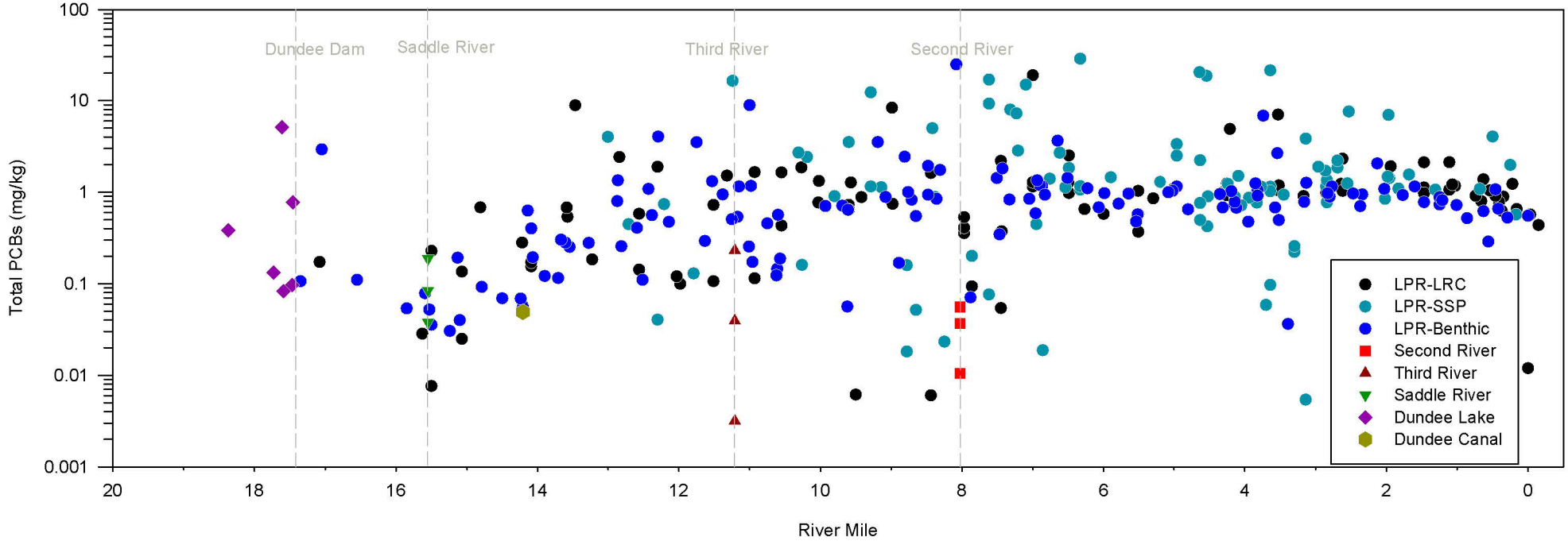
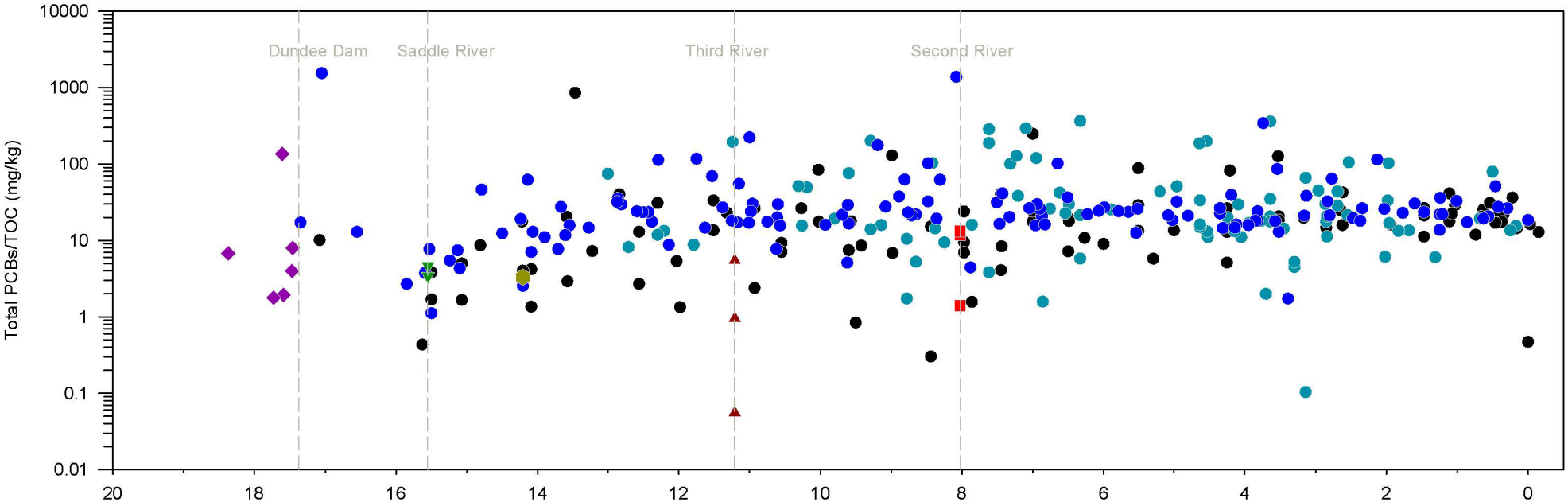
3-2.e Surficial Concentration vs. River Mile, Log Scale - Total PCBs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

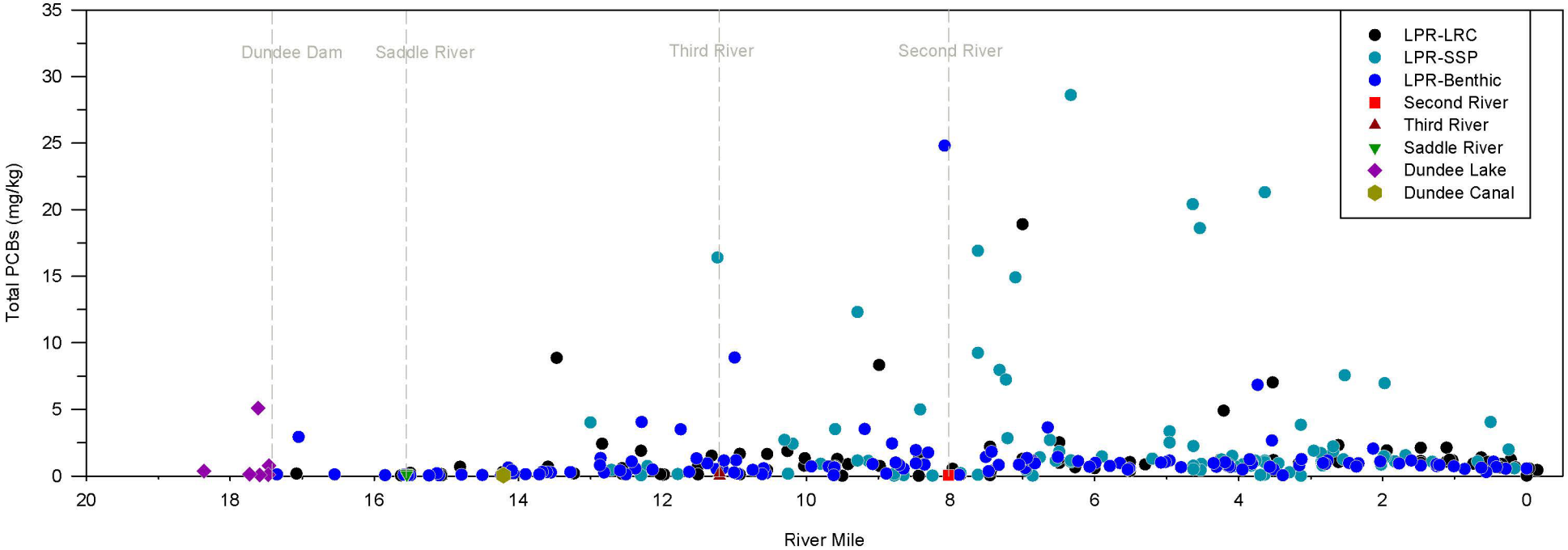


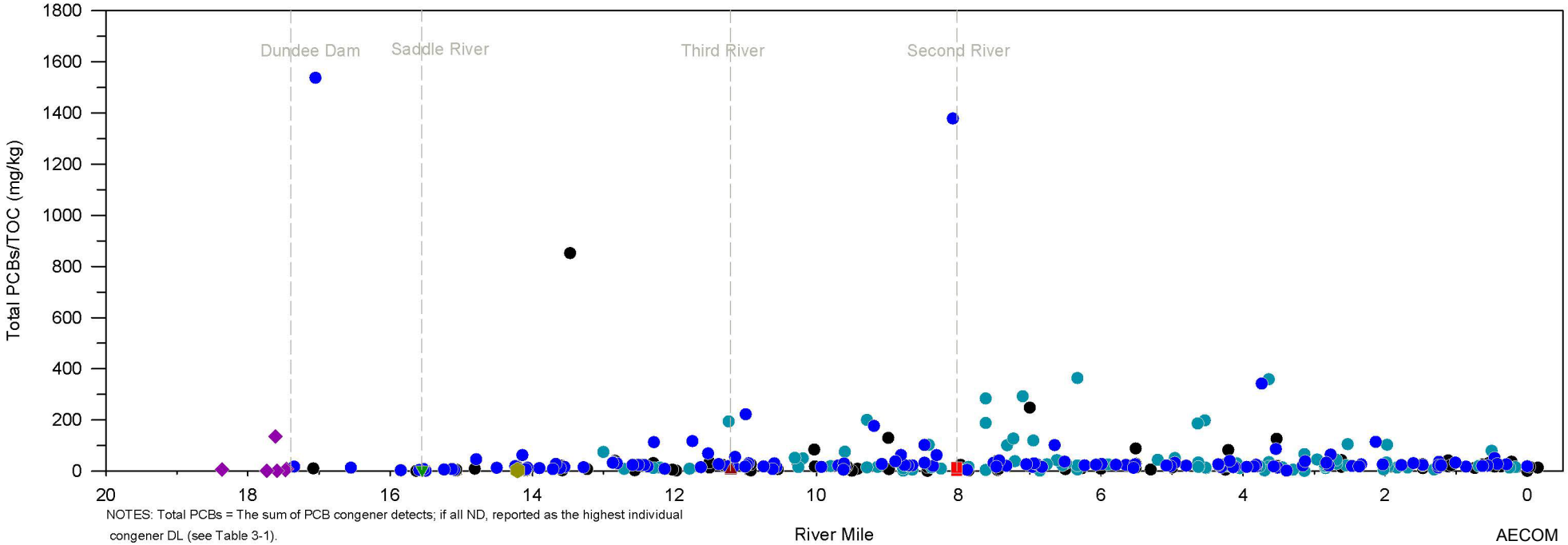


NOTES: Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL (see Table 3-1).
Data presented on a dry weight basis.

AECOM
November 2014

3-2.f Surficial Concentration vs. River Mile, Linear Scale - Total PCBs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

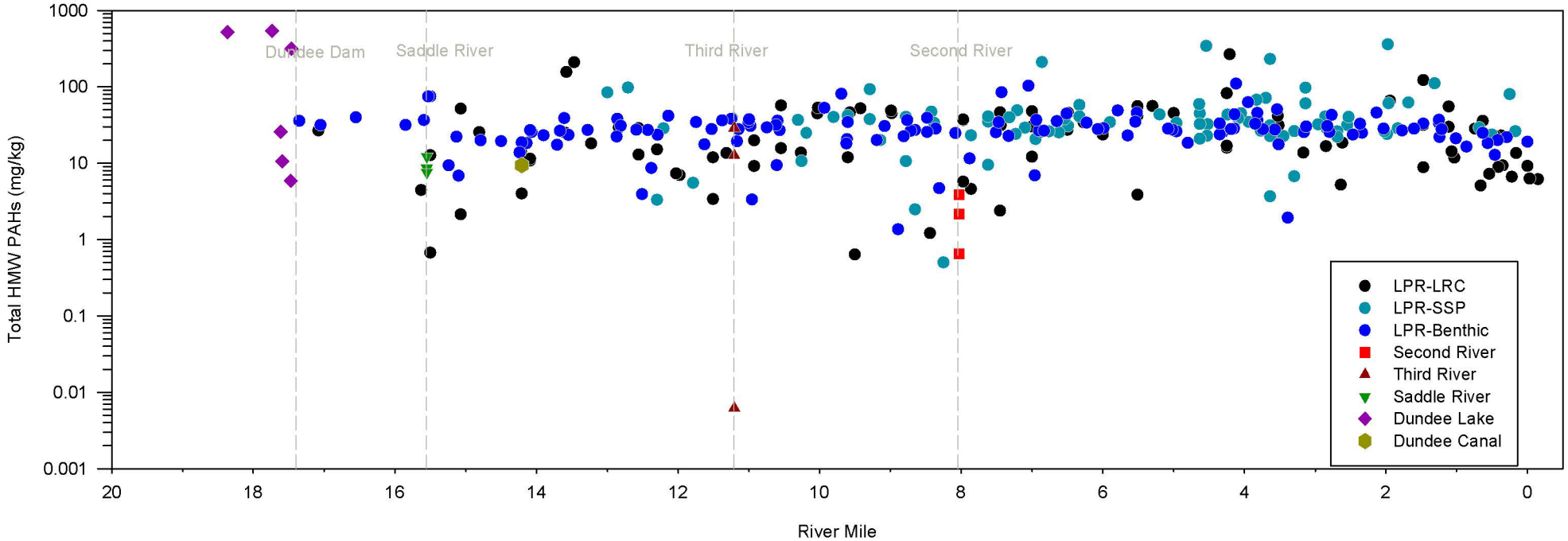


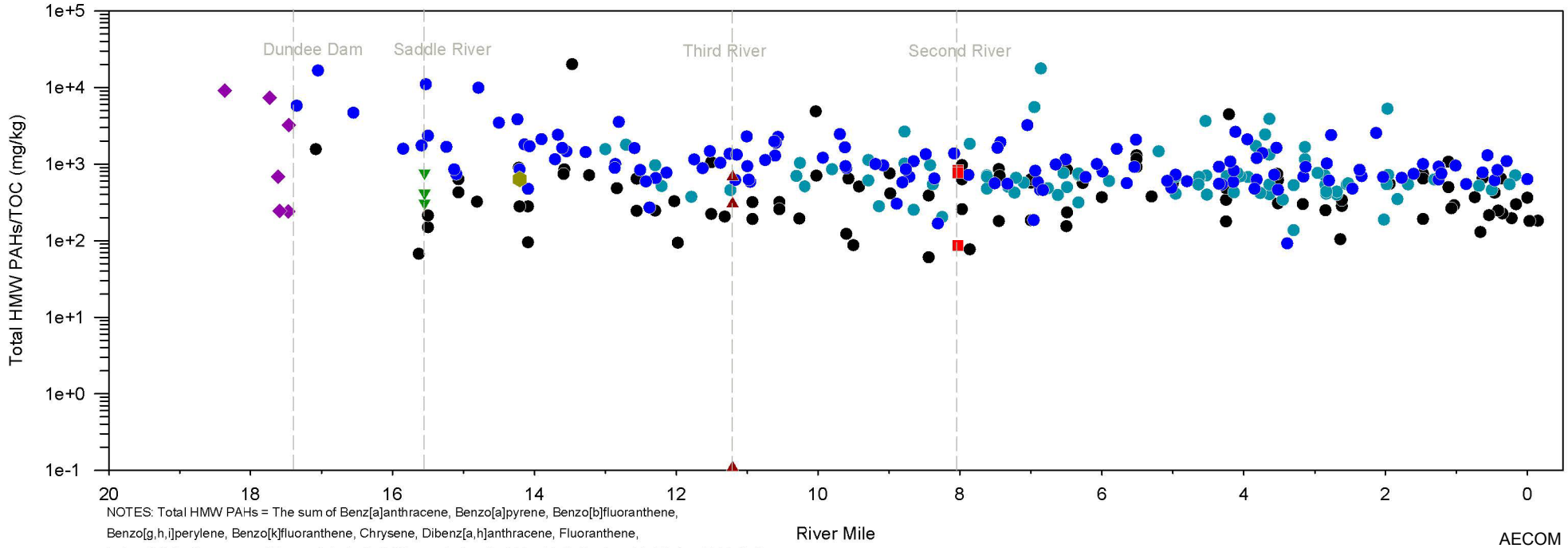


NOTES: Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL (see Table 3-1).
Data presented on a dry weight basis.

AECOM
November 2014

3-2.g Surficial Concentration vs. River Mile, Log Scale - Total HMW PAHs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).
Data presented on a dry weight basis.

AECOM
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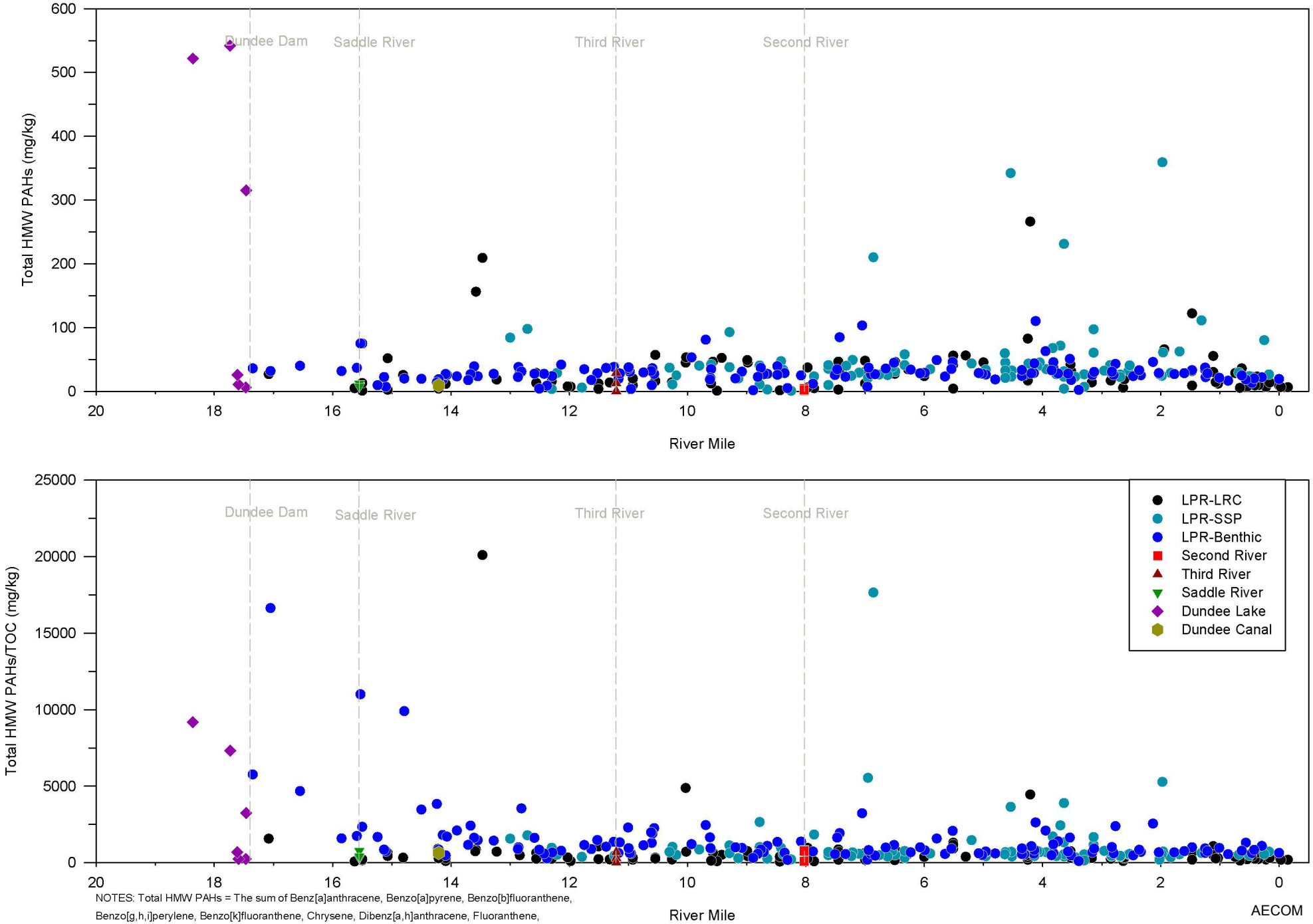
3-2.h Surficial Concentration vs. River Mile, Linear Scale - Total HMW PAHs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples



NOTES: Total HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).
Data presented on a dry weight basis.

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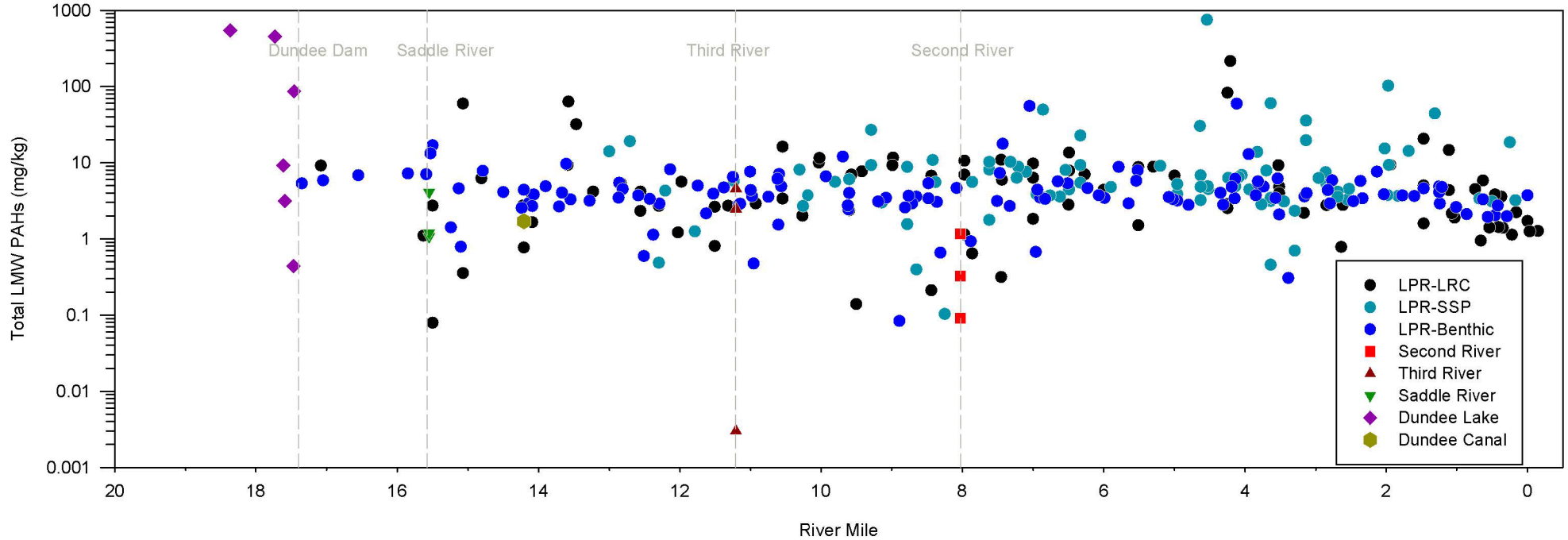
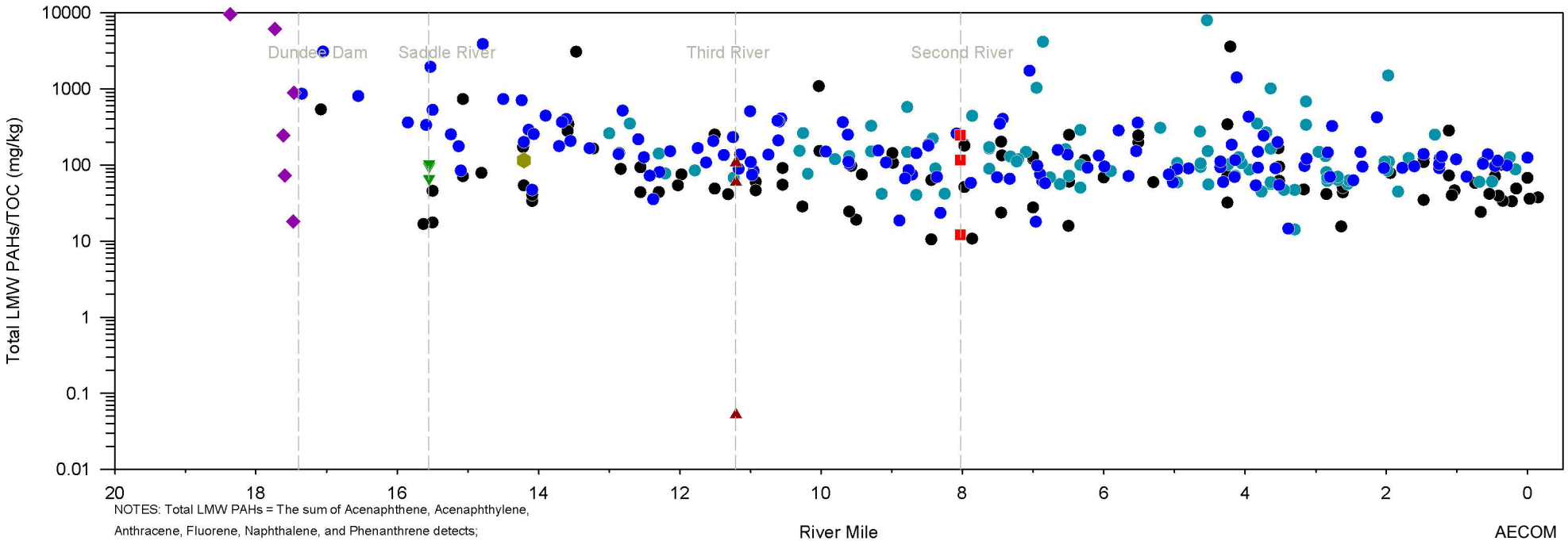
3-2.i Surficial Concentration vs. River Mile, Log Scale - Total LMW PAHs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).
Data presented based on a dry weight basis.

AECOM
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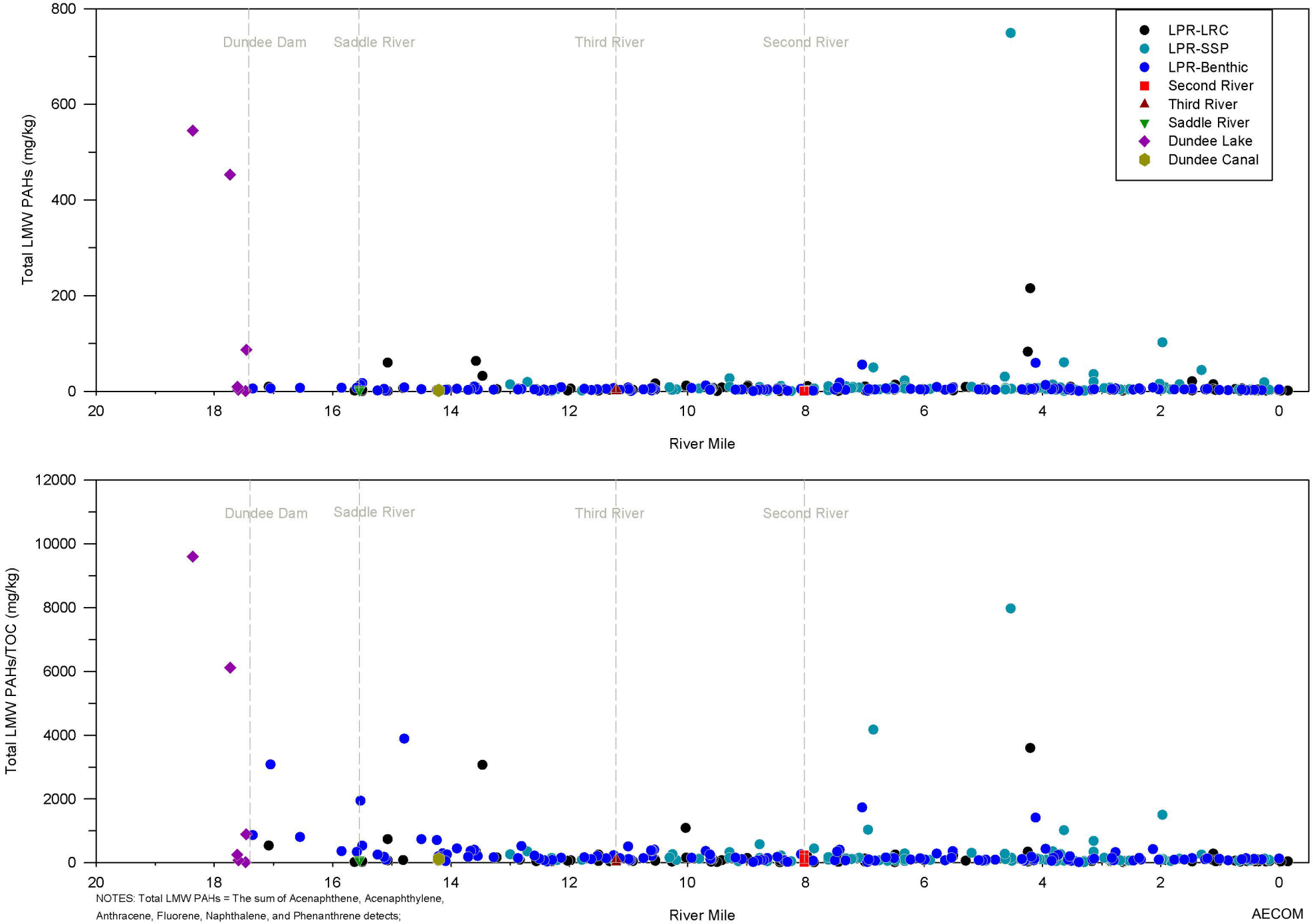
3-2.j Surficial Concentration vs. River Mile, Linear Scale - Total LMW PAHs
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples



NOTES: Total LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1). Data presented on a dry weight basis.

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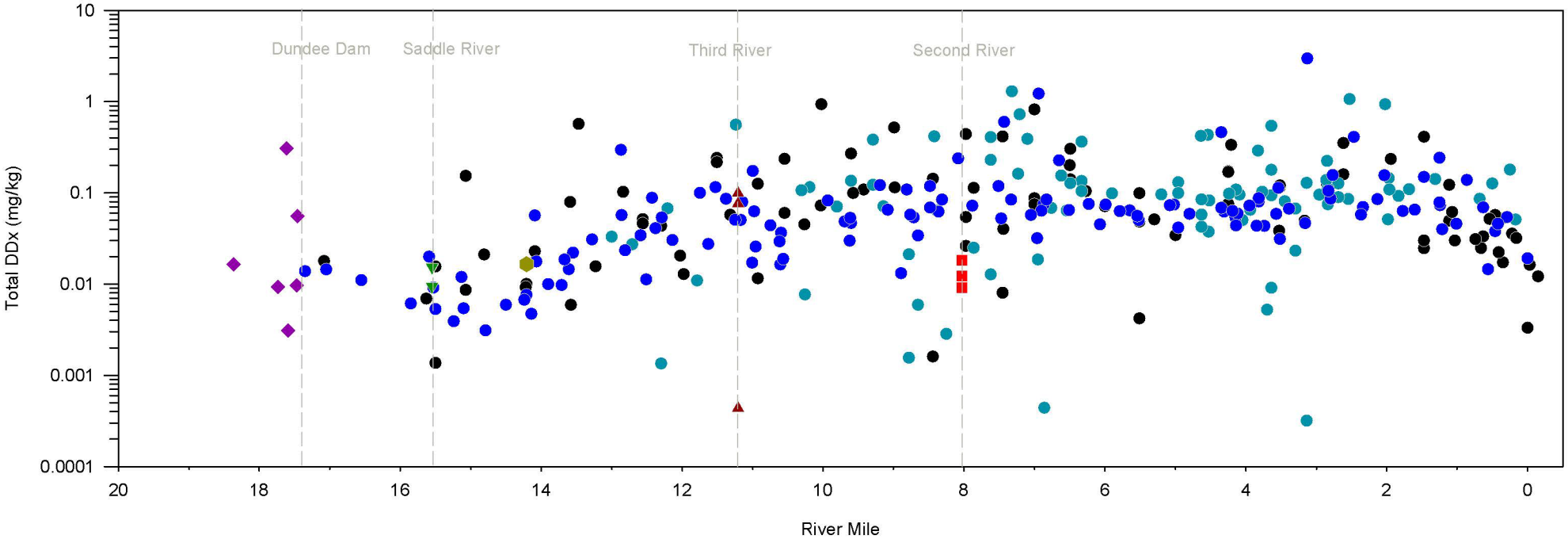
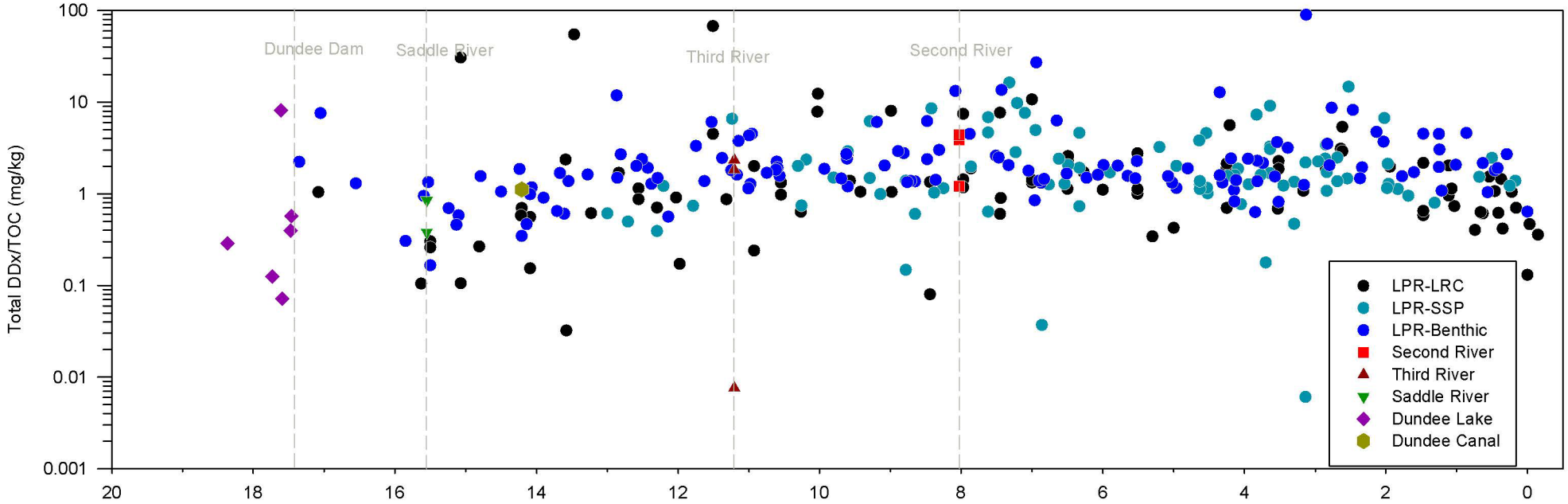
3-2.k Surficial Concentration vs. River Mile, Log Scale - Total DDx
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total DDx = The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).
Data presented on a dry weight basis.

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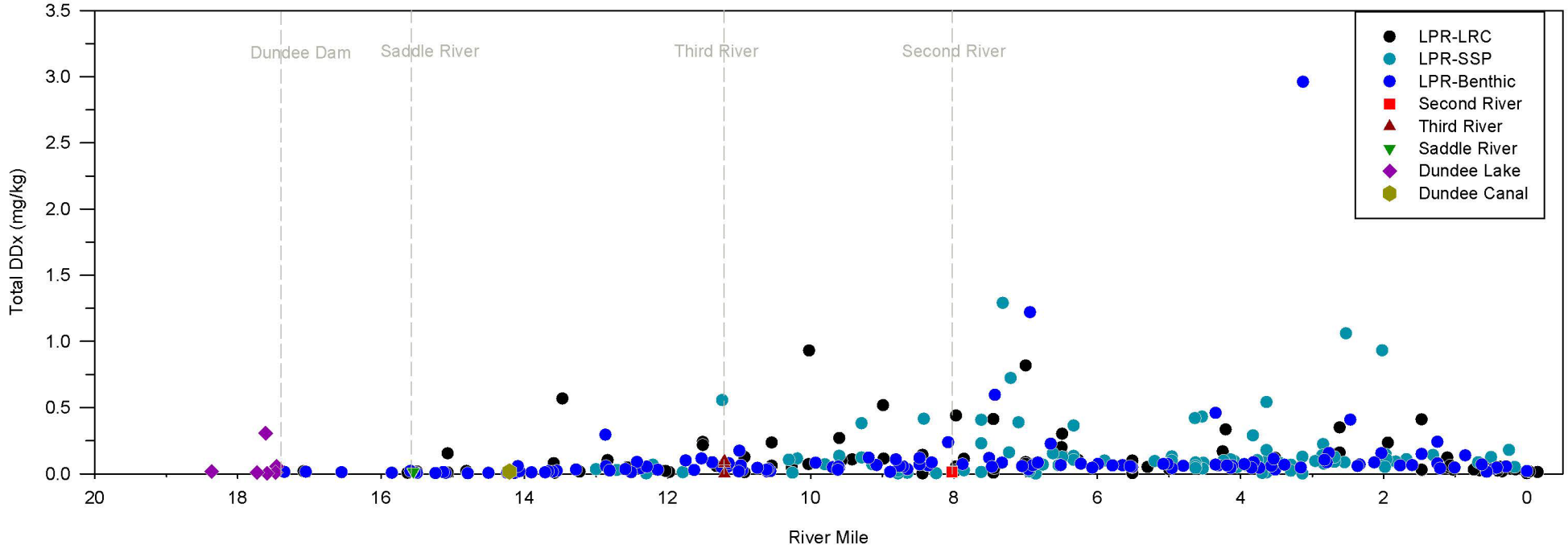
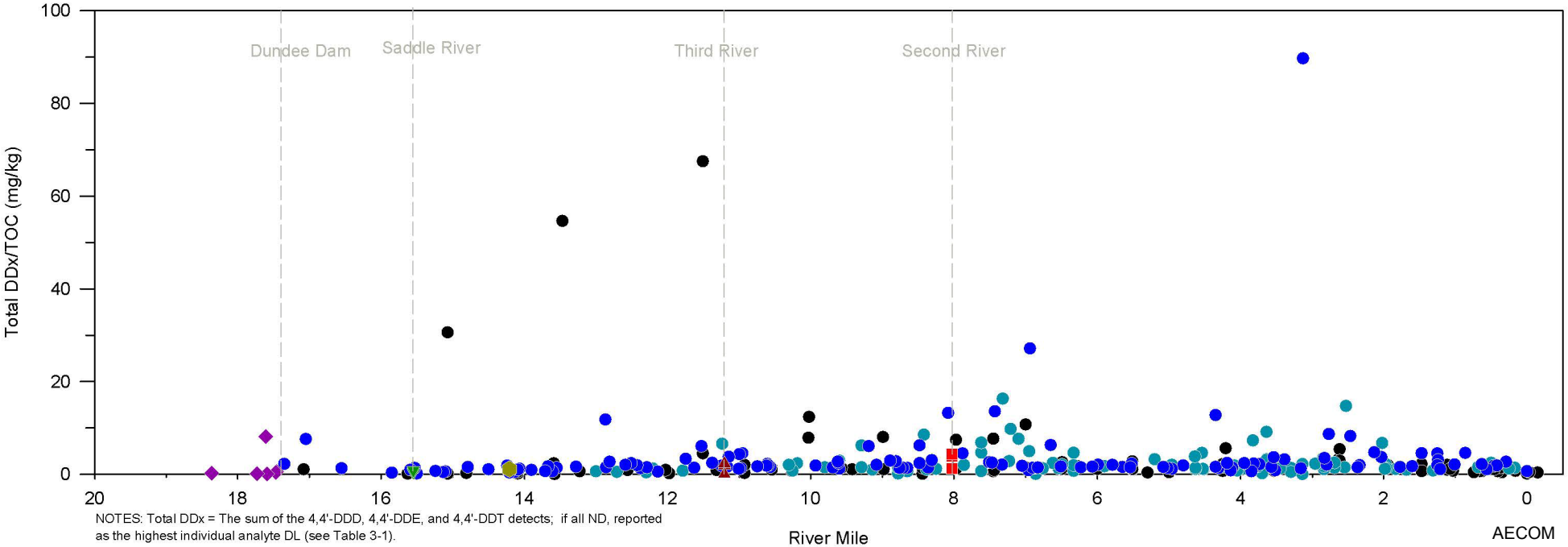
3-2.I Surficial Concentration vs. River Mile, Linear Scale - Total DDx
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total DDx = The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).
Data presented on a dry weight basis.

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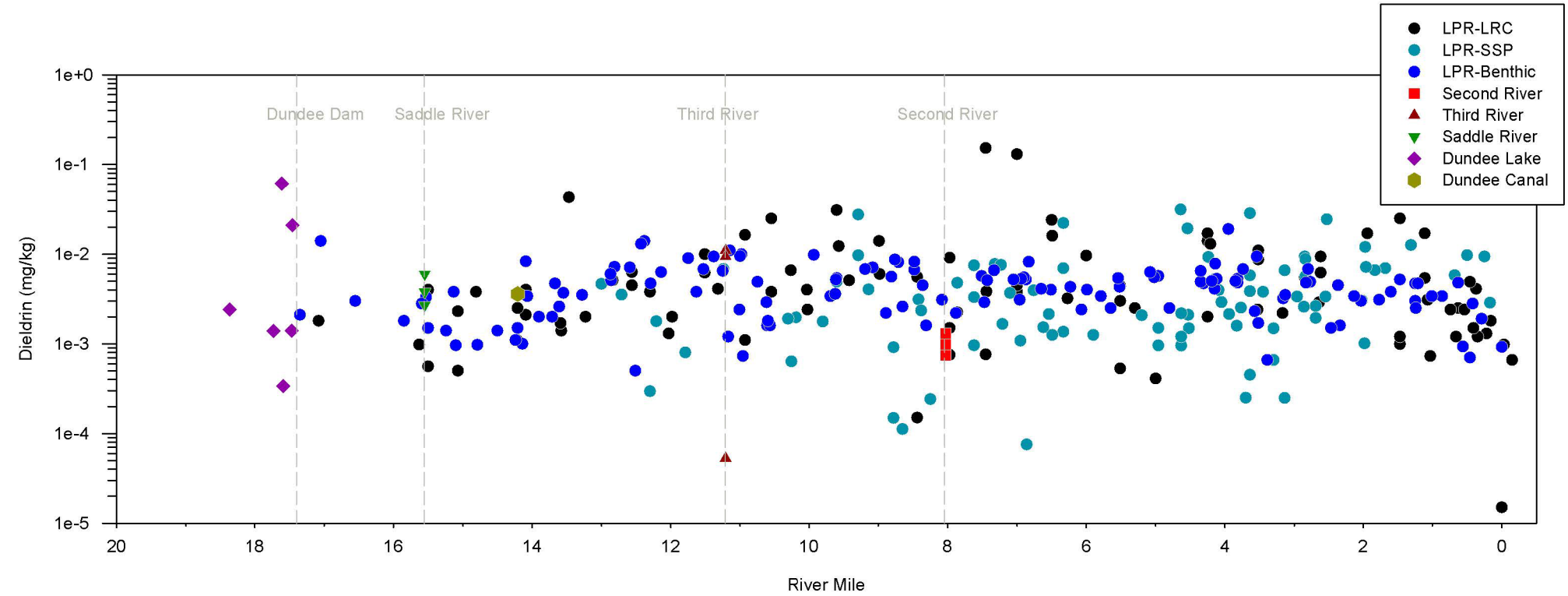
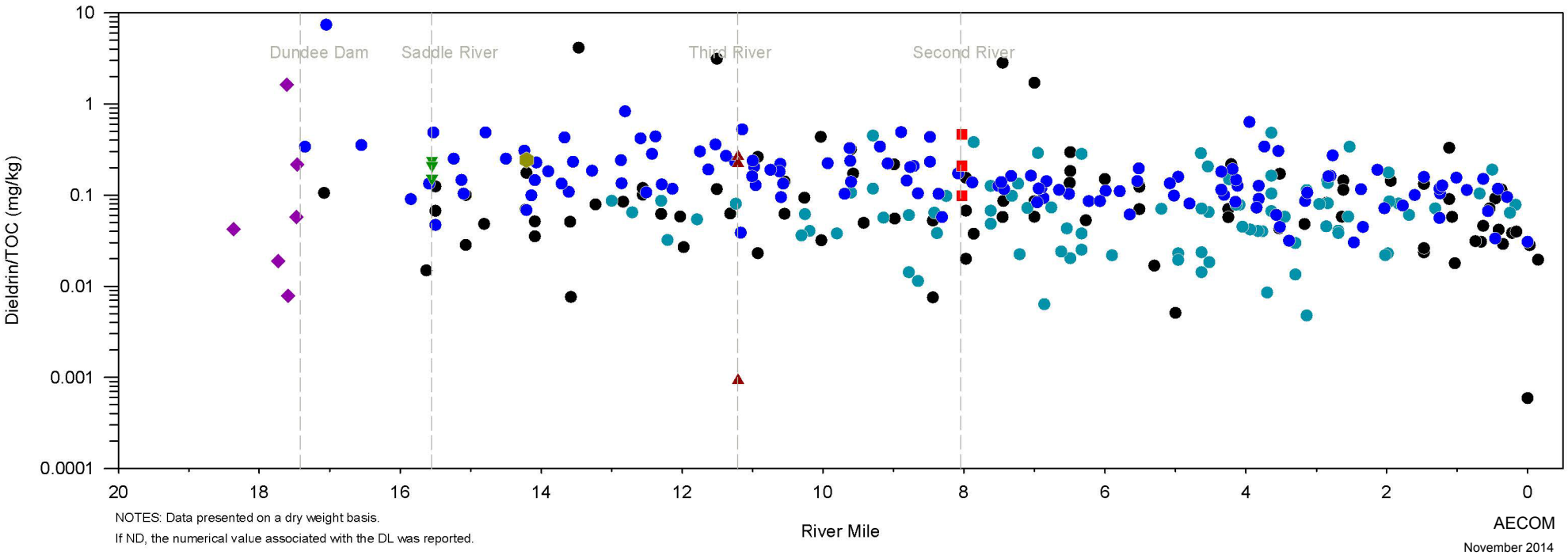
3-2.m Surficial Concentration vs. River Mile, Log Scale - Dieldrin
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

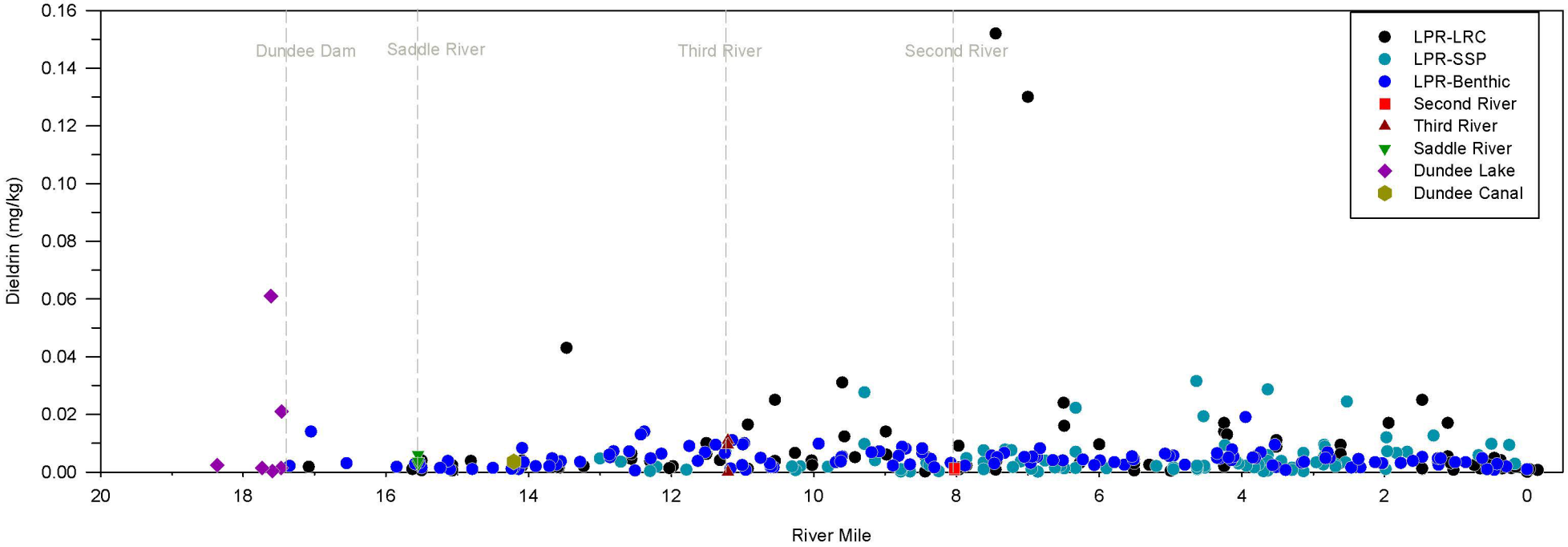


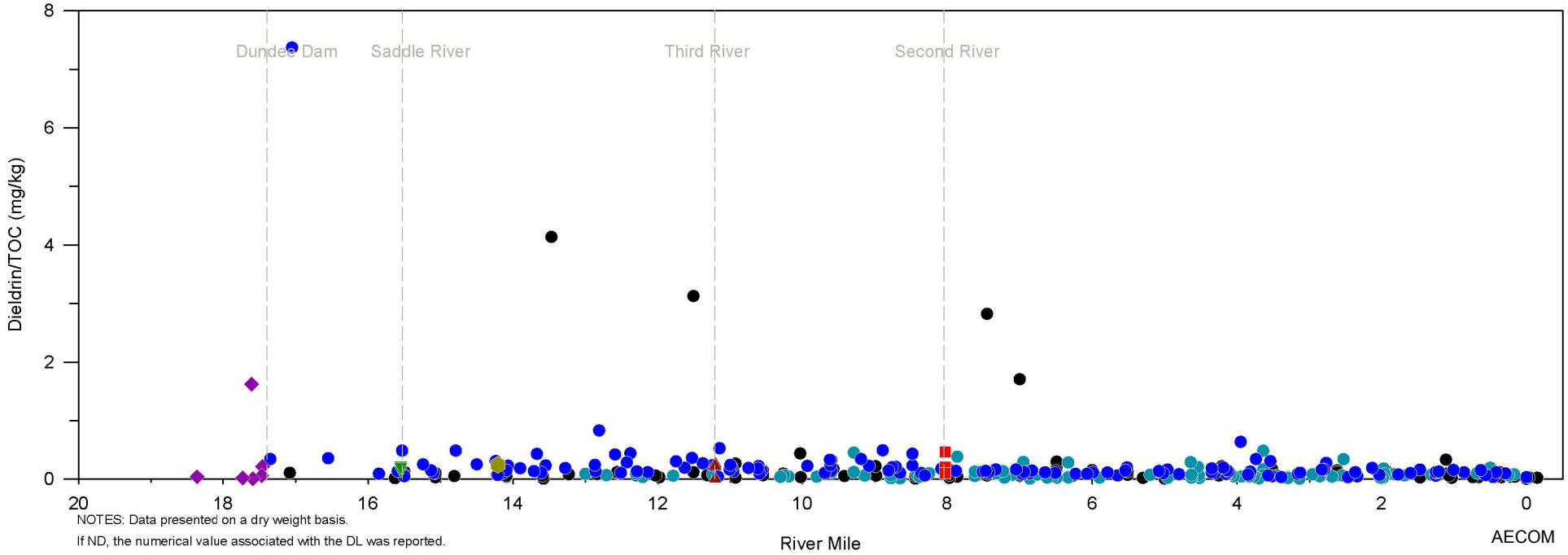


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.n Surficial Concentration vs. River Mile, Linear Scale - Dieldrin
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

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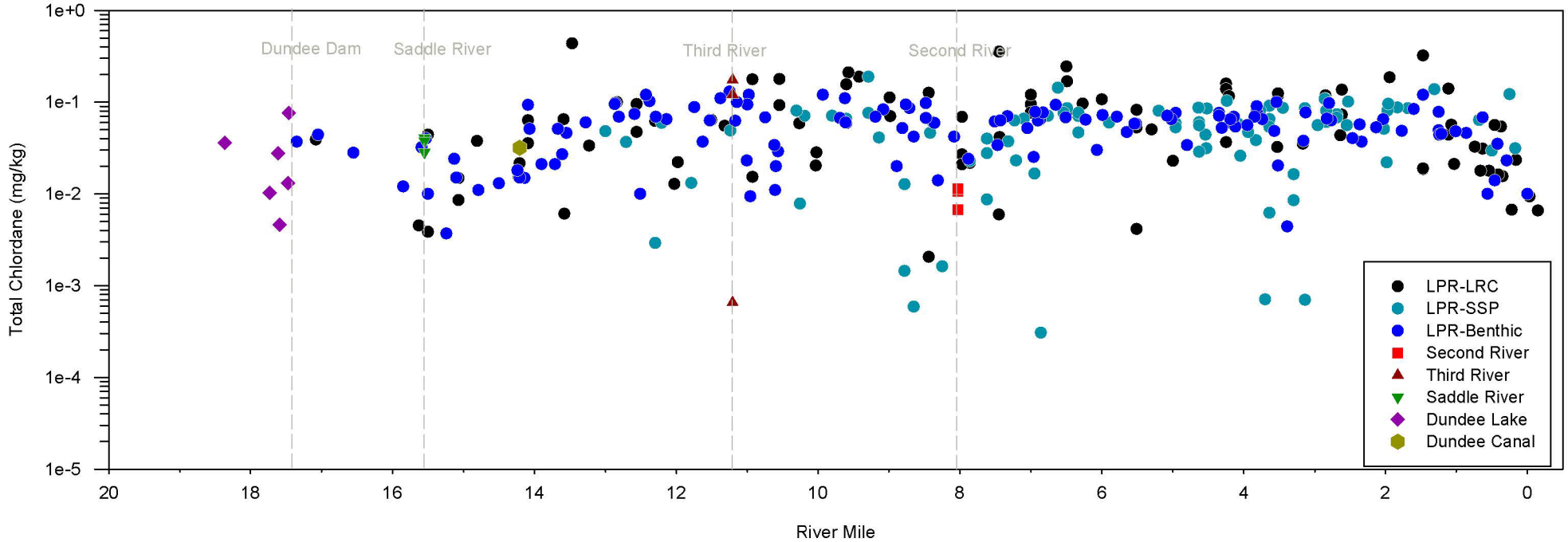
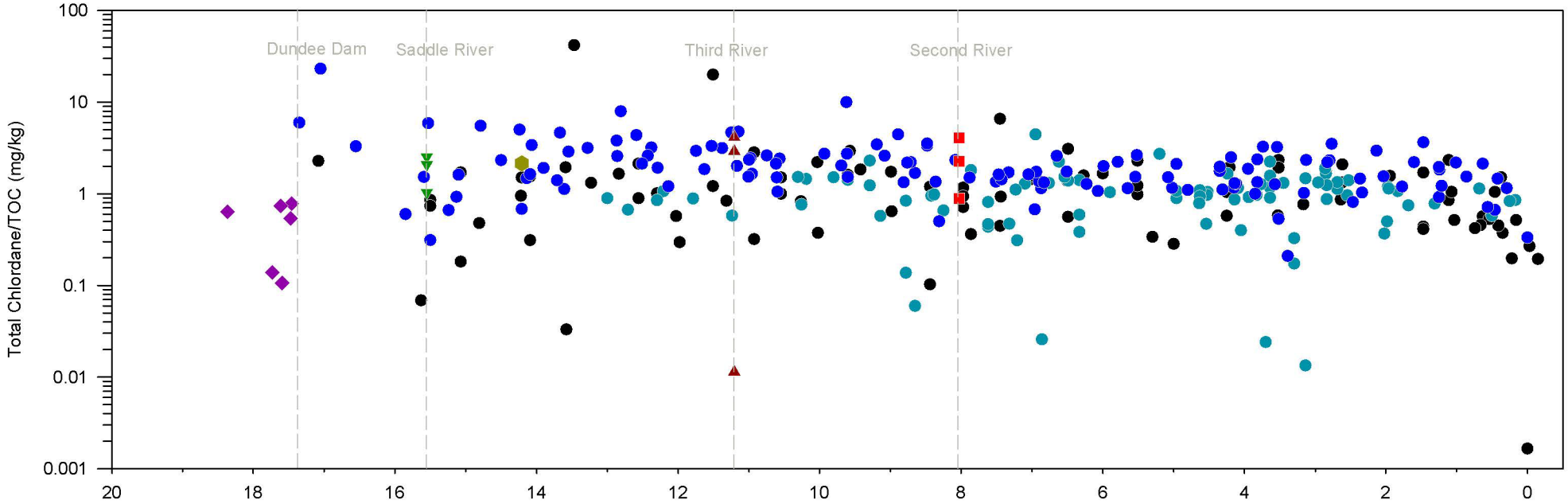
3-2.o Surficial Concentration vs. River Mile, Log Scale - Total Chlordane
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total Chlordane = The sum of cis-Chlordane, oxy-Chlordane, trans-Chlordane, cis-Nonachlor, trans-Nonachlor detects. If all ND, reported as the highest individual analyte DL. Data presented on a dry weight basis.

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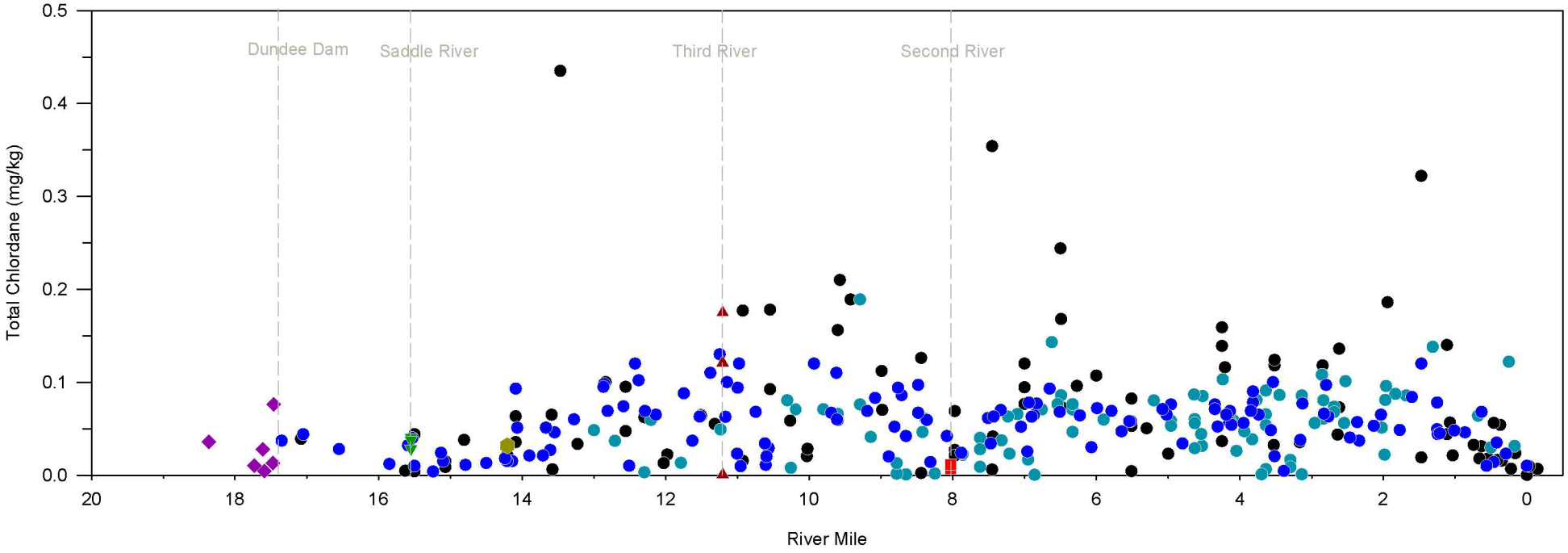
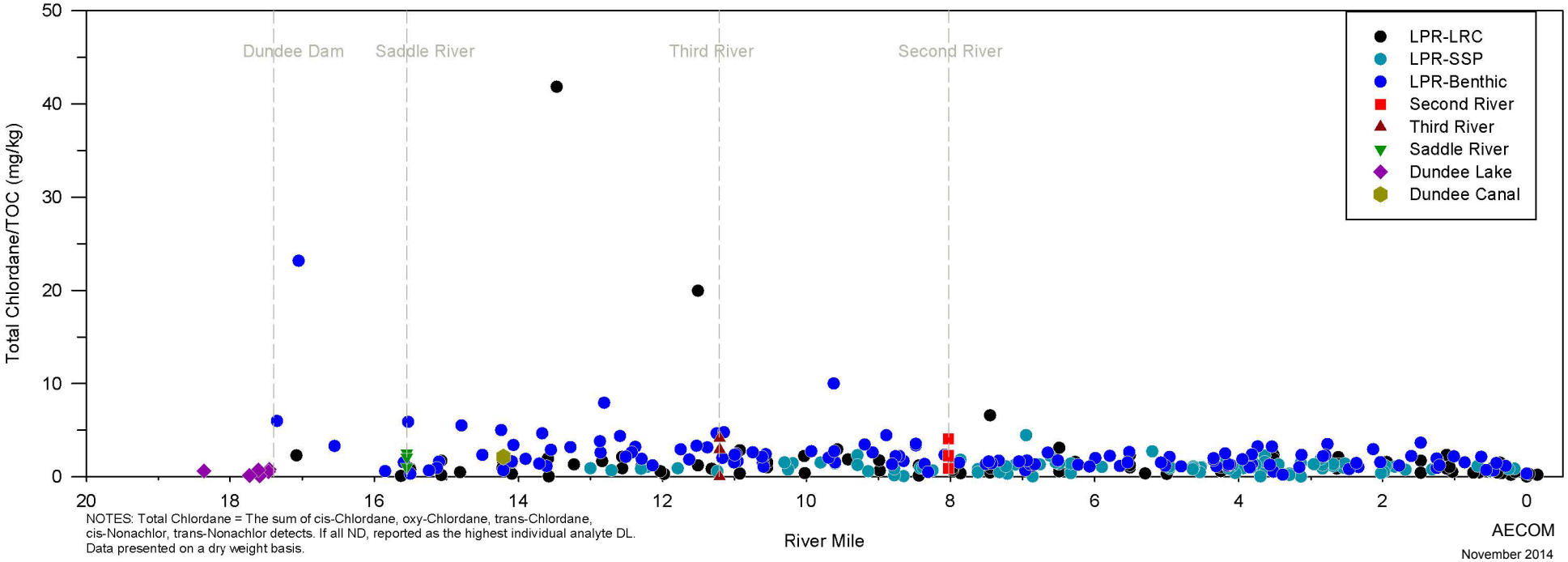
3-2.p Surficial Concentration vs. River Mile, Linear Scale - Total Chlordane
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Total Chlordane = The sum of cis-Chlordane, oxy-Chlordane, trans-Chlordane, cis-Nonachlor, trans-Nonachlor detects. If all ND, reported as the highest individual analyte DL. Data presented on a dry weight basis.

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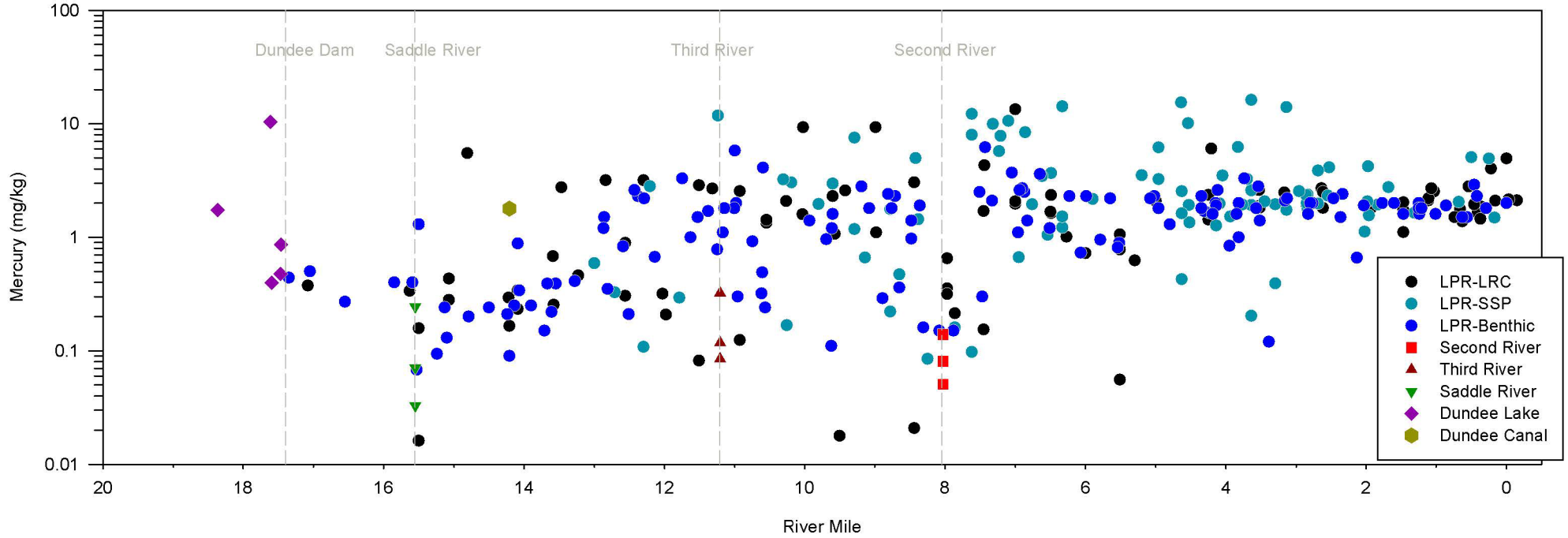
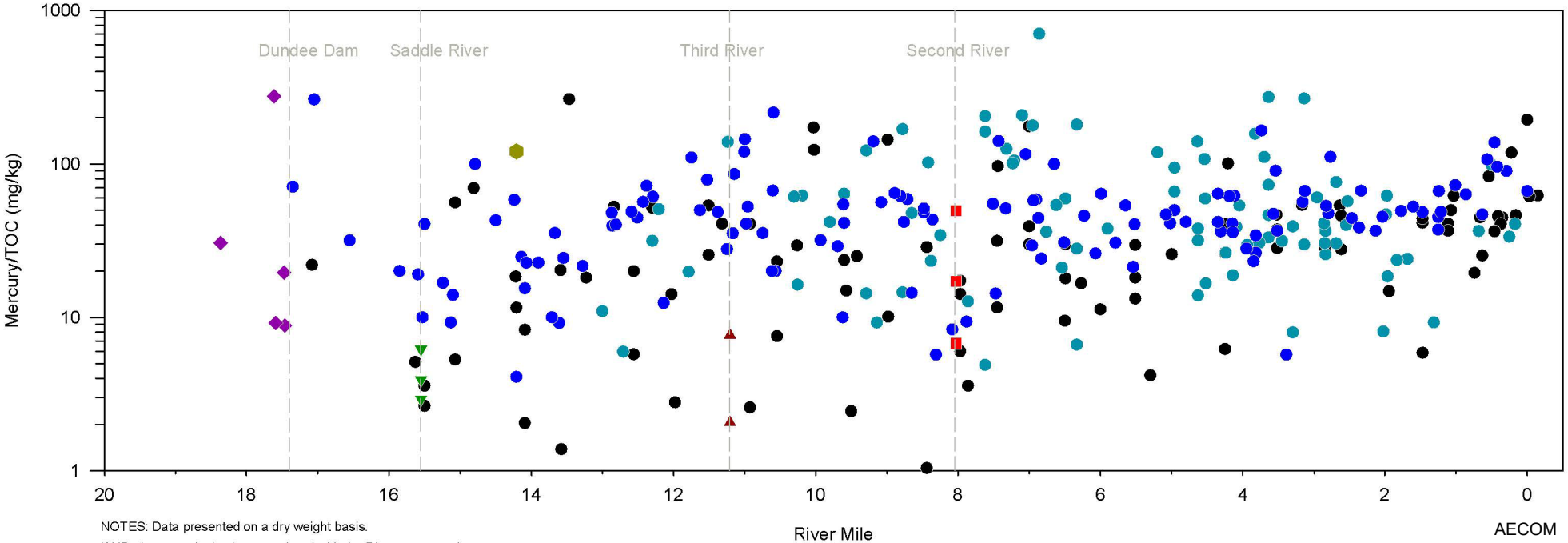
3-2.q Surficial Concentration vs. River Mile, Log Scale - Mercury
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

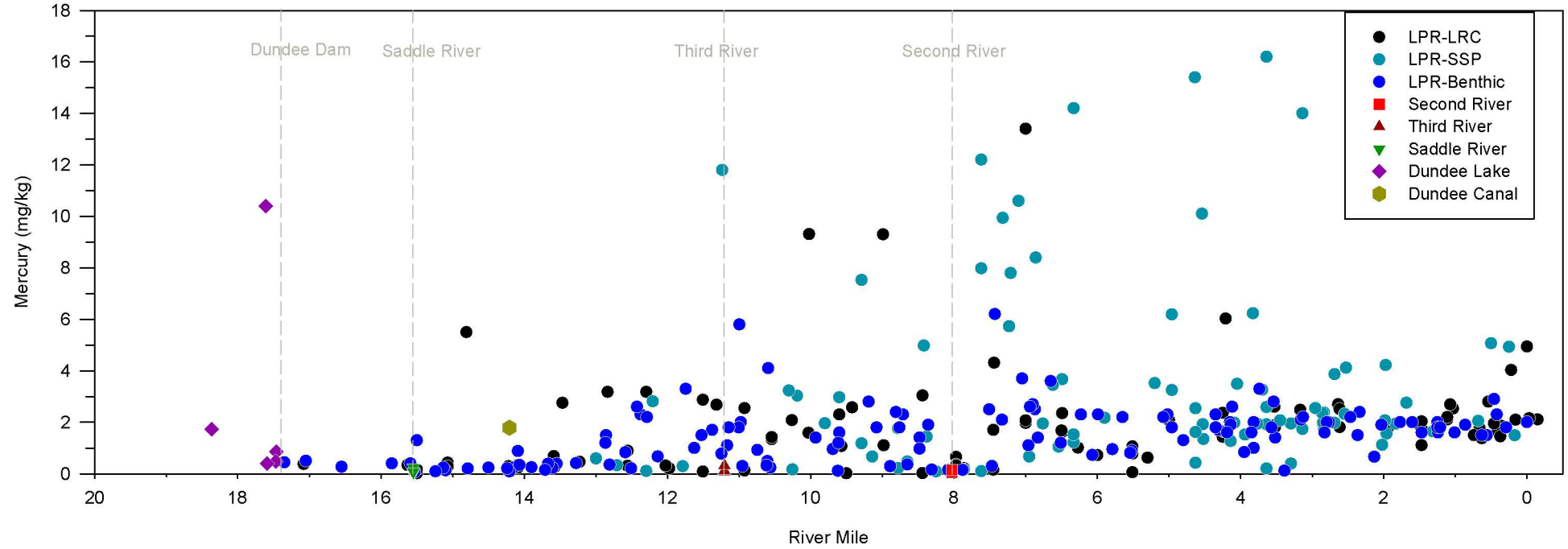


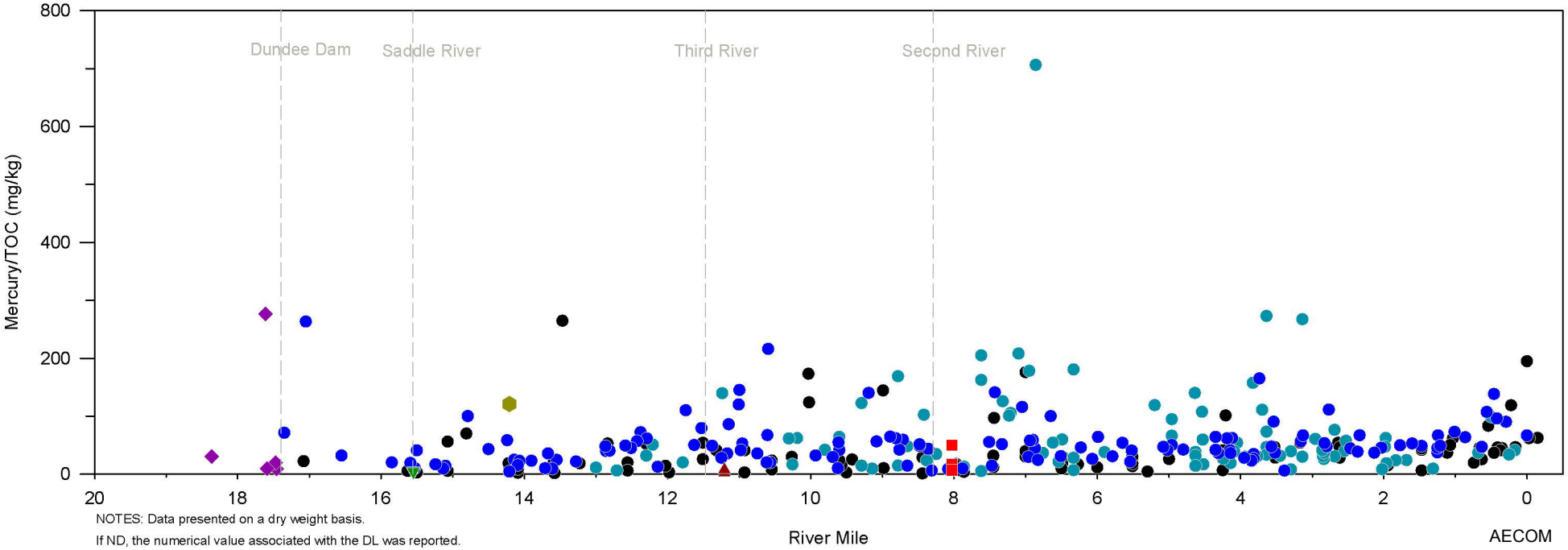


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.r Surficial Concentration vs. River Mile, Linear Scale - Mercury
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

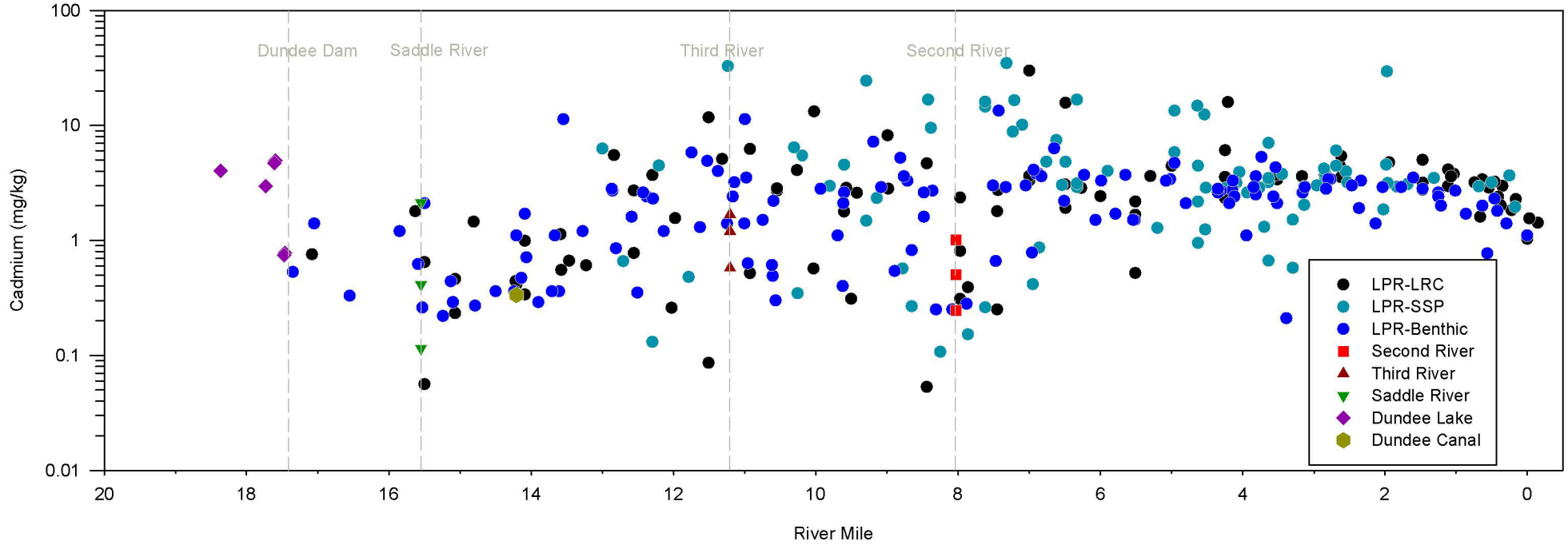


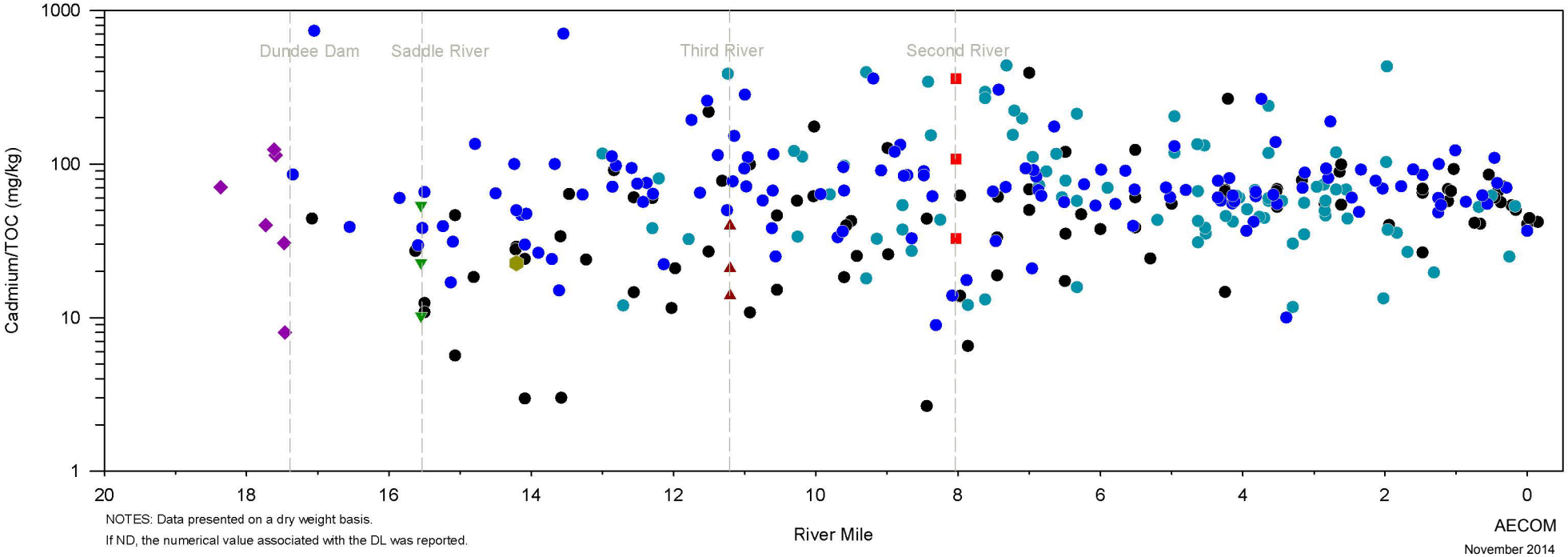


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.s Surficial Concentration vs. River Mile, Log Scale - Cadmium
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples





NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

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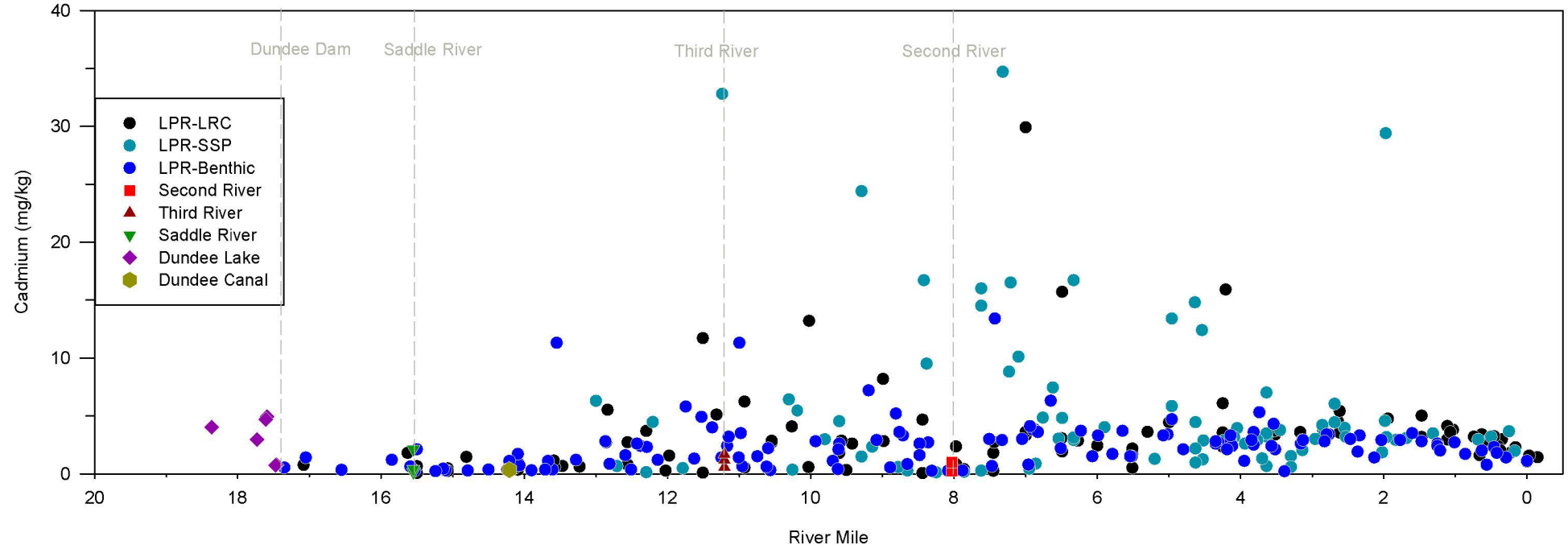
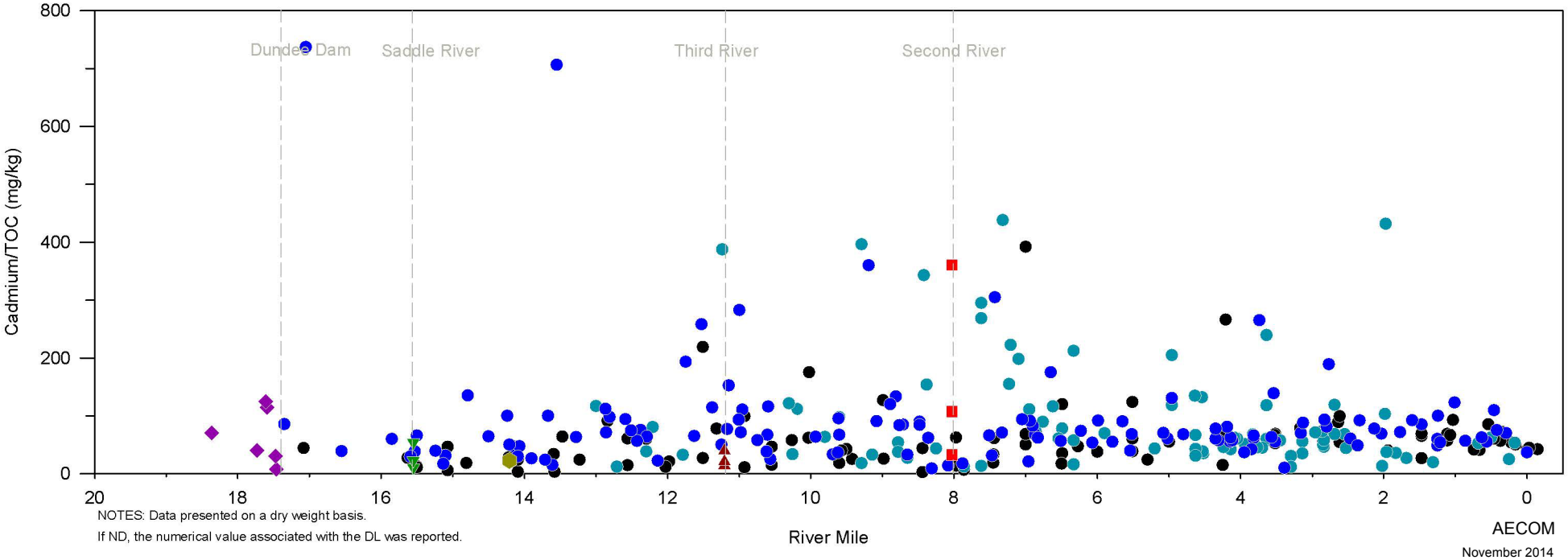
3-2.t Surficial Concentration vs. River Mile, Linear Scale - Cadmium
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

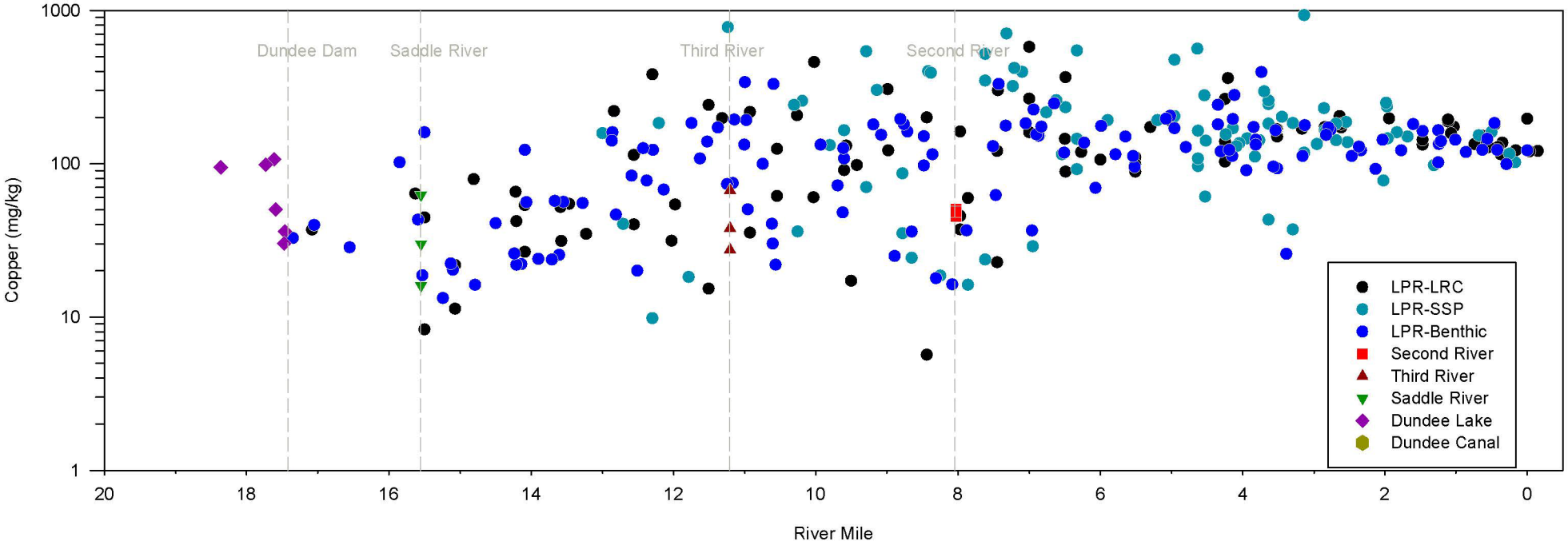


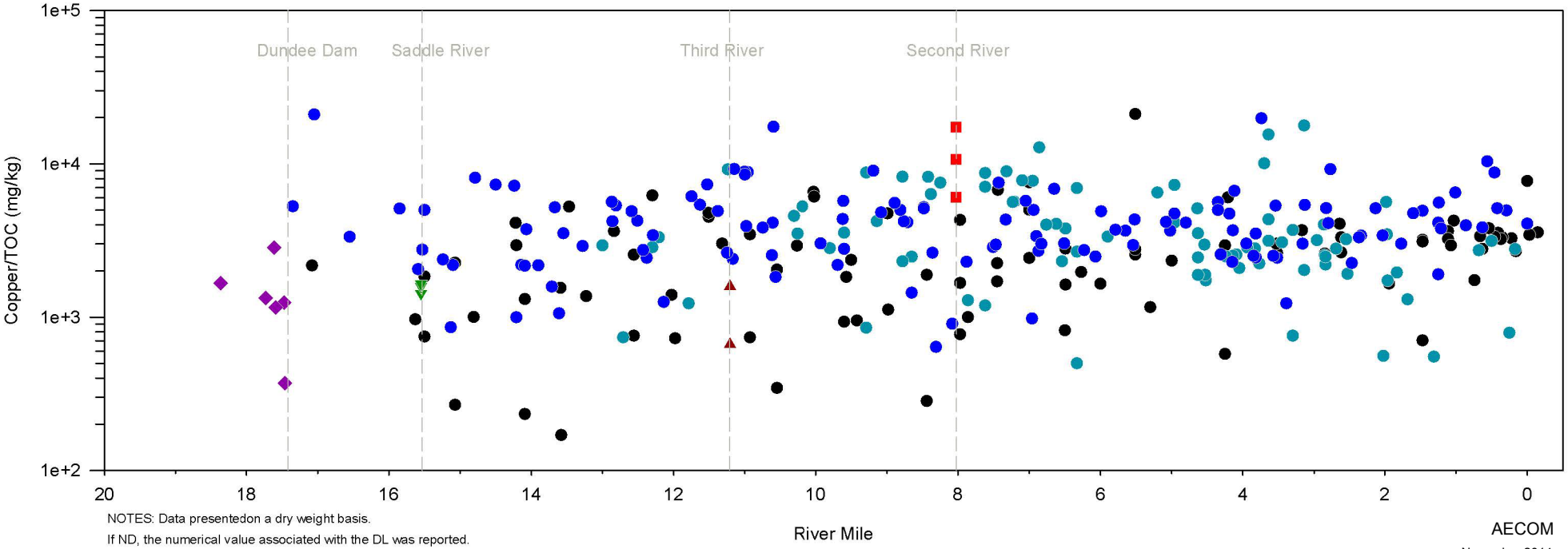


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.u Surficial Concentration vs. River Mile, Log Scale - Copper
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

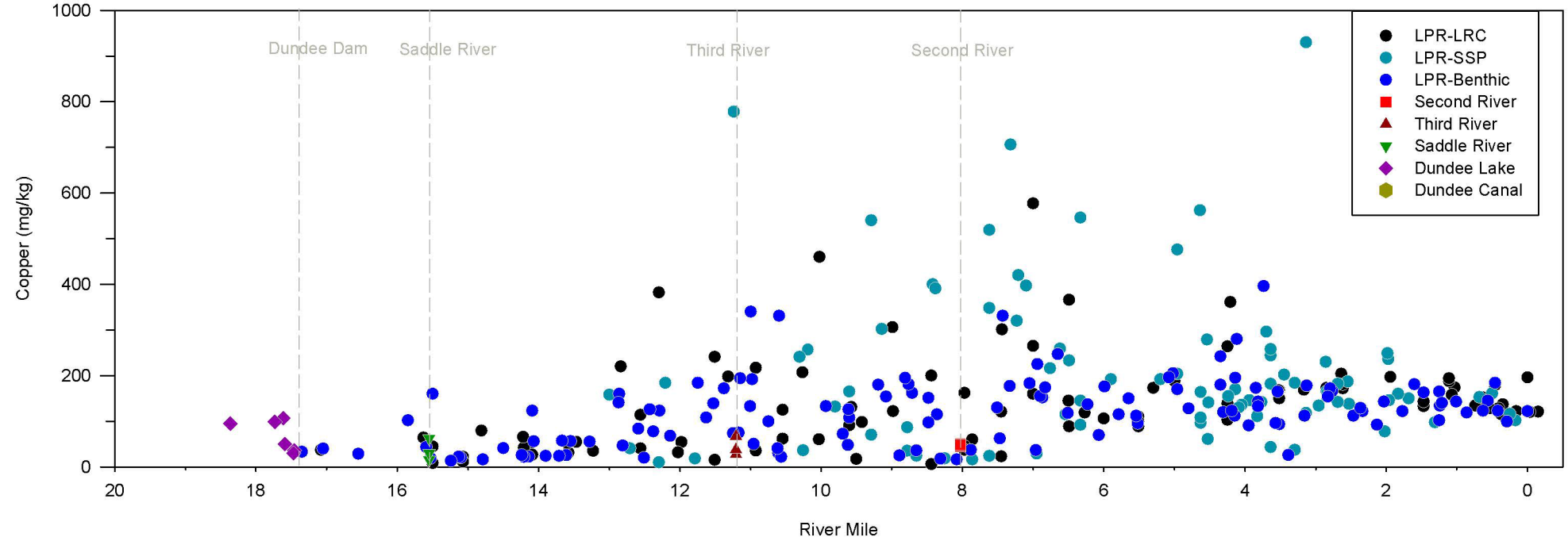


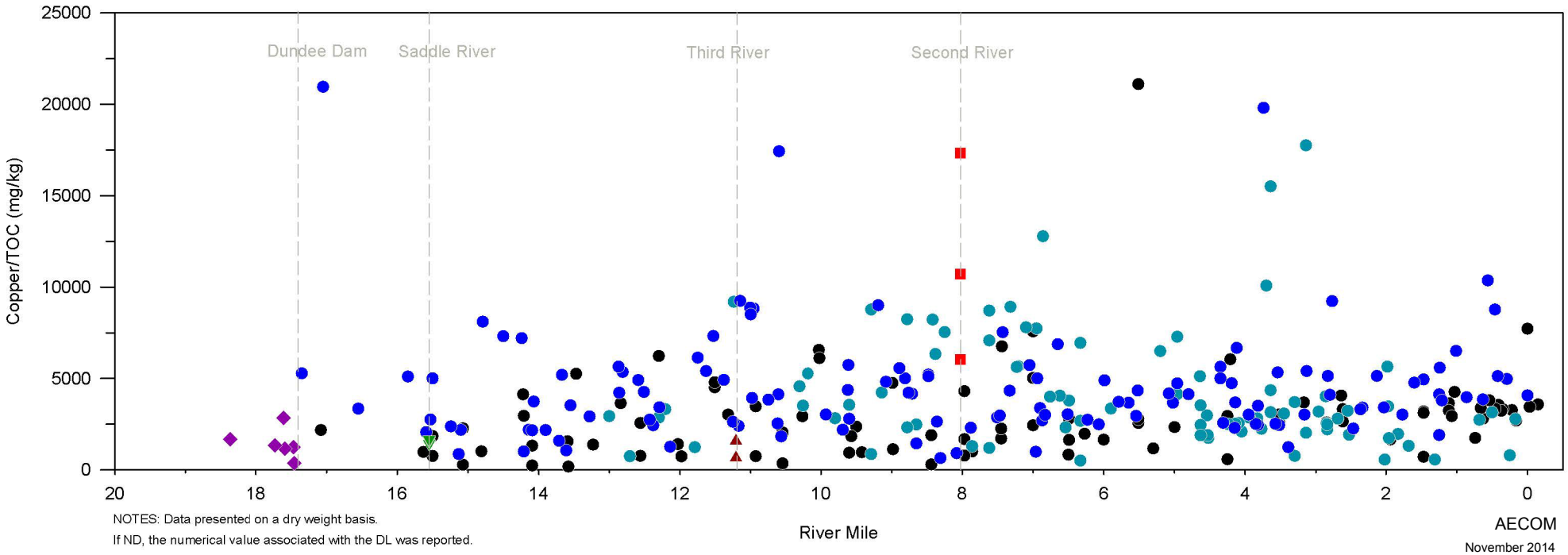


NOTES: Data presentedon a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.v Surficial Concentration vs. River Mile, Linear Scale - Copper
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

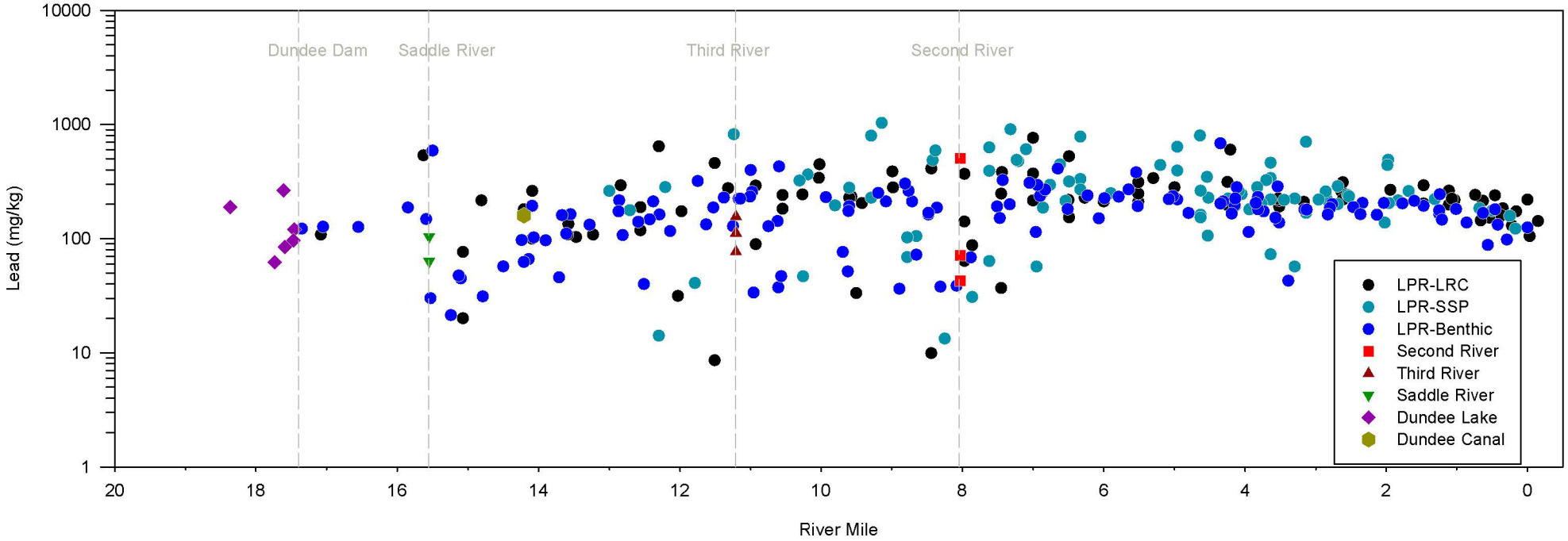


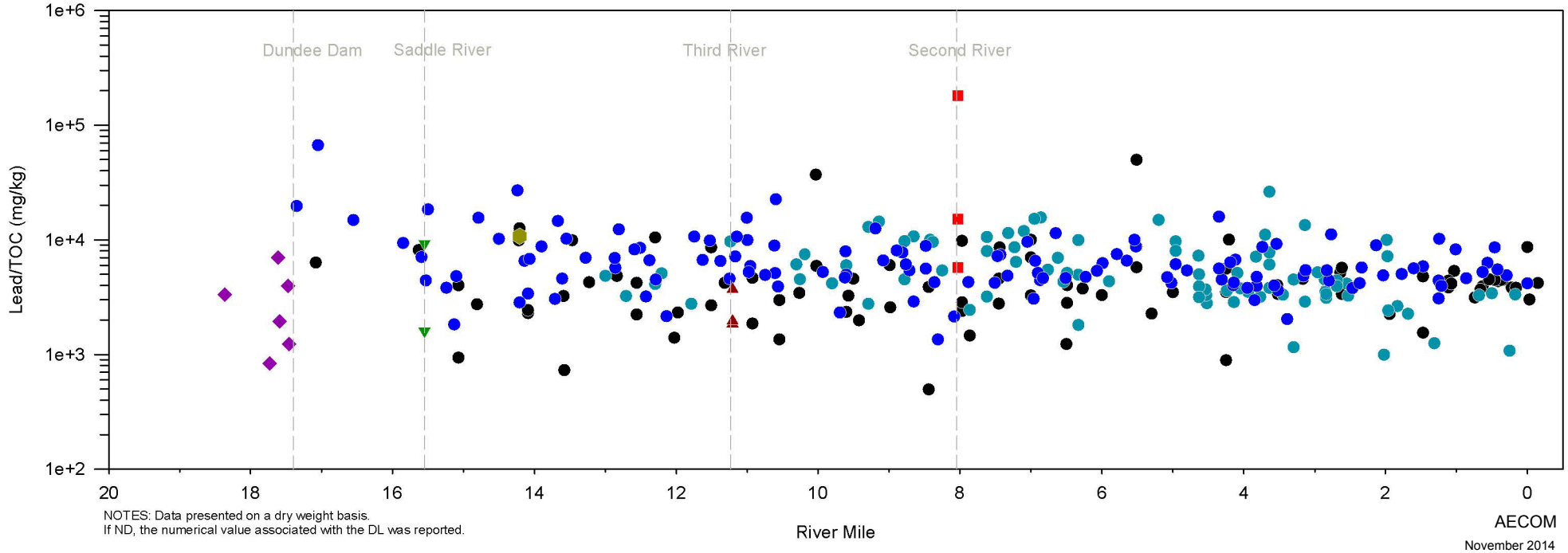


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.w Surficial Concentration vs. River Mile, Log Scale - Lead
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

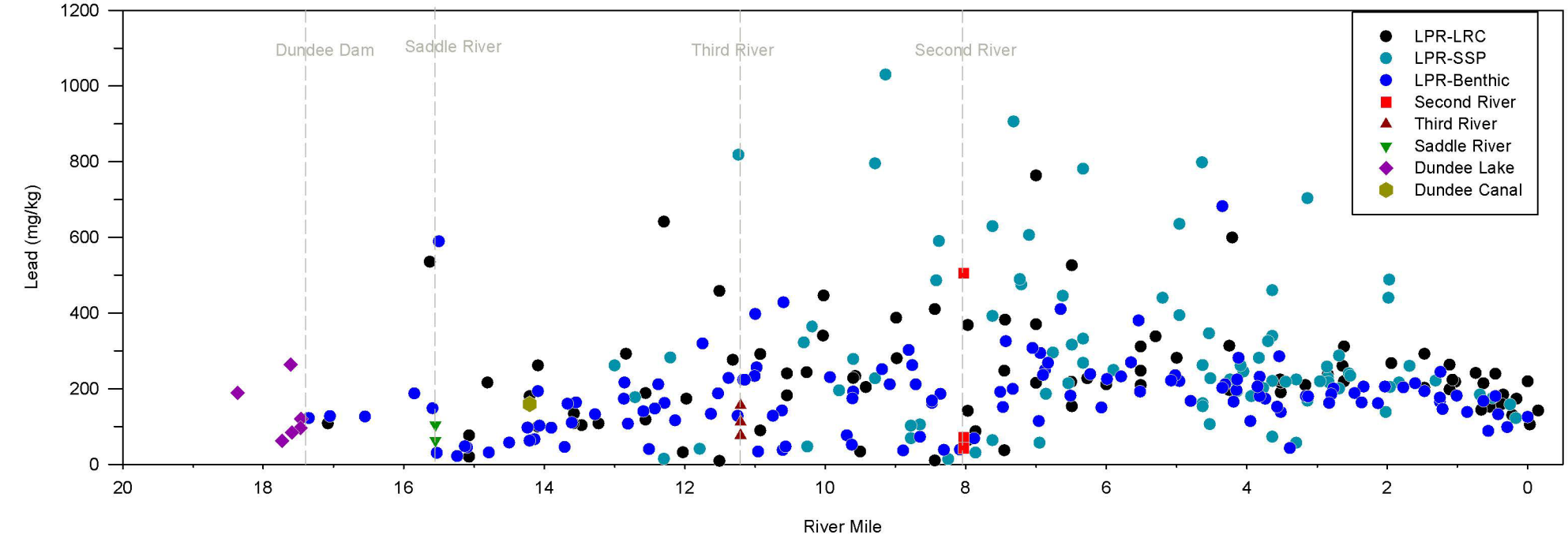


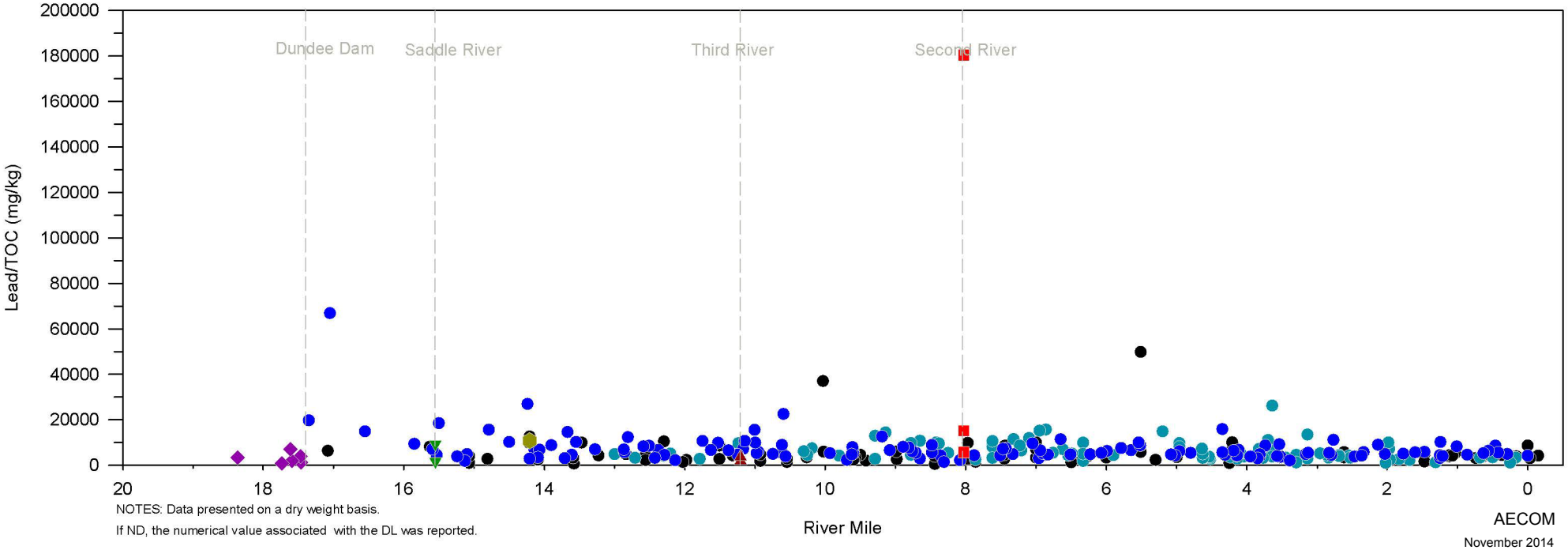


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

3-2.x Surficial Concentration vs. River Mile, Linear Scale - Lead
Surficial Sediments (0 - 0.5 ft) - LRC, Benthic and LRC SSP Samples

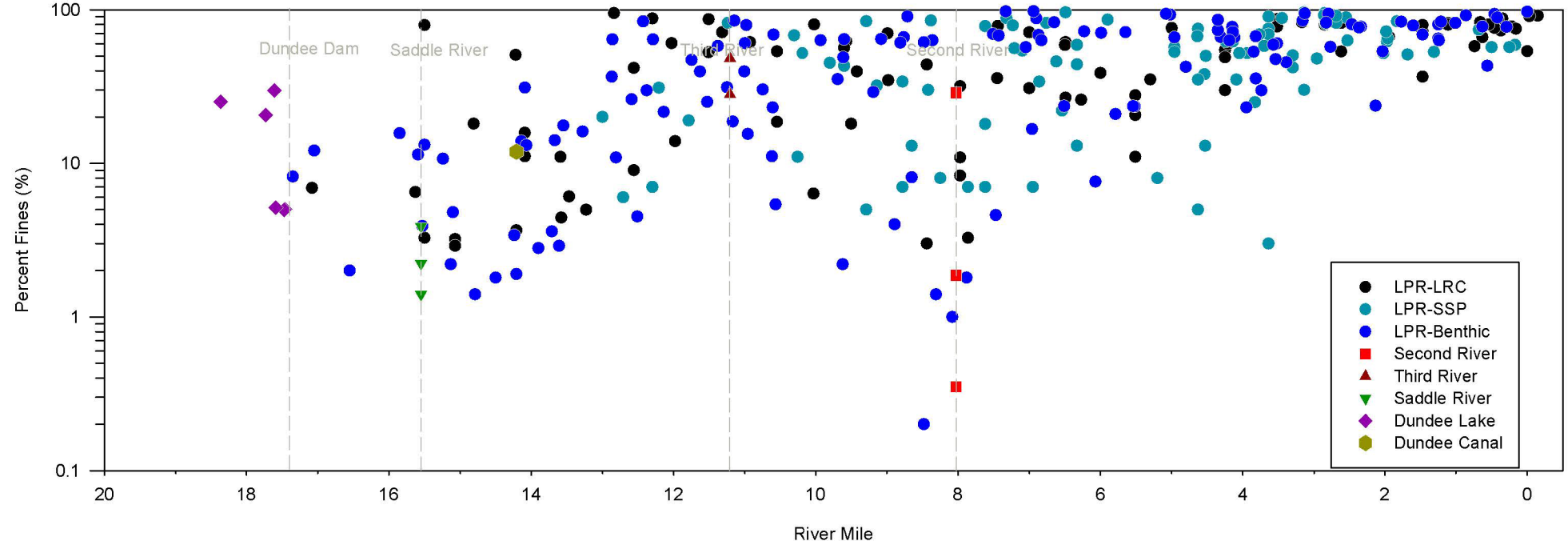


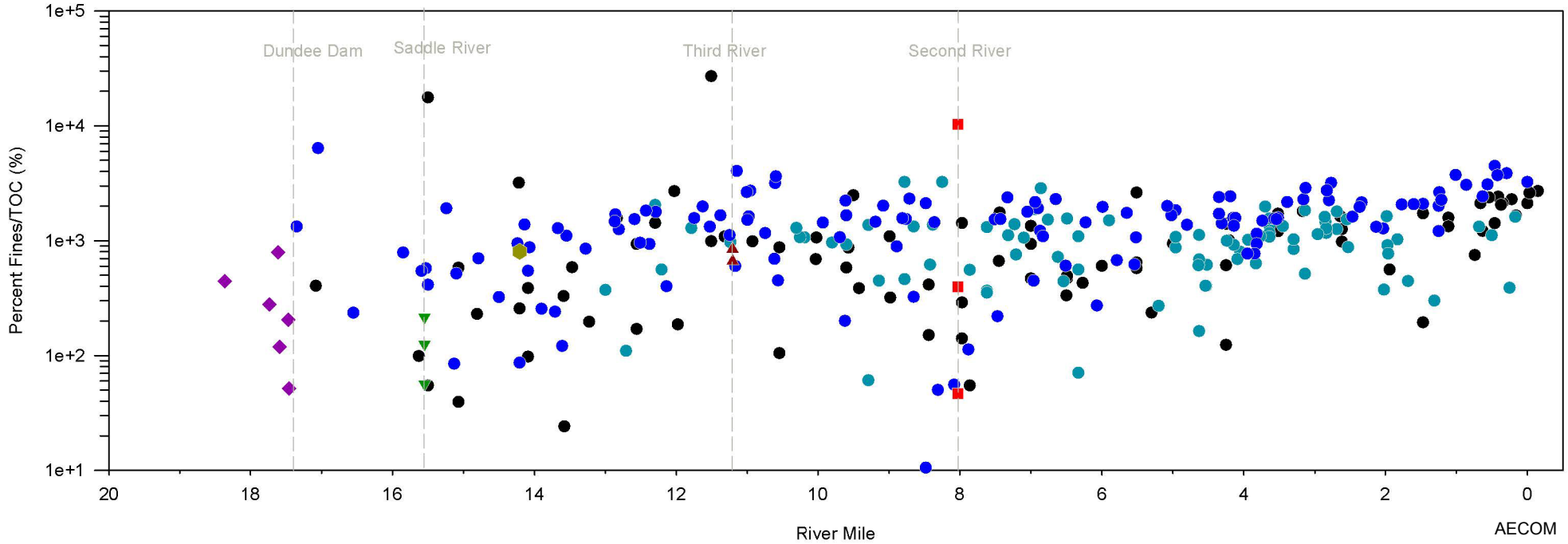


NOTES: Data presented on a dry weight basis.
If ND, the numerical value associated with the DL was reported.

AECOM
November 2014

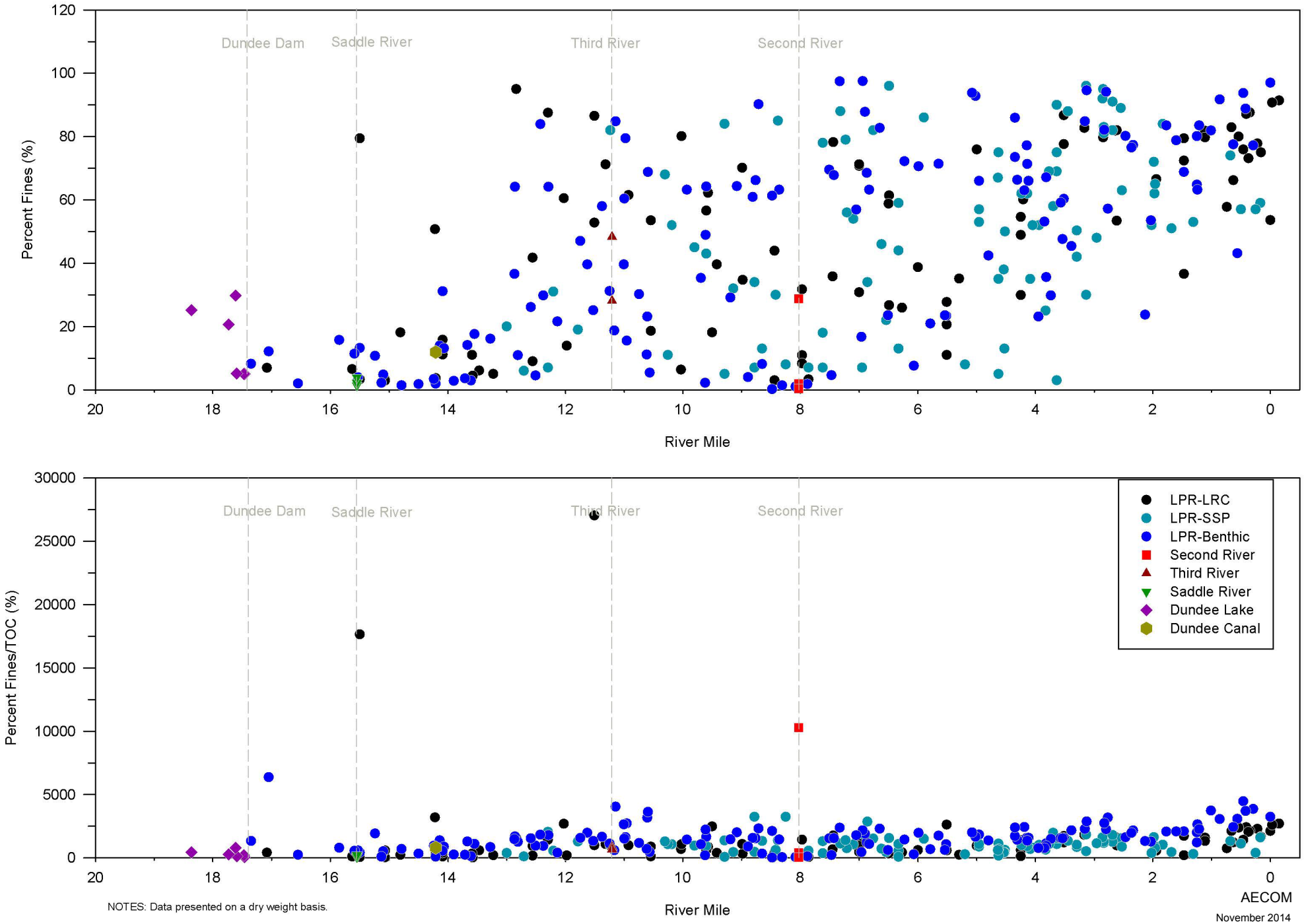
3-2.y Surficial Concentration vs. River Mile, Log Scale - Percent Fines
Surficial Sediments (0.0 ft - 0.5 ft) - LRC, Benthic and SSP Samples





AECOM
November 2014

3-2.z Surficial Concentration vs. River Mile, Linear Scale - Percent Fines
Surficial Sediments (0.0 ft - 0.5 ft) - LRC, Benthic and SSP Samples



NOTES: Data presented on a dry weight basis.

AECOM
November 2014

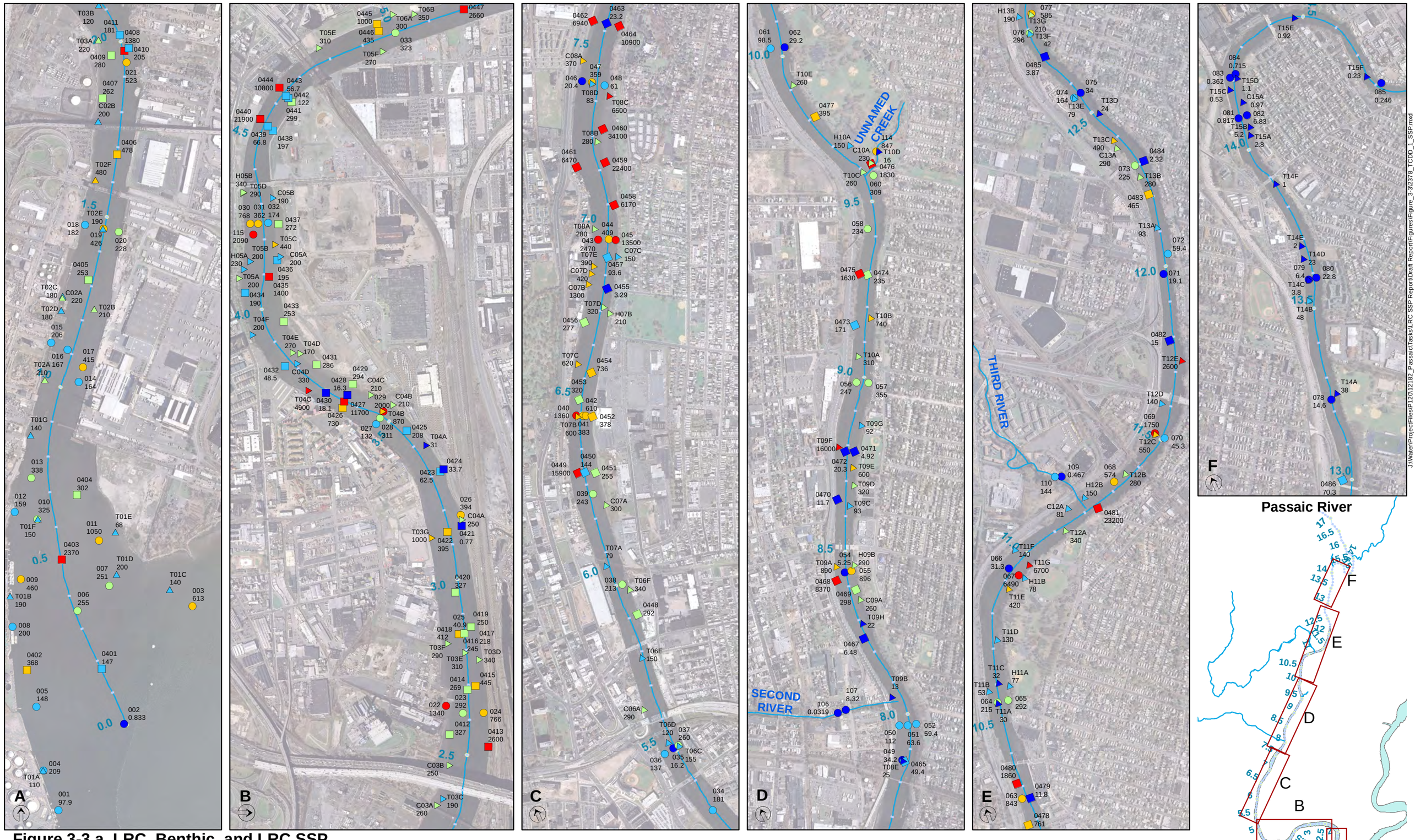


Figure 3-3.a LRC, Benthic, and LRC SSP Surficial Analyte Concentration: 2,3,7,8-TCDD (ng/kg)

0 - 0.5 ft
(Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=39.5
● >39.5 - <=209
● >209 - <=357
● >357 - <=1330
● >1330

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Present On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

0 0.5 1 Miles

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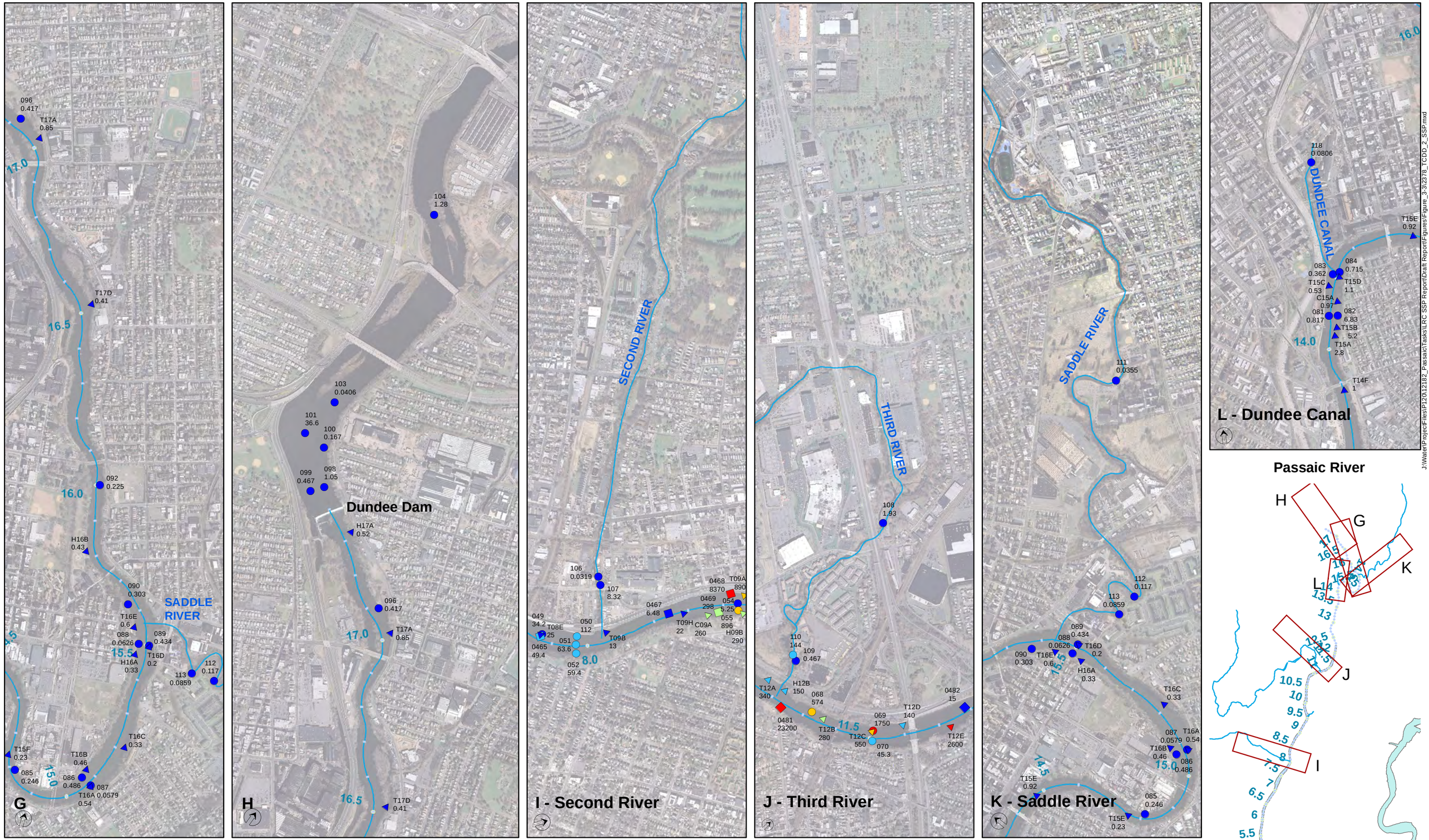

Figure 3-3.a LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: 2,3,7,8-TCDD (ng/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=39.5
● >39.5 - <=209
● >209 - <=357
● >357 - <=1330
● >1330

Passaic River Centerline (miles)

022 Location Code
594 Concentration (Present On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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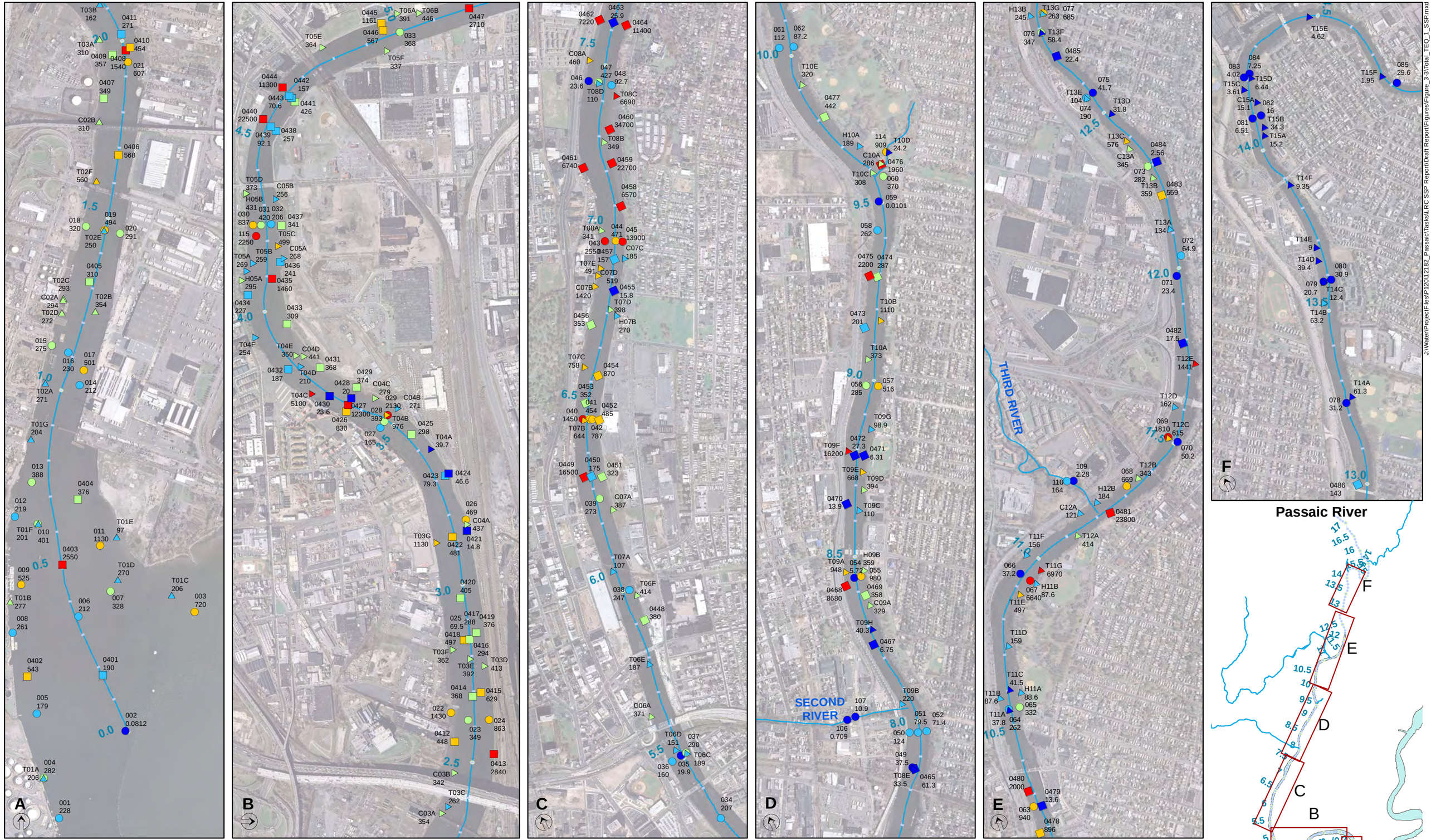

Location 0466 not sampled.

Figure 3-3.b LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Total TEQ (ng/kg)

0 - 0.5 ft (Page 1 of 2)

NOTES: Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF (see Table 3-1).

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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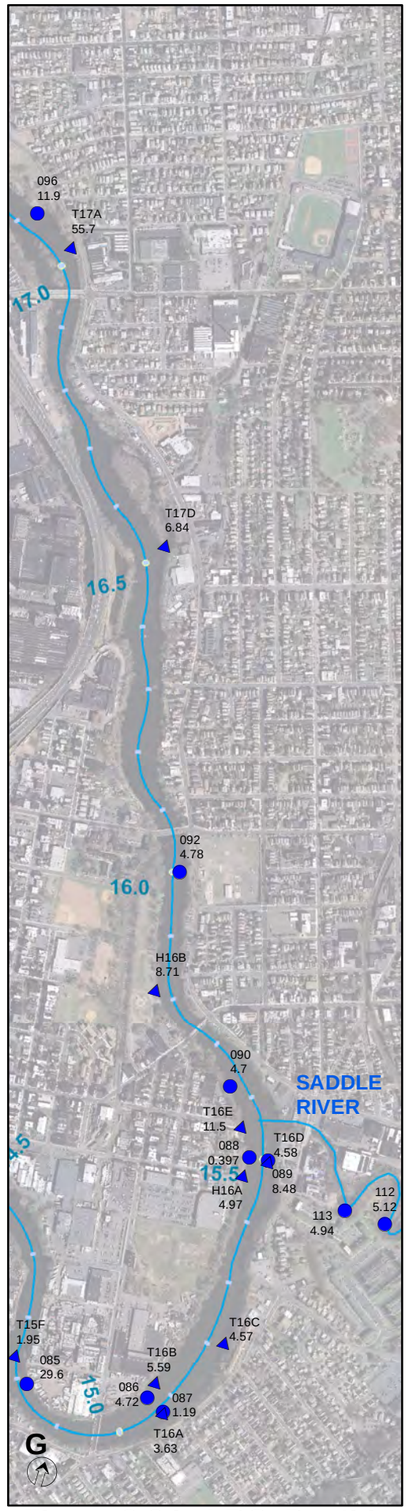

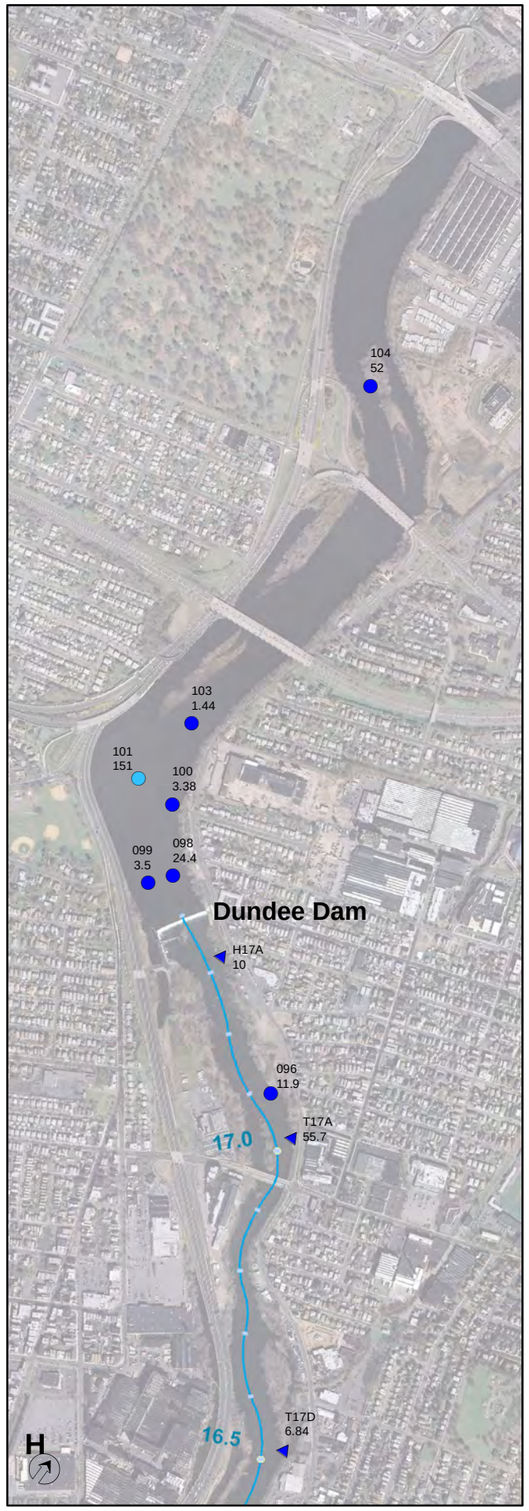

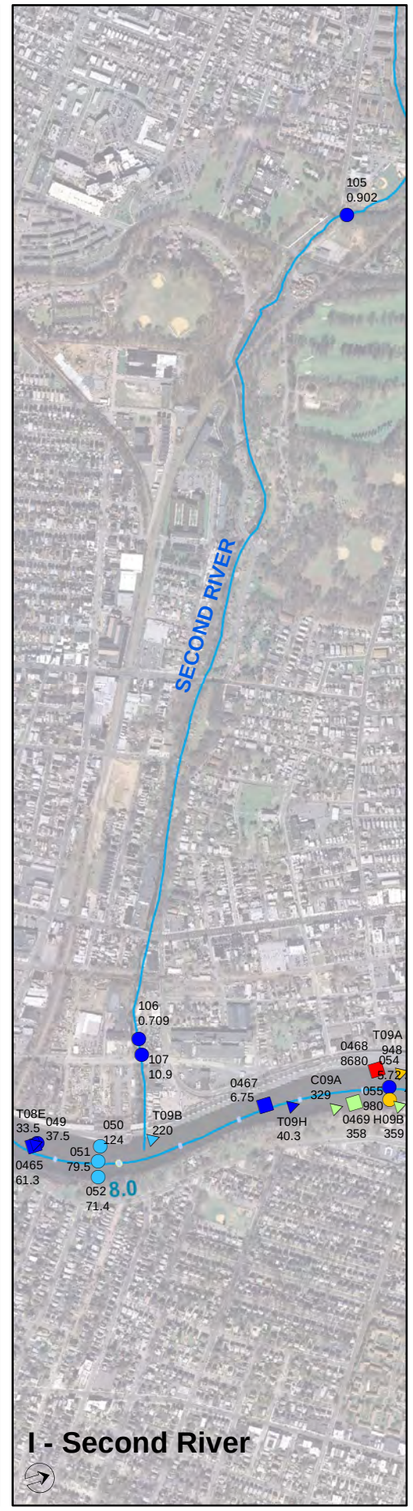

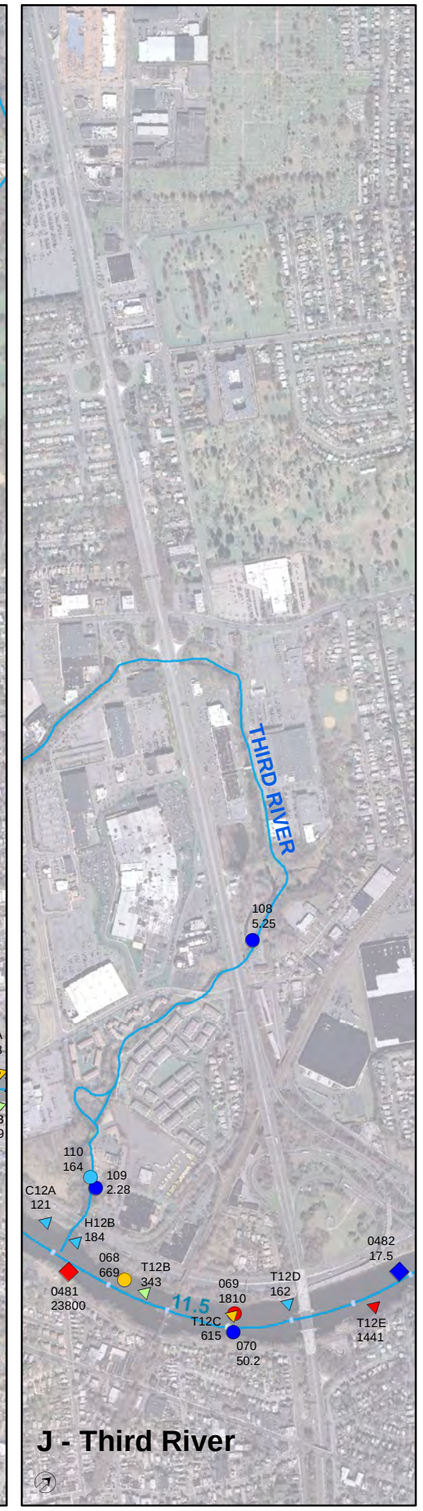

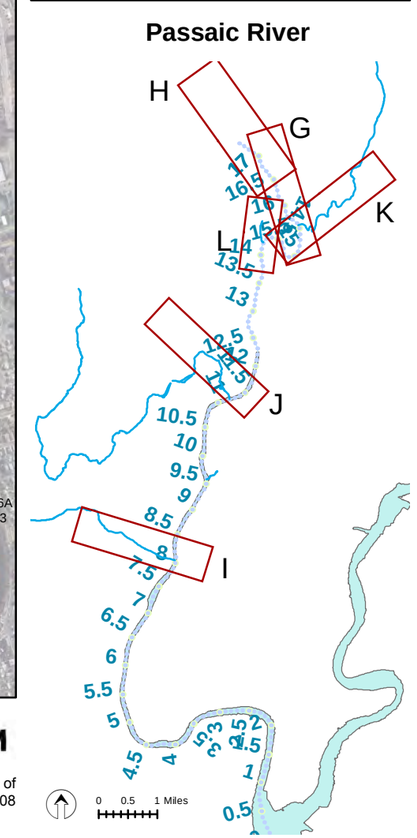

Figure 3-3.b LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Total TEQ (ng/kg)

0 - 0.5 ft
(Page 2 of 2)

NOTES: Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF (see Table 3-1).

0 500 1,000 2,000 Feet

LRC Benthic SSP

- <=61.3
- >61.3 - <=271
- >271 - <=446
- >446 - <=1430
- >1430

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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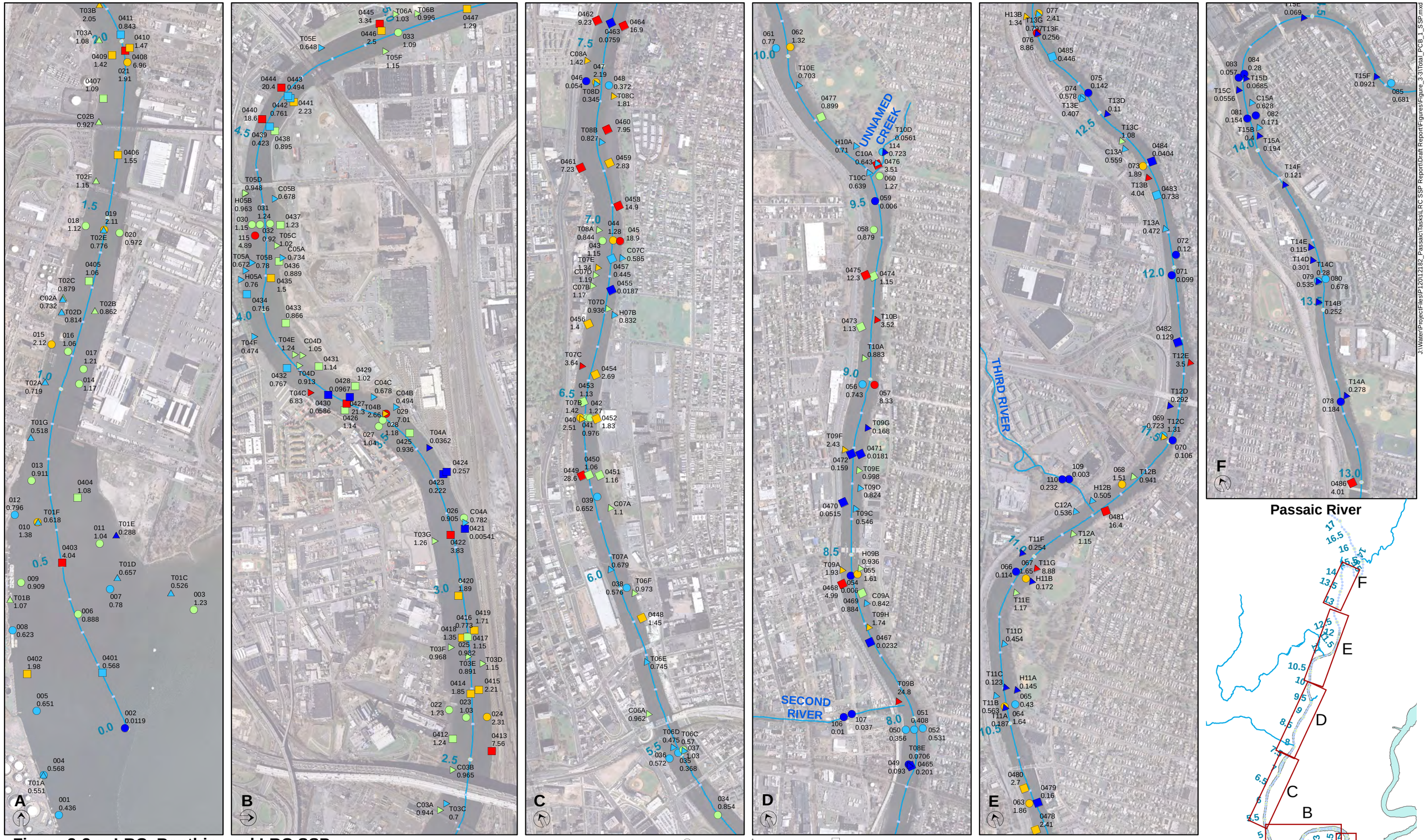

Figure 3-3.c LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Total PCBs (mg/kg)

0 - 0.5 ft

(Page 1 of 2)

NOTES: Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL (see Table 3-1).

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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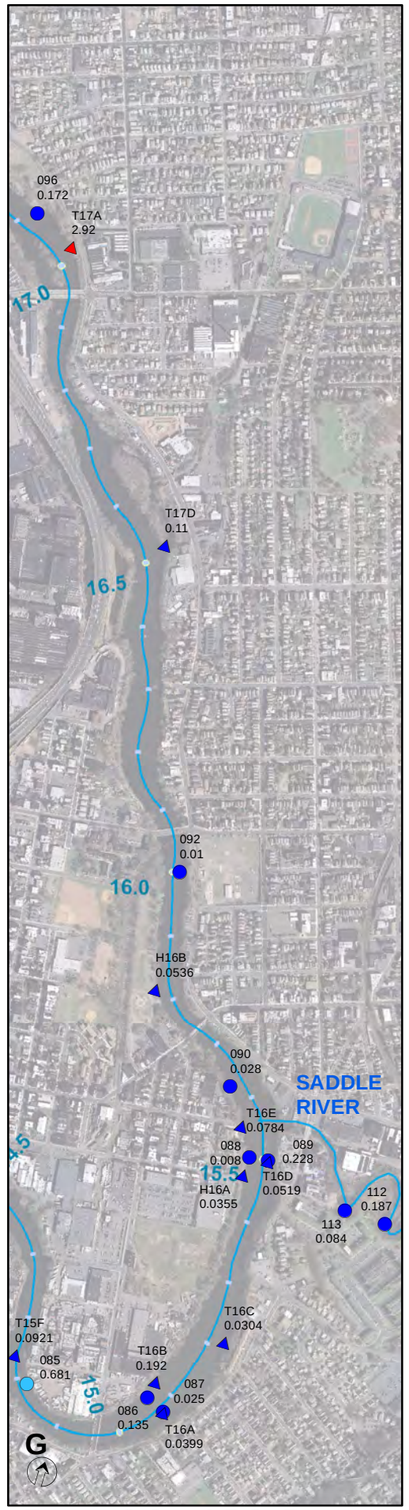

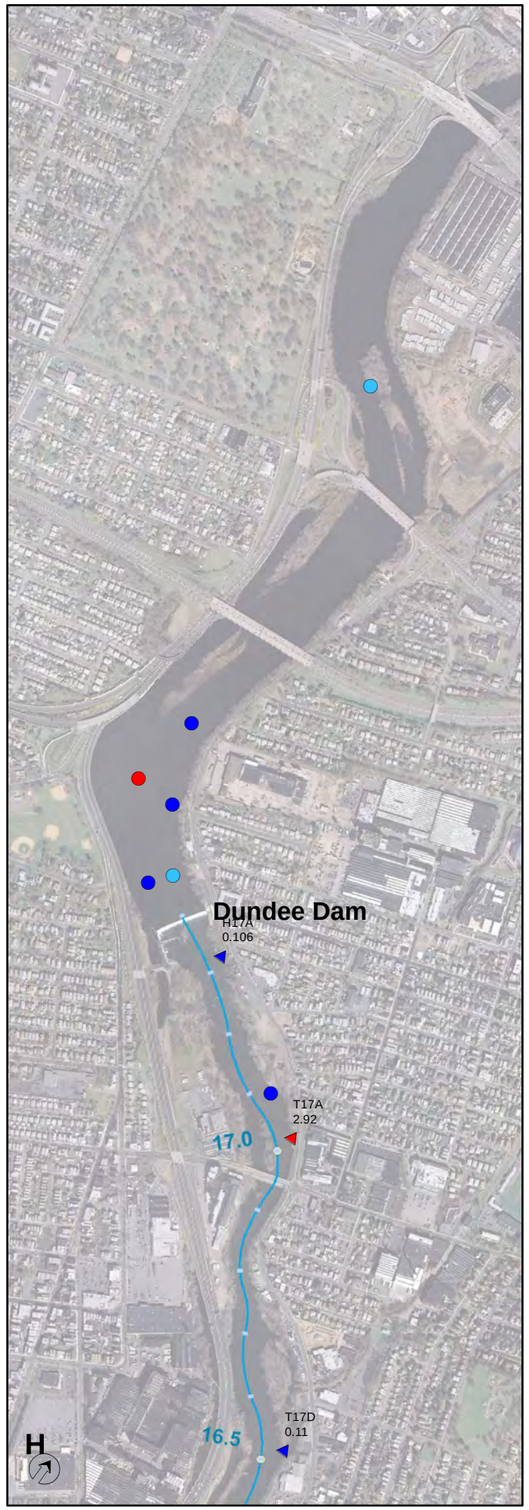

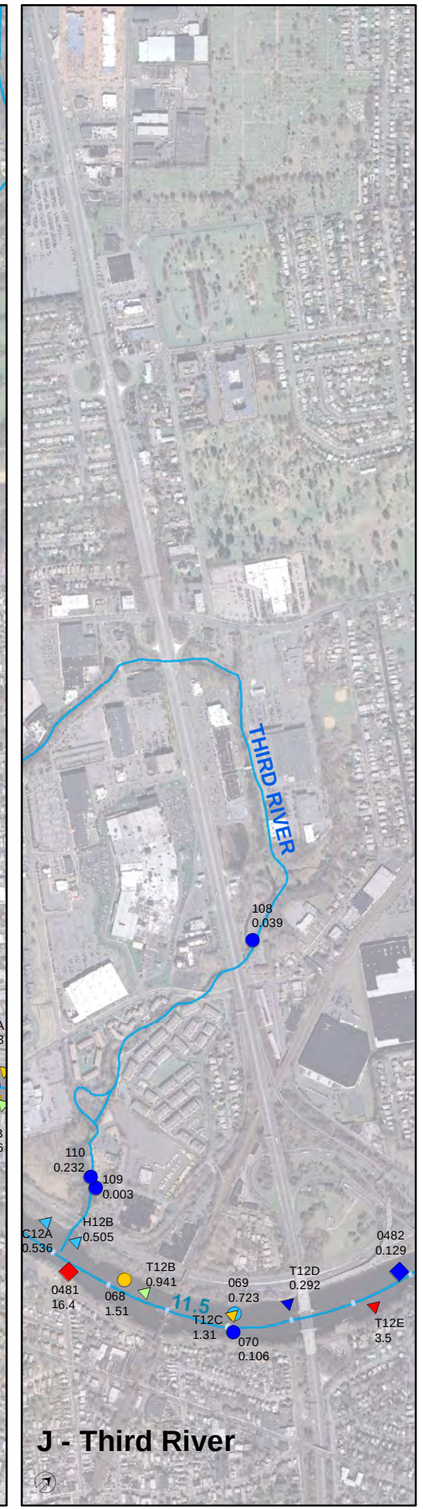

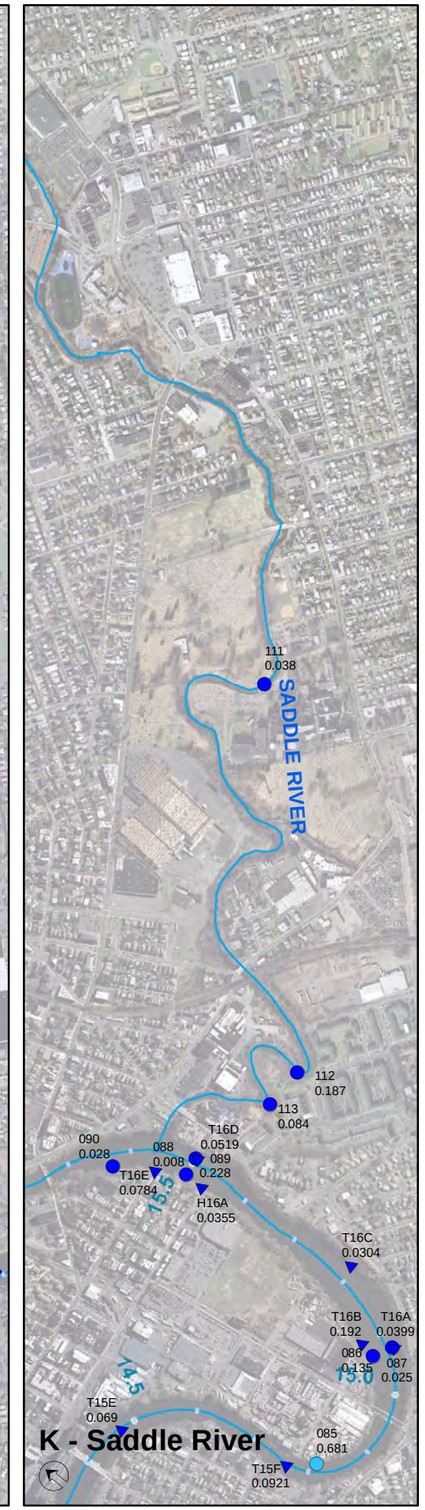

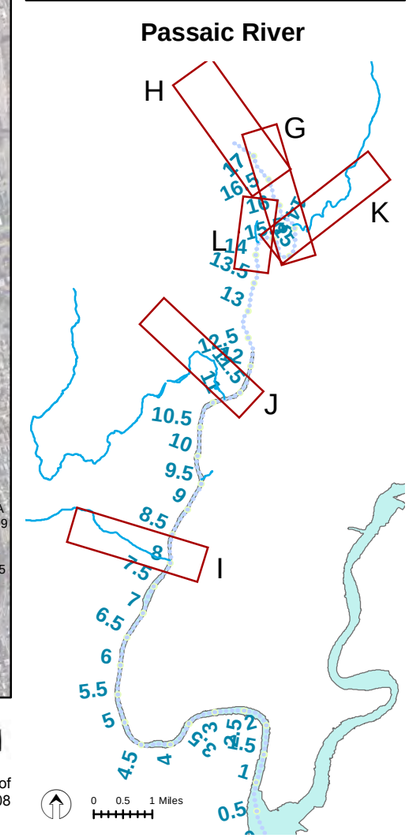

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Figure 3-3.c LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Total PCBs (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL (see Table 3-1).

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=0.301
● >0.301 - <=0.843
● >0.843 - <=1.27
● >1.27 - <=2.88
● >2.88
Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

Figure 3-3.d LRC, Benthic, and LRC SSP Surficial Analyte Concentration: HMW PAHs (mg/kg)

0 - 0.5 ft
(Page 1 of 2)

NOTES: HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene and Pyrene detects; if all ND, reported as highest individual analyte DL (see Table 3-1).

LY
- <=18.1
- >18.1 - <=27.4

LRC / Benthic
- >27.4 - <=38.0
- >38.0 - <=57.5

SSP
- >57.5

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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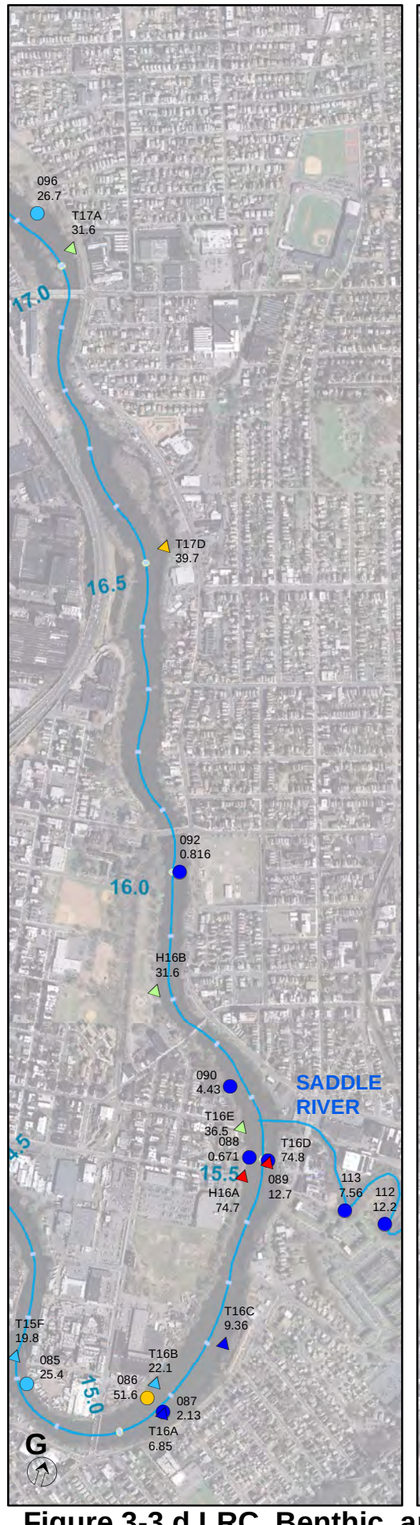

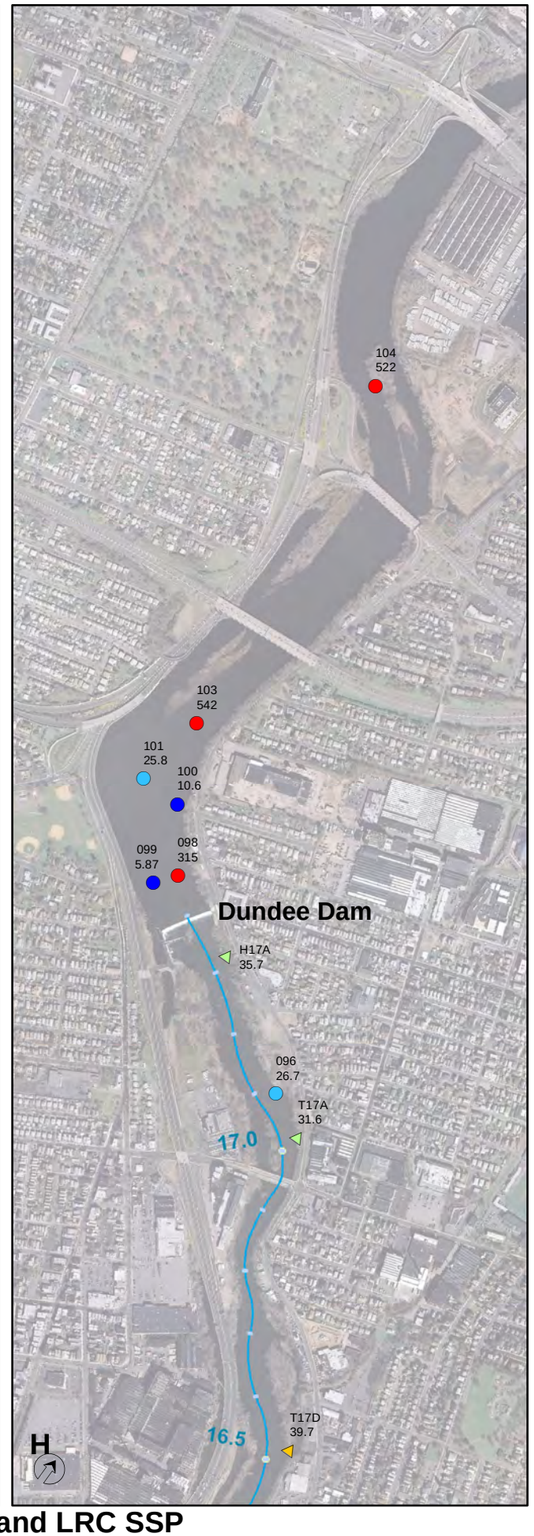

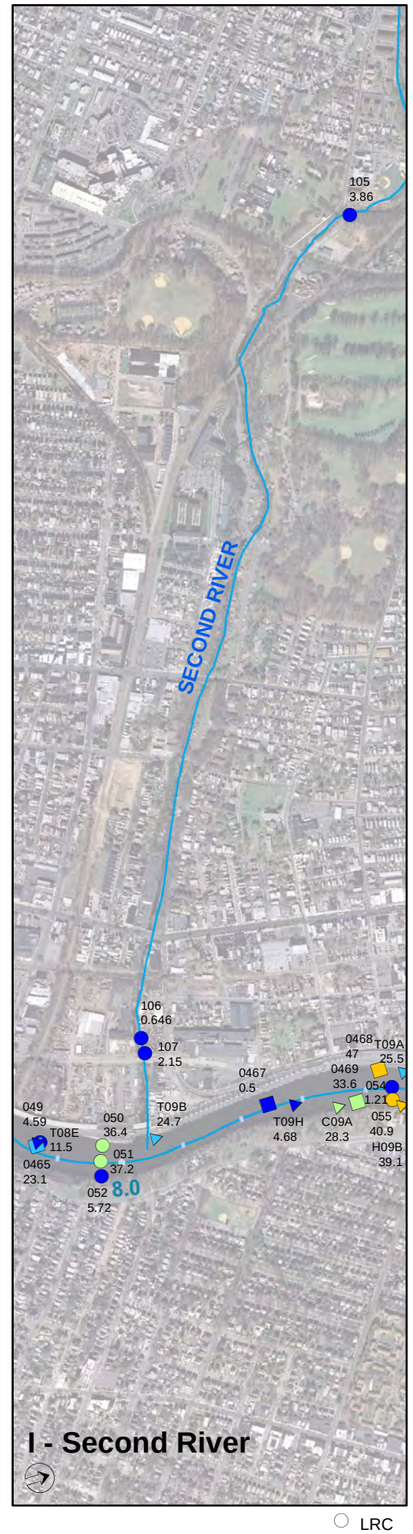

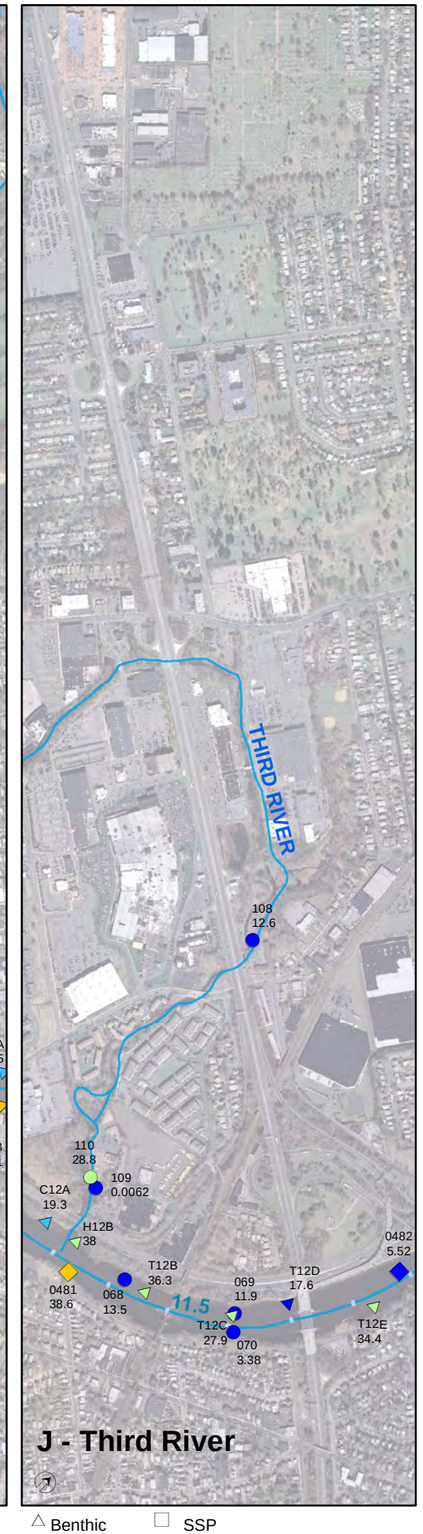

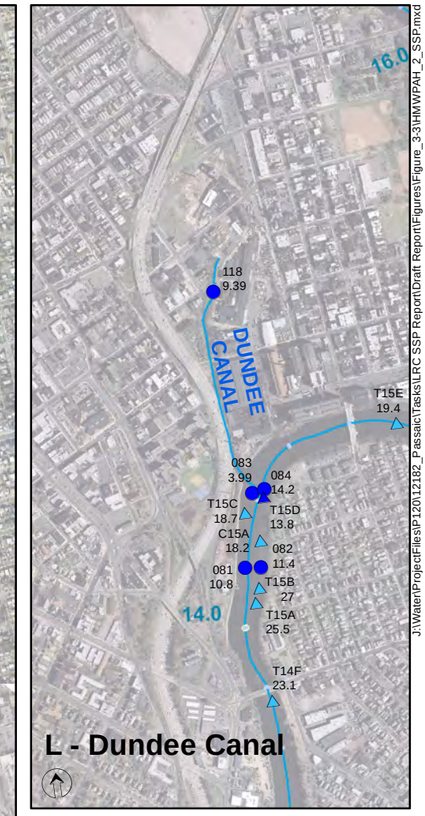

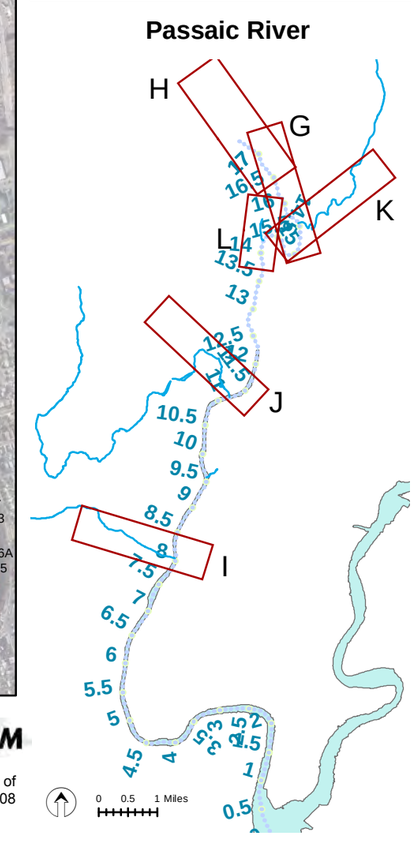

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Figure 3-3.d LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: HMW PAHs (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene and Pyrene detects; if all ND, reported as highest individual analyte DL (see Table 3-1).

0 500 1,000 2,000 Feet

LRC Benthic SSP

<=18.1
>18.1 - <=27.4
>27.4 - <=38.0
>38.0 - <=57.5
>57.5
Passaic River Centerline (miles)

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

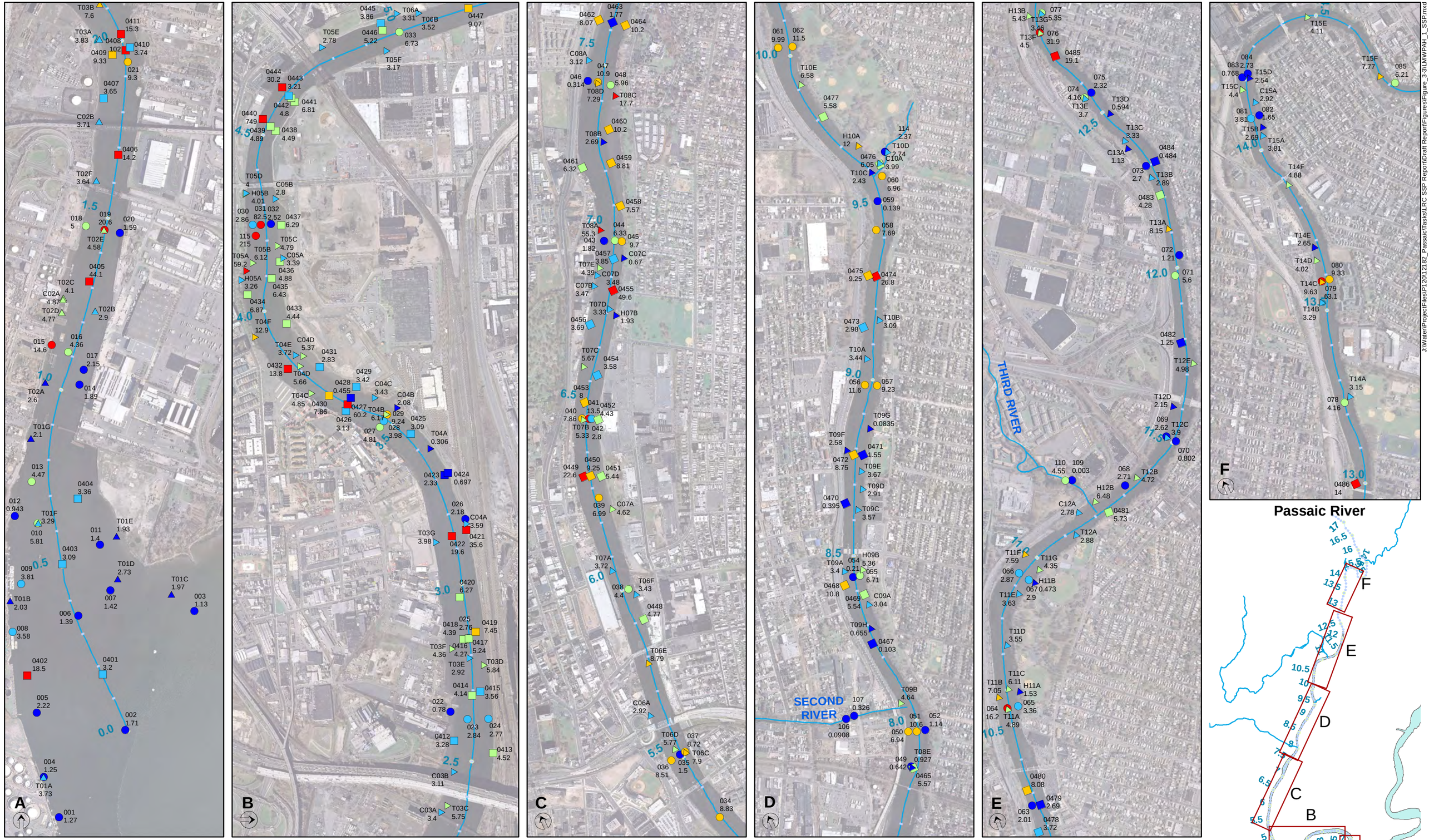

Figure 3-3.e LRC, Benthic, and LRC SSP Surficial Analyte Concentration: LMW PAHs (mg/kg)

0 - 0.5 ft
(Page 1 of 2)

NOTES: LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Napthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

○ LRC △ Benthic □ SSP

- <=2.73
- >2.73 - <=4.00
- >4.00 - <=6.87
- >6.87 - <=13.1
- >13.1

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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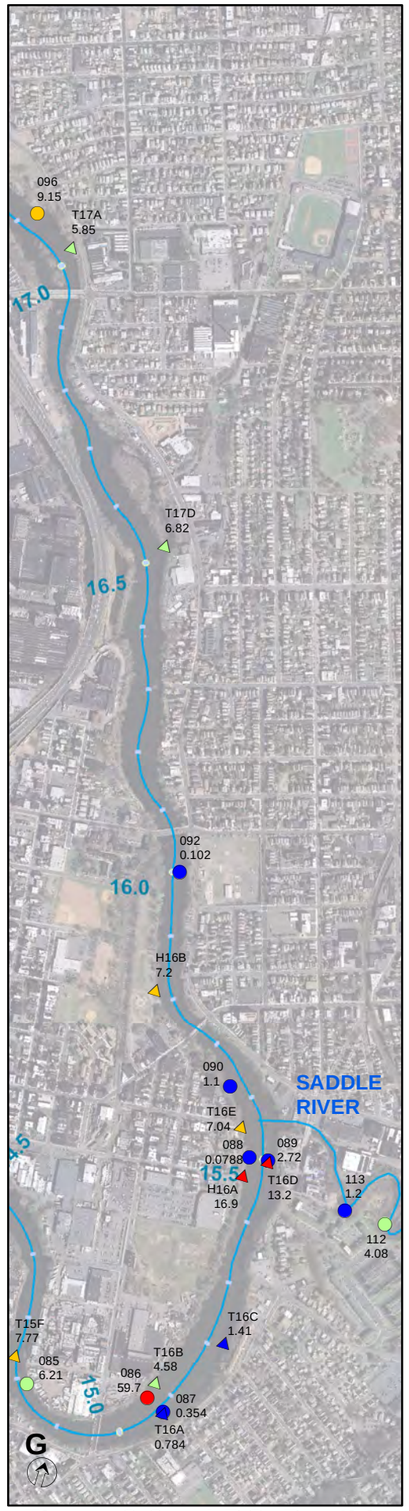

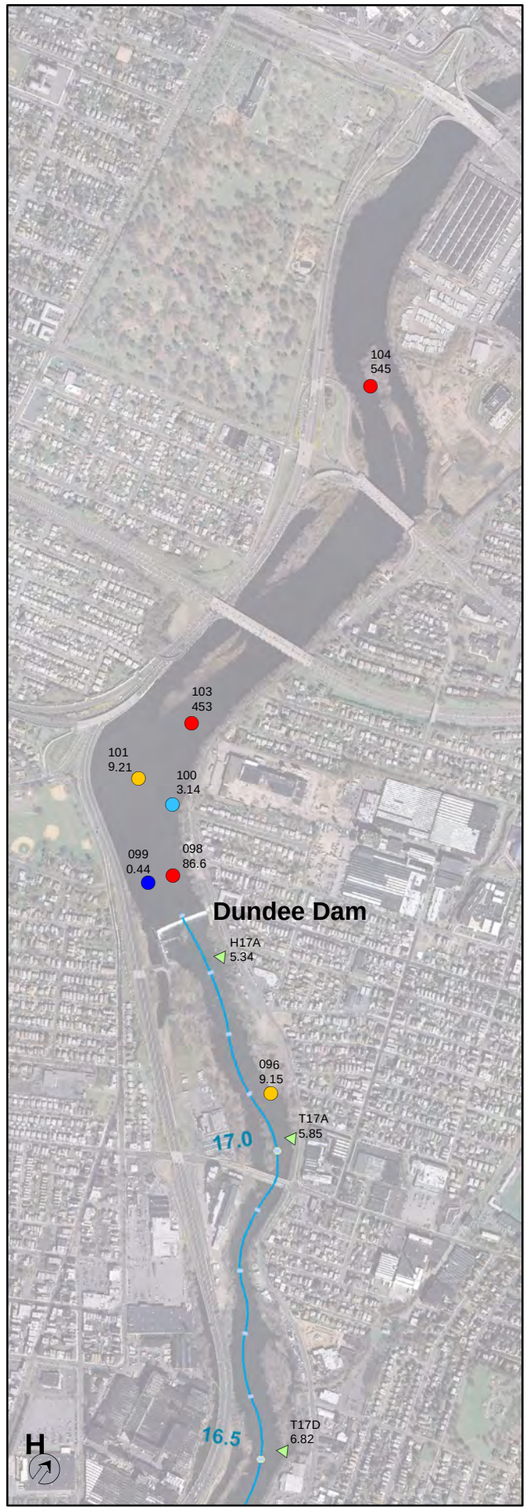

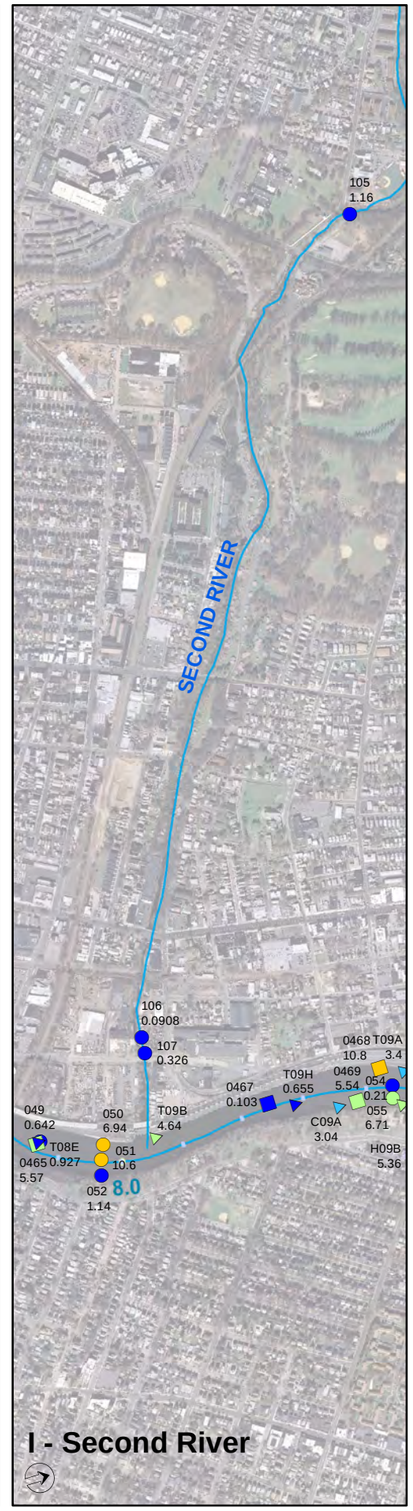

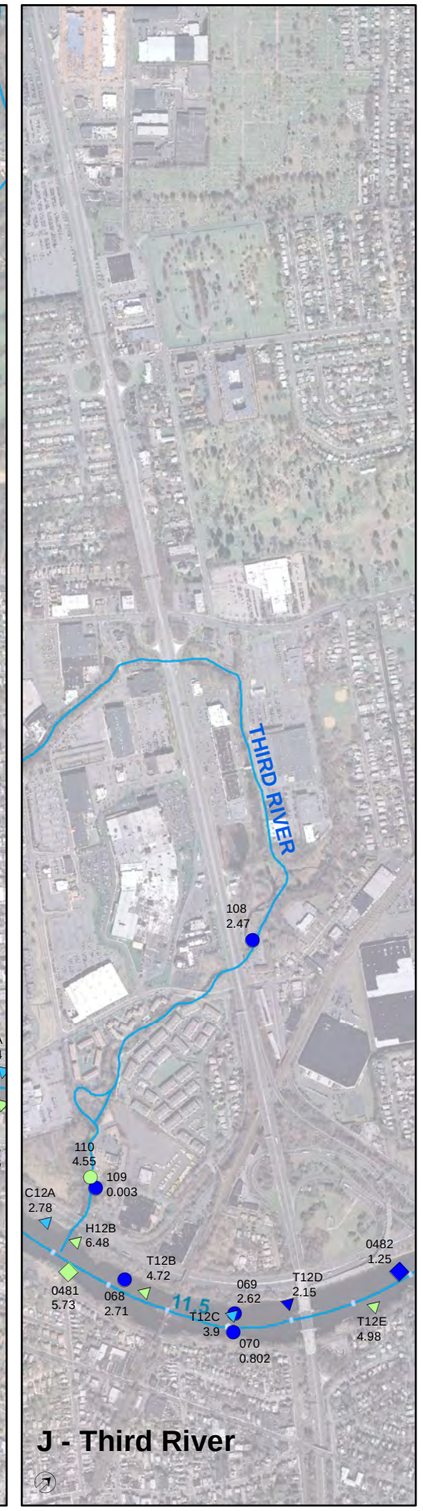

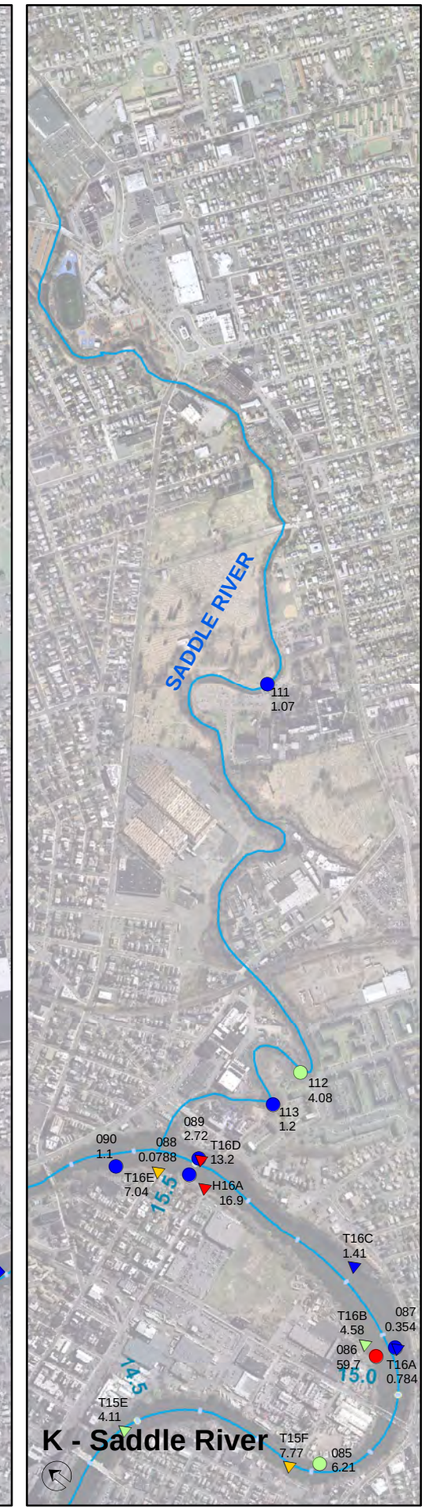

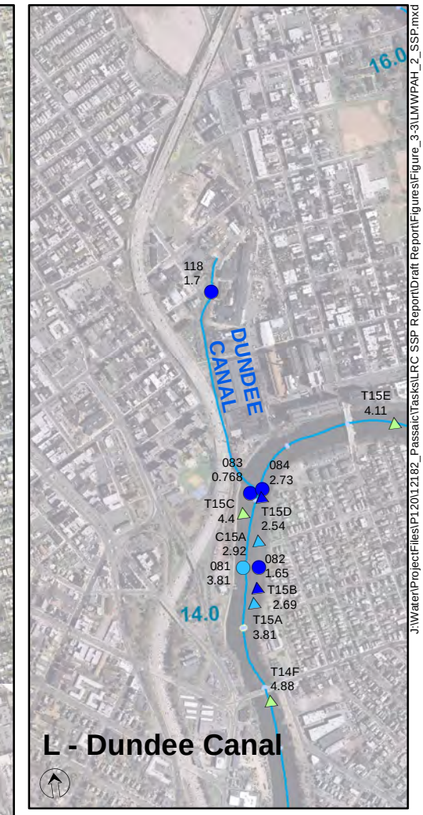

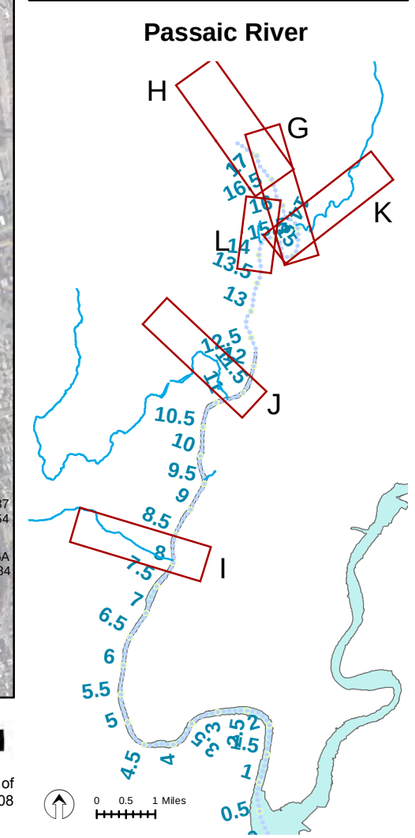

Figure 3-3.e LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: LMW PAHs (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Napthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=2.73
● >2.73 - <=4.00
● >4.00 - <=6.87
● >6.87 - <=13.1
● >13.1

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Passaic River Centerline (miles)

November 2014 AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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Figure 3-3.f LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Total DDx (mg/kg)
0 - 0.5 ft
(Page 1 of 2)

NOTES: Total DDx = The sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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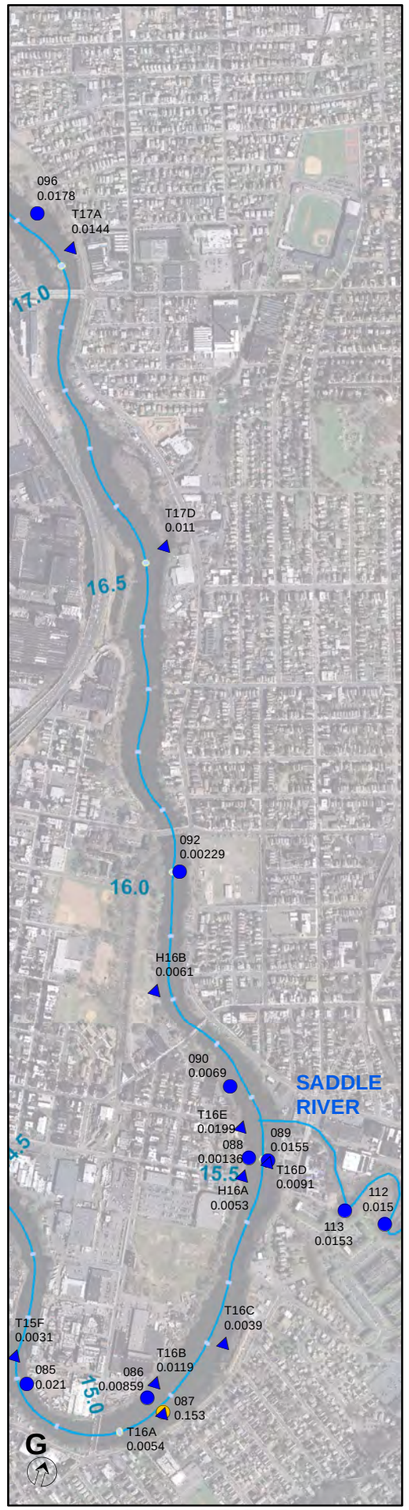

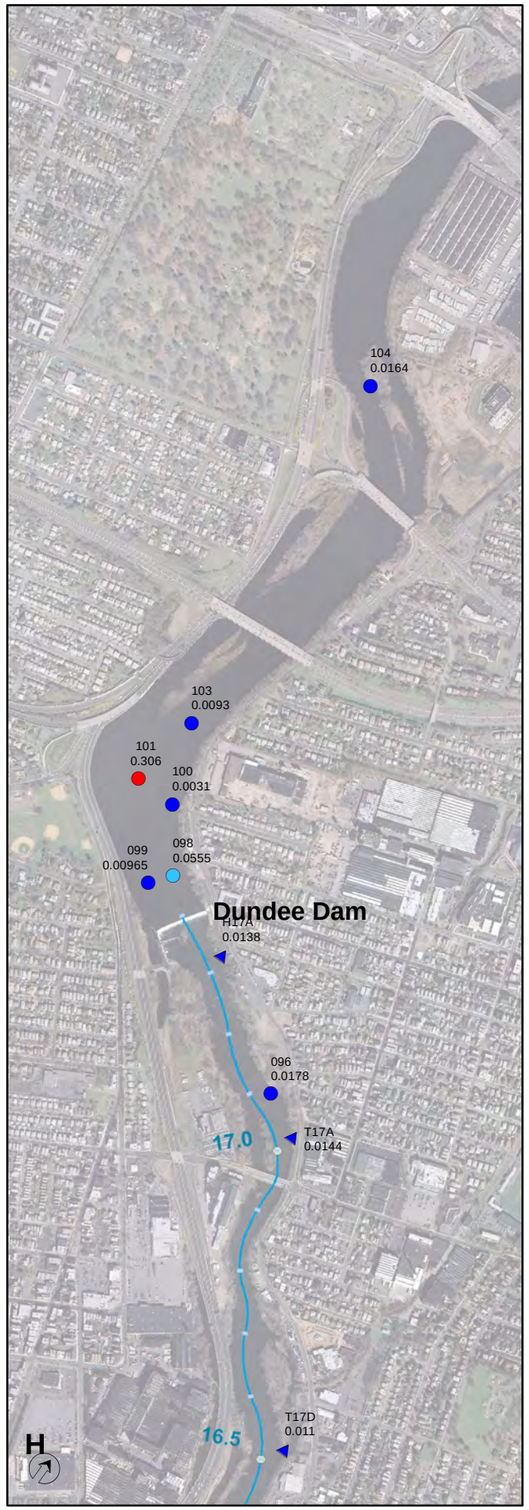

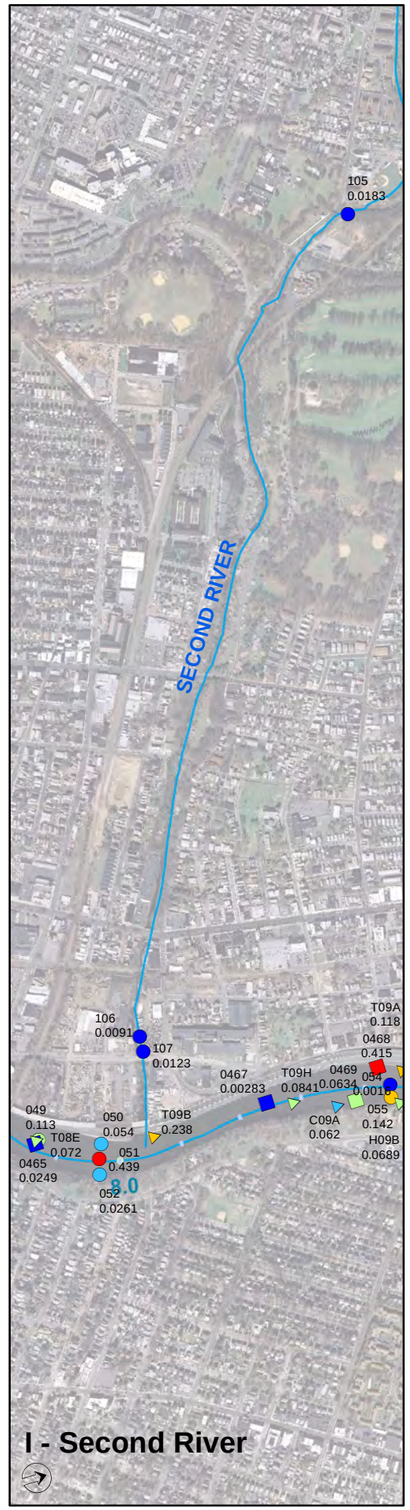

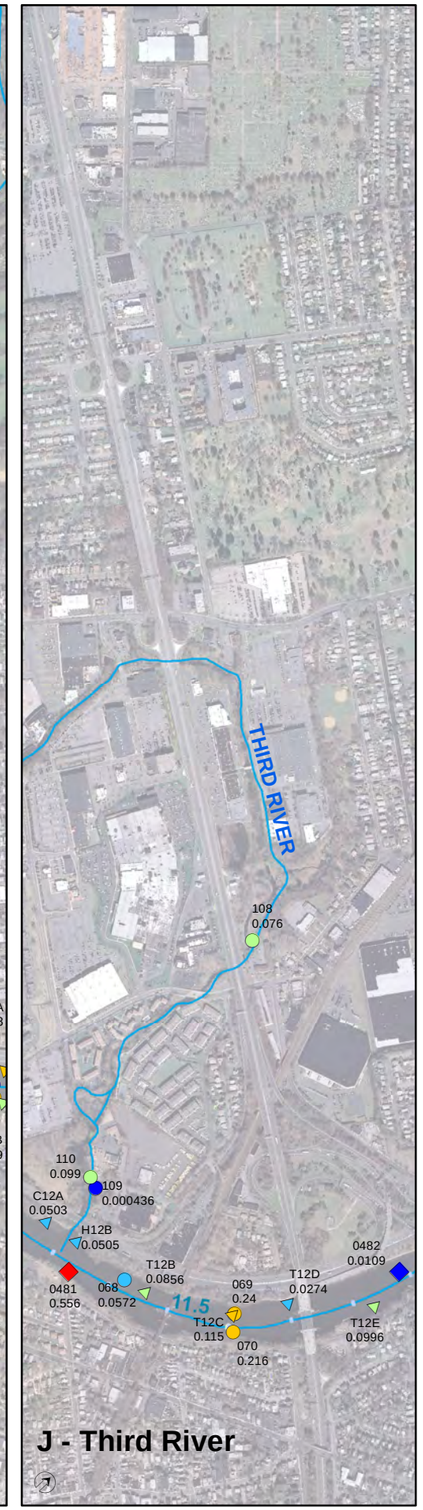

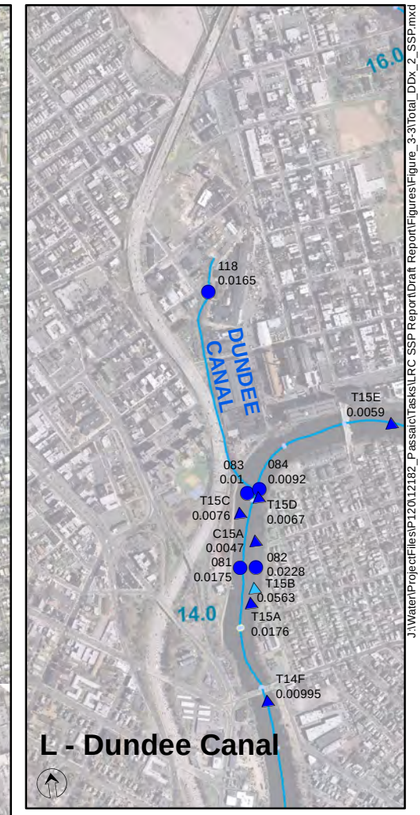

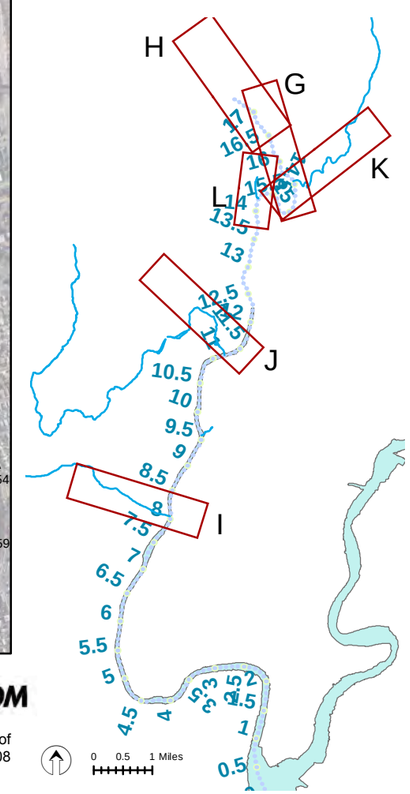

Figure 3-3.f LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Total DDx (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: Total DDx = The sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL (see Table 3-1).

0 500 1,000 2,000 Feet

LRC Benthic SSP

- <=0.0255
- >0.0255 - <=0.0626
- >0.0626 - <=0.113
- >0.113 - <=0.241
- >0.241

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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Figure 3-3.g LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Dieldrin (mg/kg)
0 - 0.5 ft
(Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

Location 0466 not sampled.

○ LRC △ Benthic □ SSP

● <=0.00180
● >0.00180 - <=0.00369
● >0.00369 - <=0.0063
● >0.0063 - <=0.011
● >0.011
Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

November 2014

AECOM

0 0.5 1 Miles

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Figure 3-3.g LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Dieldrin (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

<=0.00180
>0.00180 - <=0.00369
>0.00369 - <=0.0063
>0.0063 - <=0.011
>0.011
Passaic River Centerline (miles)

LRC Benthic SSP

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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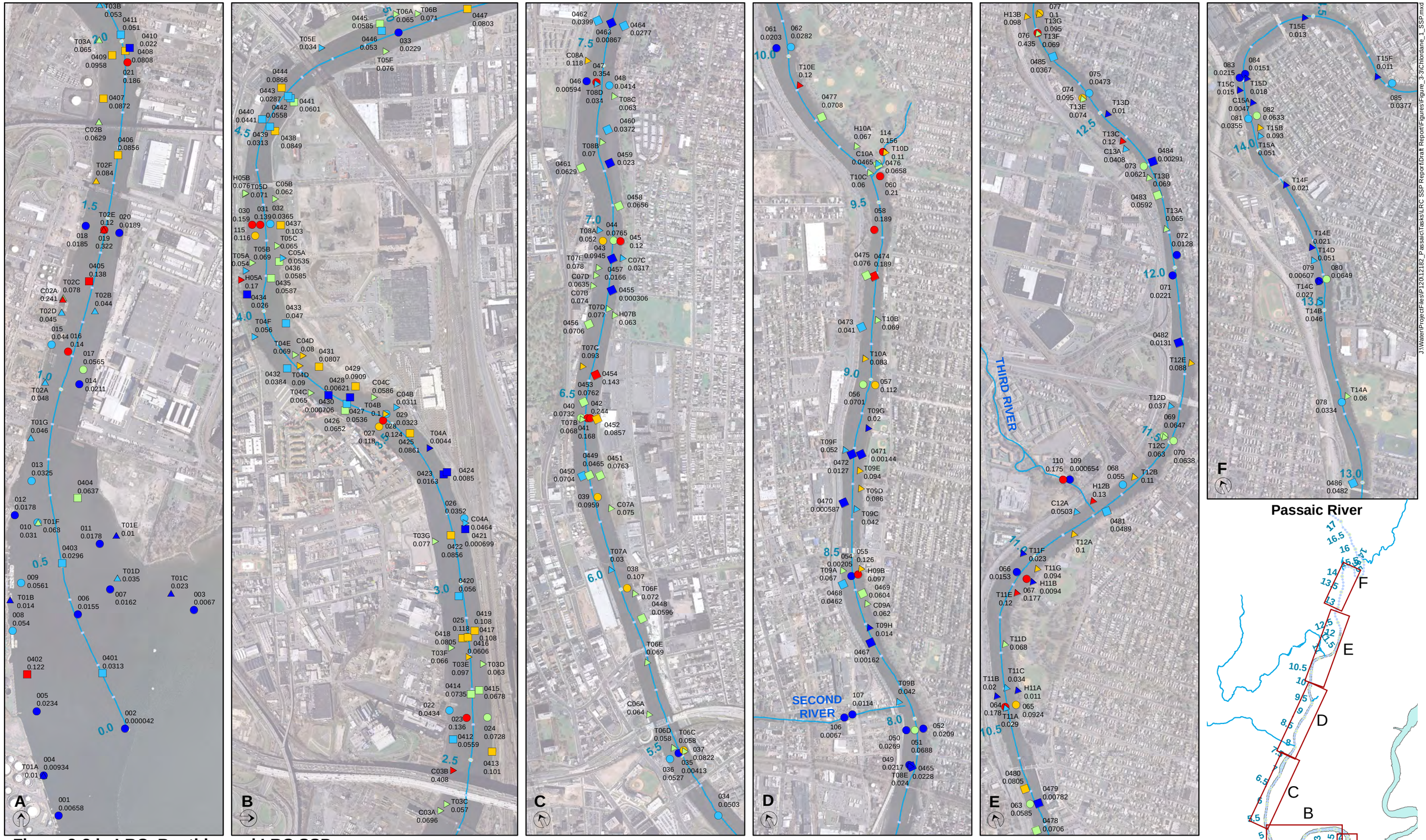
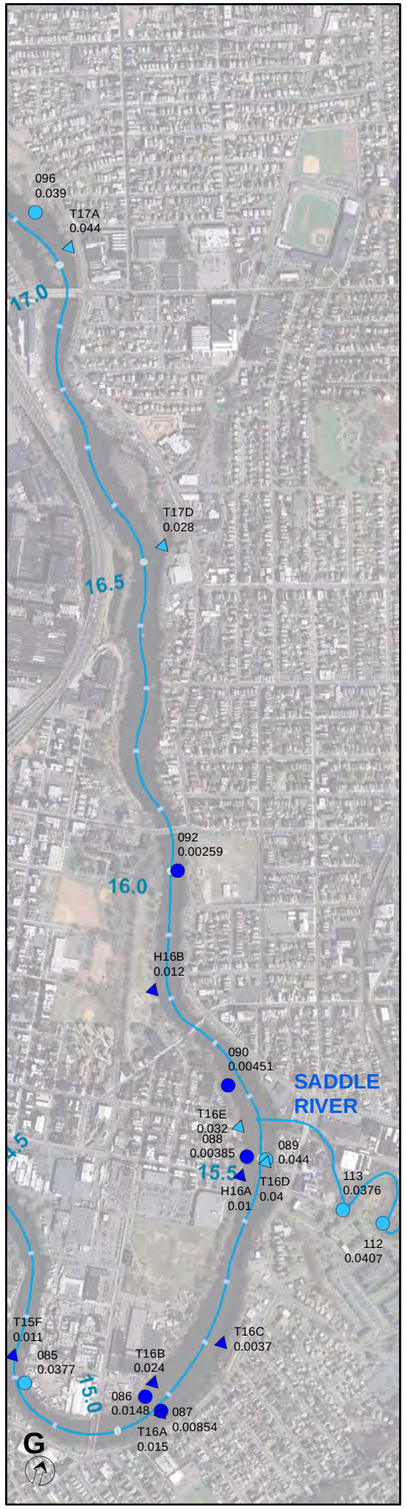
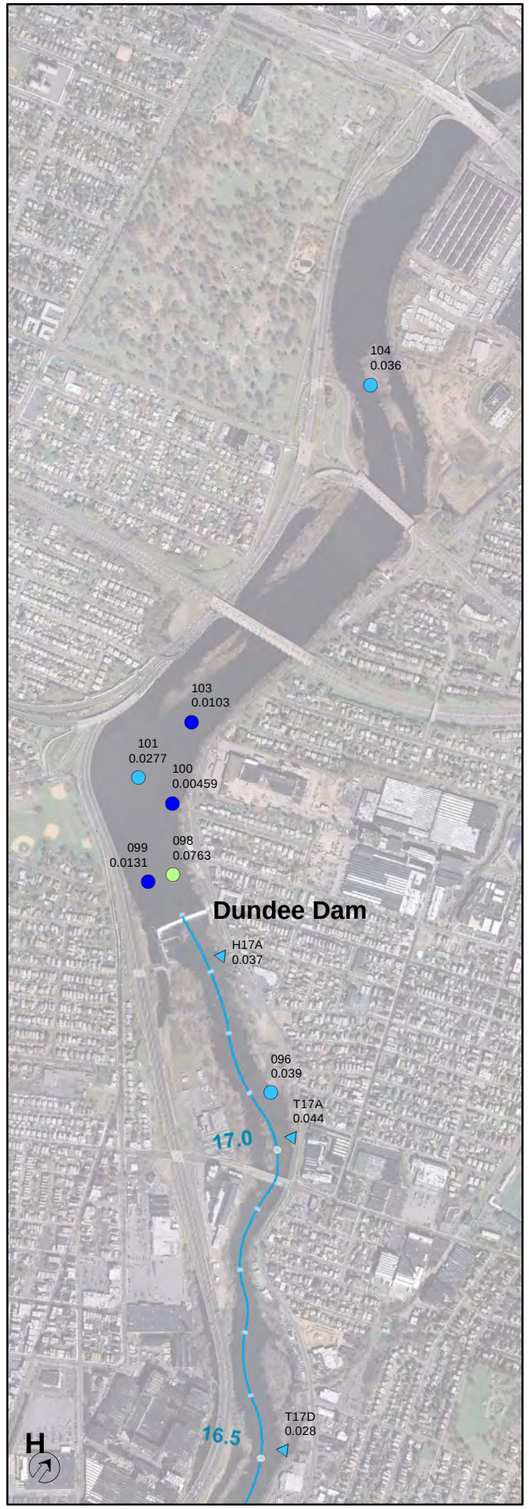
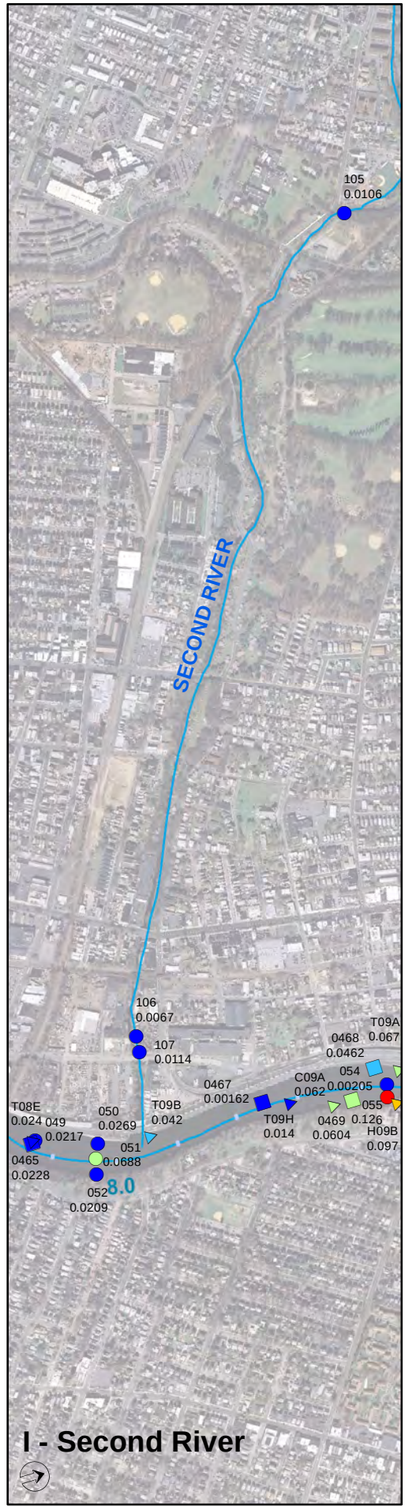


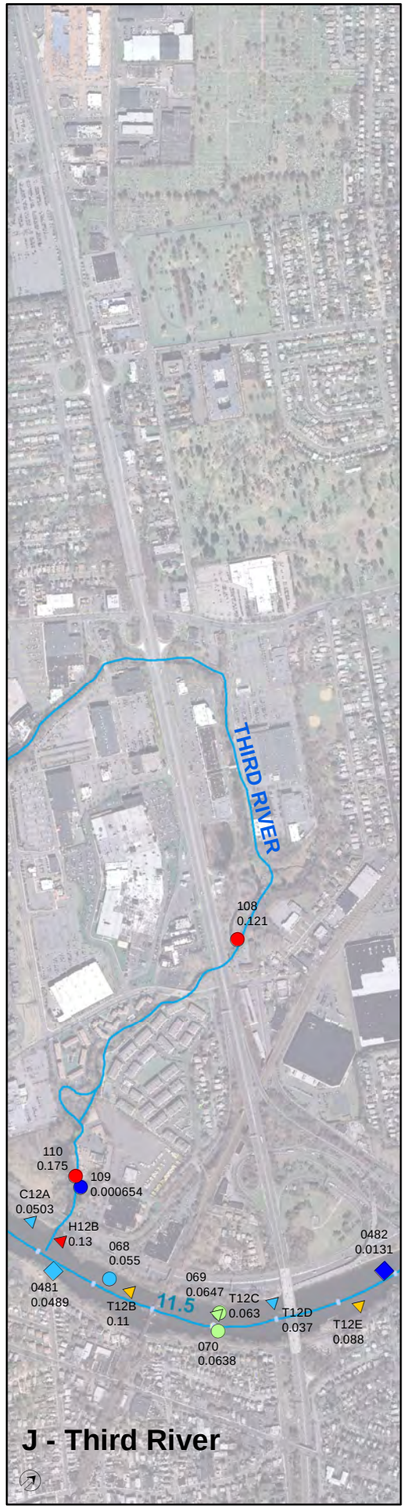
Figure 3-3.h LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Total Chlordane (mg/kg)
0 - 0.5 ft
(Page 1 of 2)

NOTES: Total Chlordane = The sum of cis-Chlordane, oxy-Chlordane, trans-Chlordane, cis-Chlordane, trans-Nonachlor detects. If all ND, reported as the highest individual analyte DL.









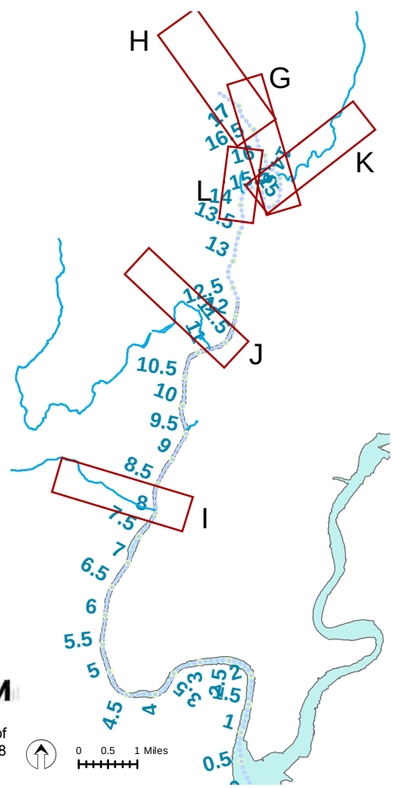


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Figure 3-3.h LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Total Chlordane (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: Total Chlordane = The sum of cis-Chlordane, oxy-Chlordane, trans-Chlordane, cis-Chlordane, trans-Nonachlor detects. If all ND, reported as the highest individual analyte DL.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=0.027
● >0.027 - <=0.0561
● >0.0561 - <=0.078
● >0.078 - <=0.118
● >0.118
Passaic River Centerline (miles)

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

November 2014 AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

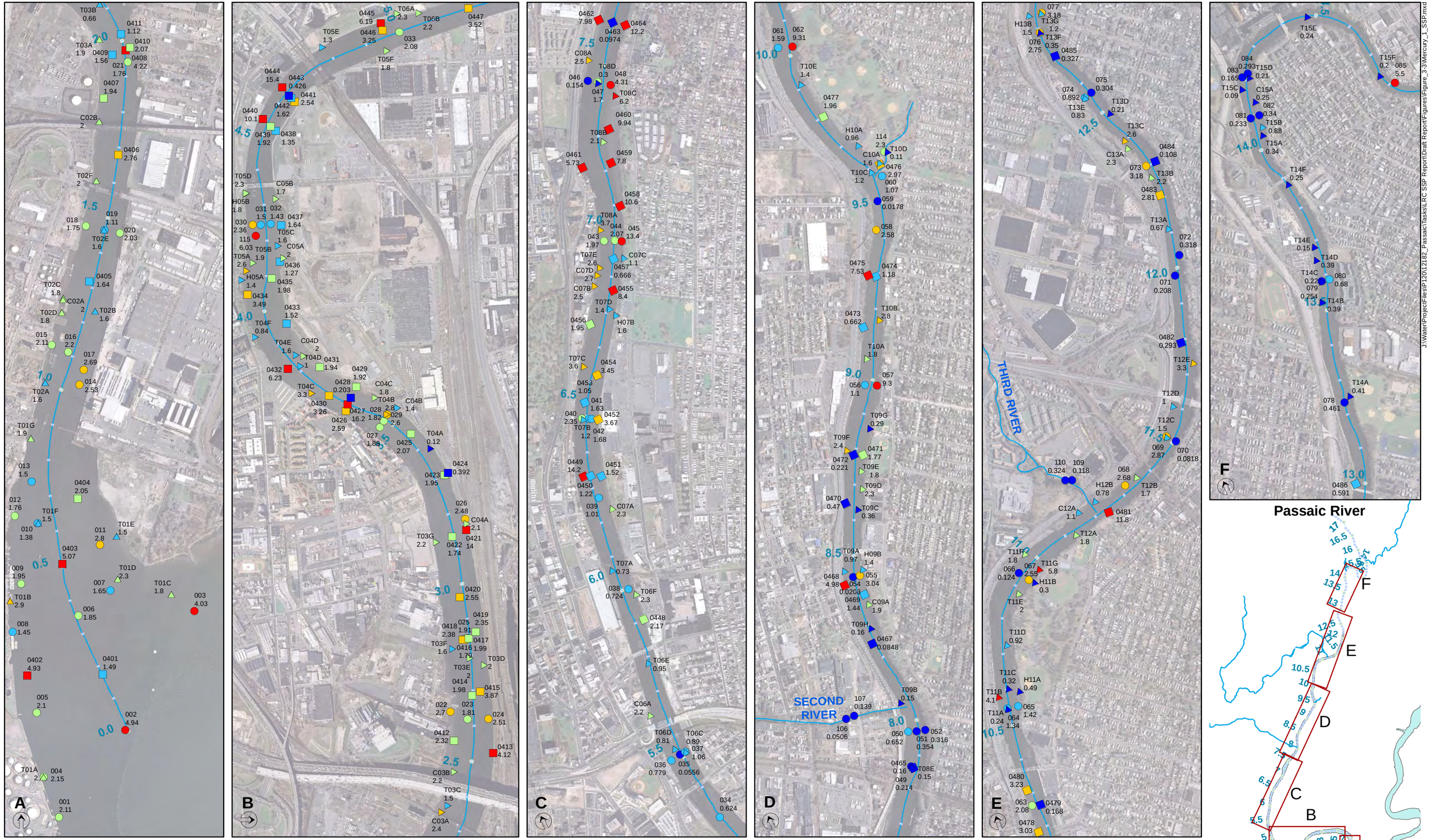

Figure 3-3.i LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Mercury (mg/kg)
0 - 0.5 ft
(Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

LRC Benthic SSP

<=0.498
>0.498 - <=1.69
>1.69 - <=2.35
>2.35 - <=3.98
>3.98
Passaic River Centerline (miles)

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

0 0.5 1 Miles

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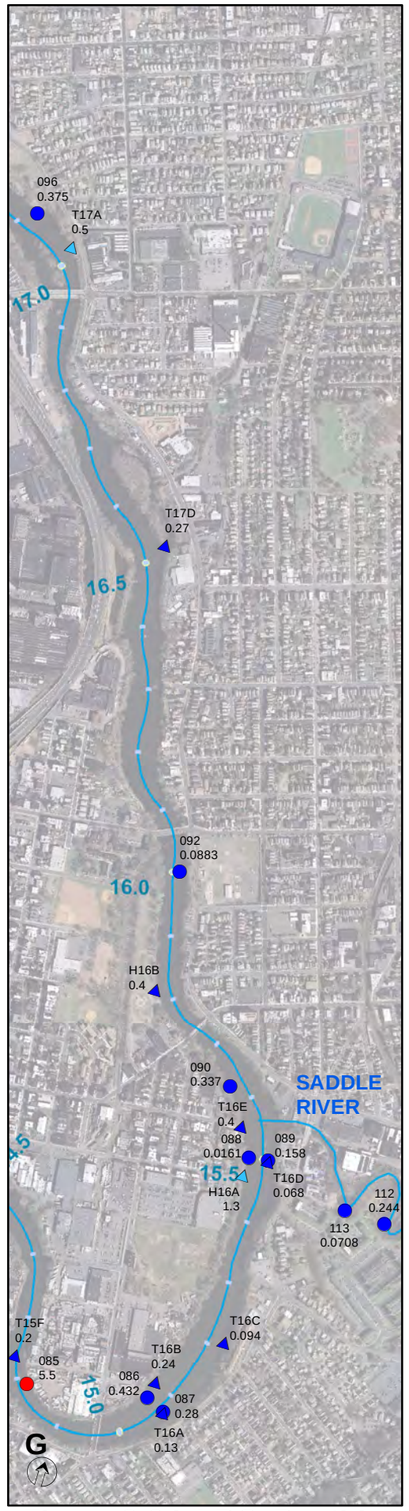

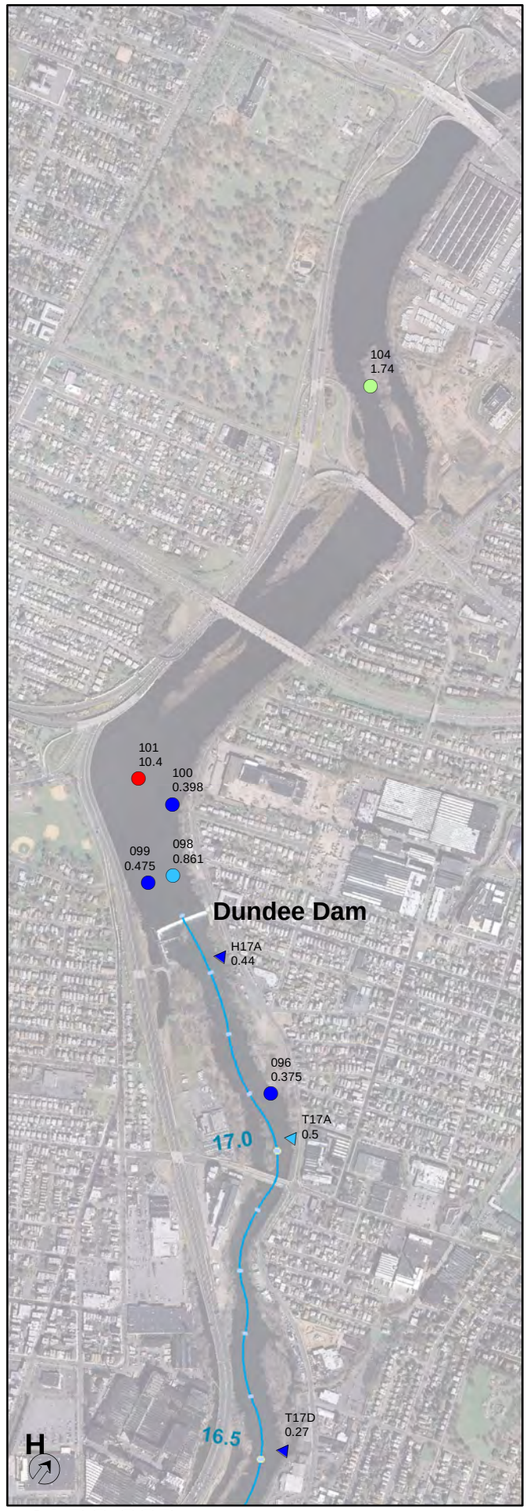

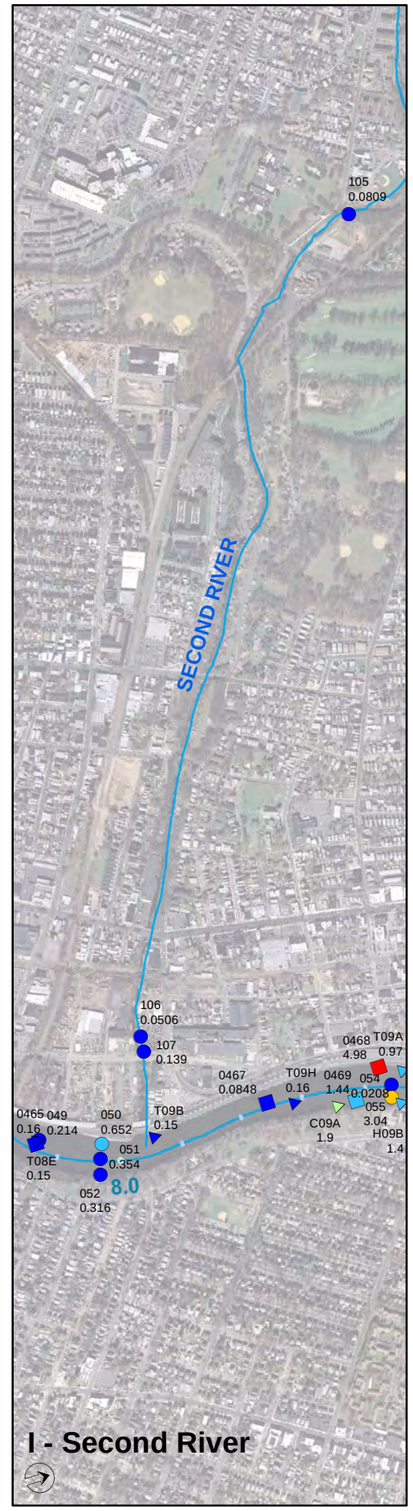

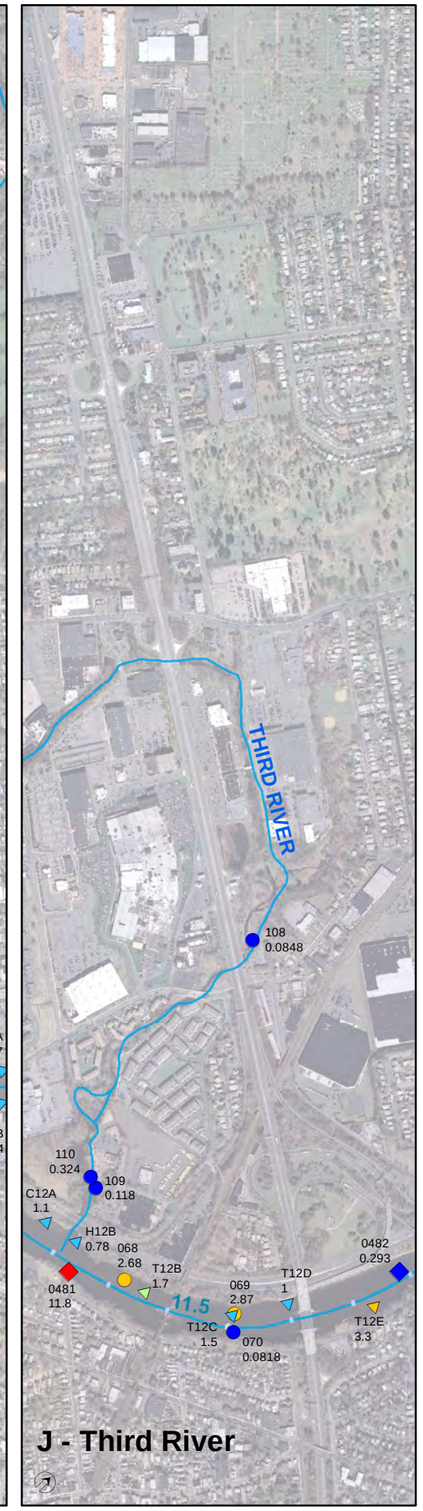

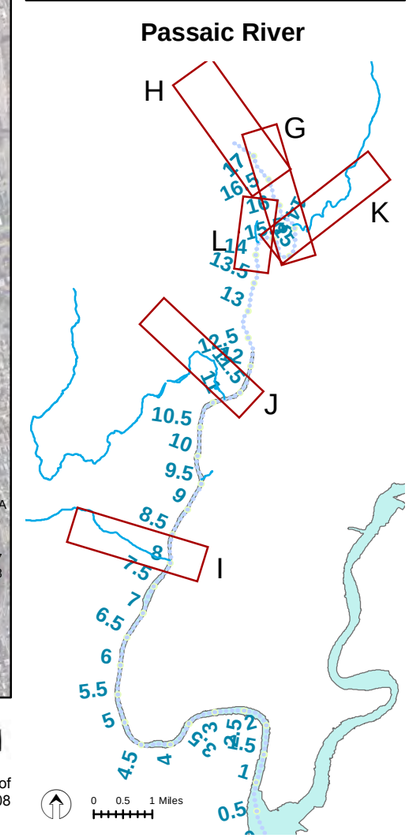

Figure 3-3.i LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Mercury (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=0.498
● >0.498 - <=1.69
● >1.69 - <=2.35
● >2.35 - <=3.98
● >3.98
Passaic River Centerline (miles)

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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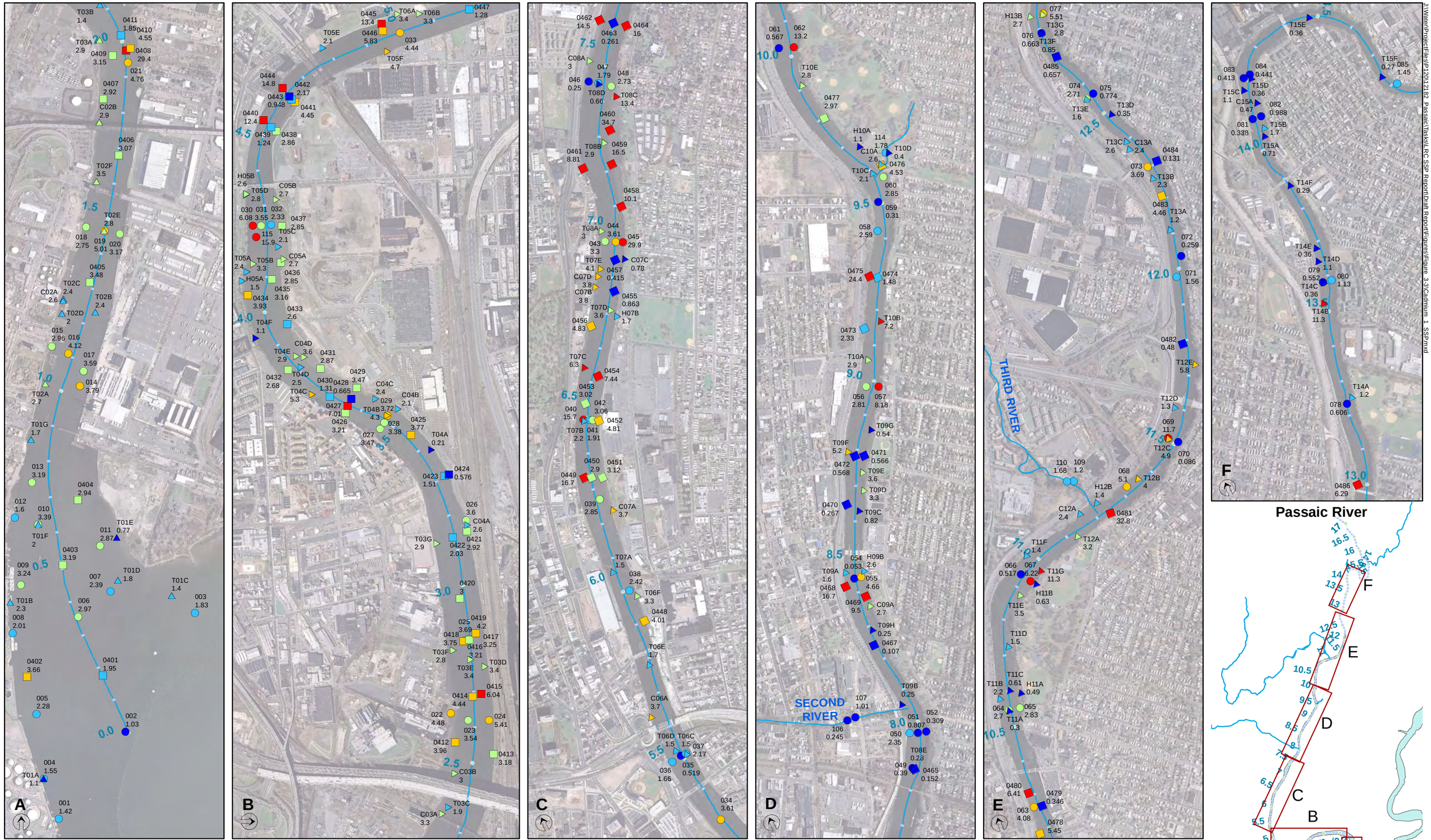

Figure 3-3.j LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Cadmium (mg/kg)

0 - 0.5 ft (Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

○ LRC △ Benthic □ SSP

● <=1.10 ● >1.10 - <=2.60 ● >2.60 - <=3.60 ● >3.60 - <=5.96 ● >5.96 — Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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Figure 3-3.j LRC, Benthic, and LRC SSP
Surficial Analyte Concentration: Cadmium (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

- <=1.10
- >1.10 - <=2.60
- >2.60 - <=3.60
- >3.60 - <=5.96
- >5.96
- Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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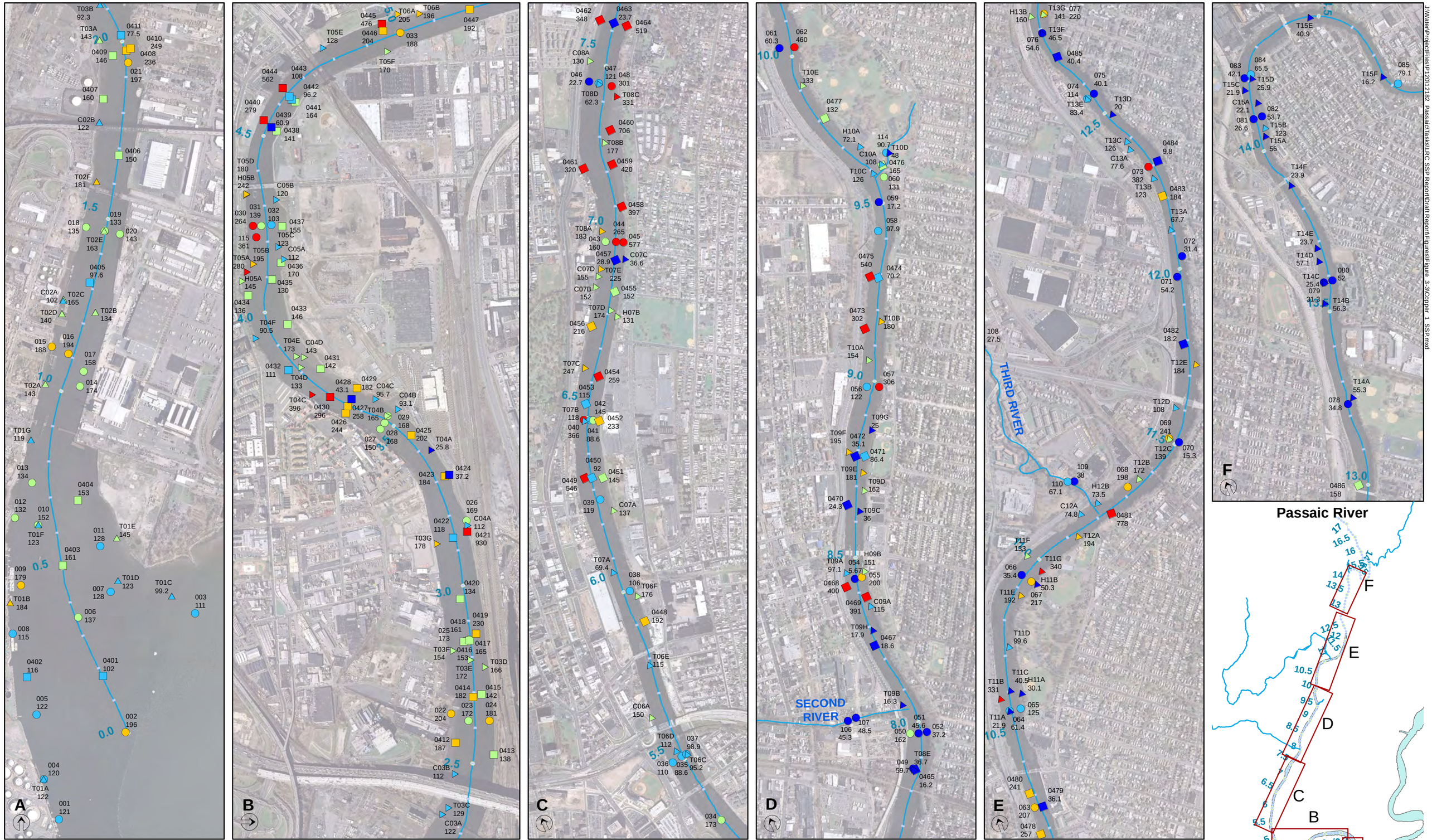

Figure 3-3.k LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Copper (mg/kg)

0 - 0.5 ft
(Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

○ LRC △ Benthic □ SSP

● <=61.3
● >61.3 - <=129
● >129 - <=177
● >177 - <=258
● >258
— Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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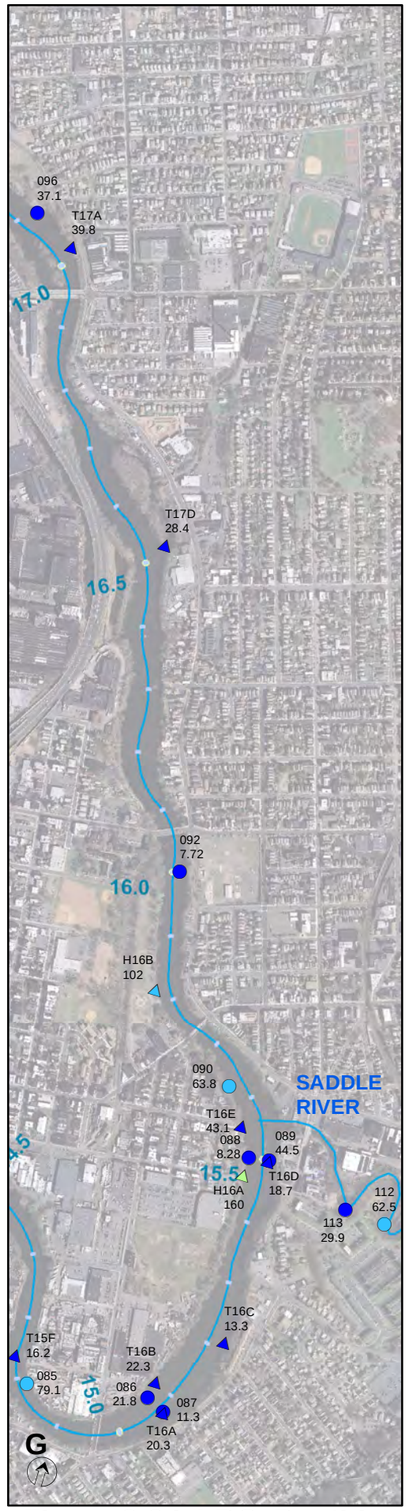

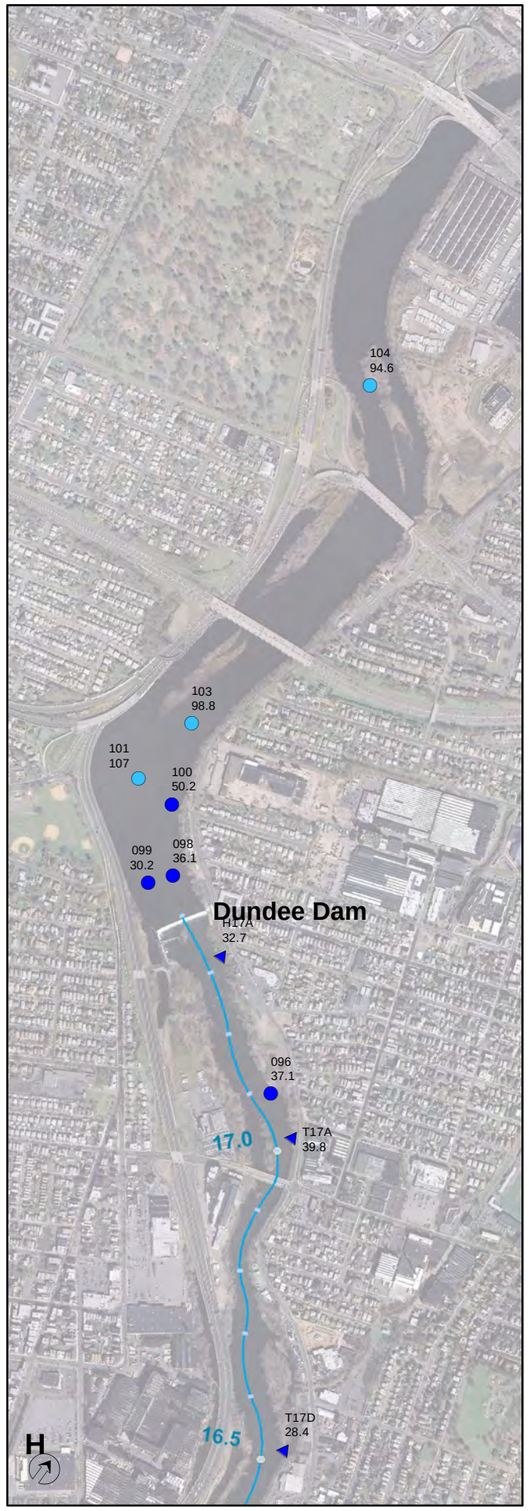

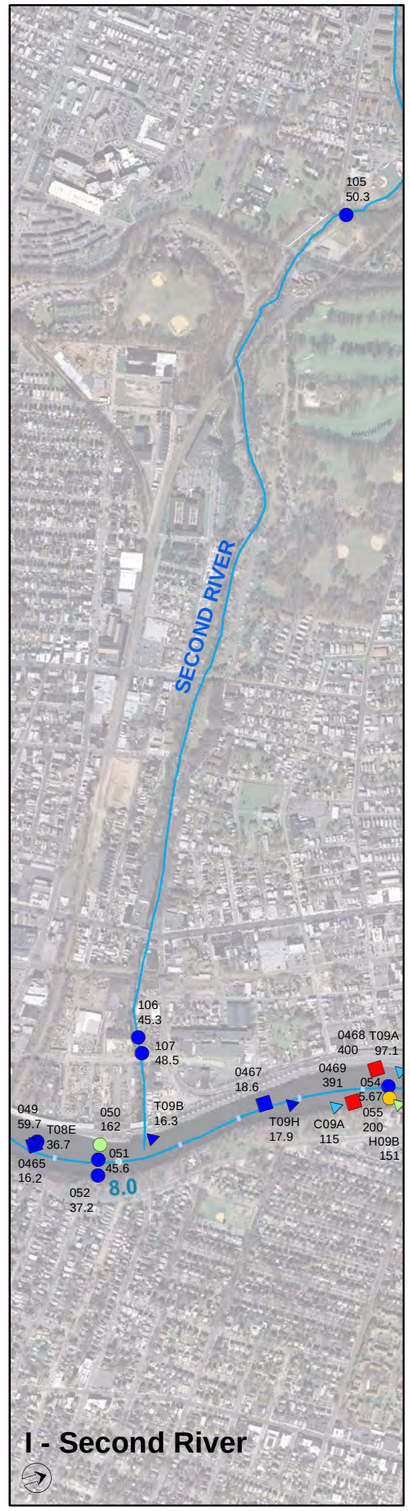

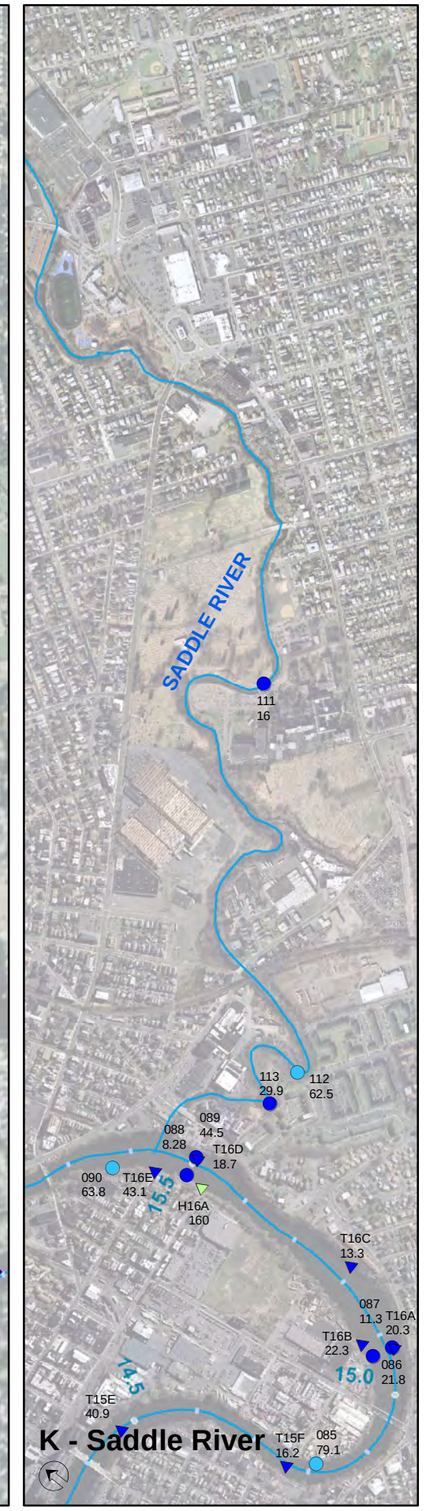

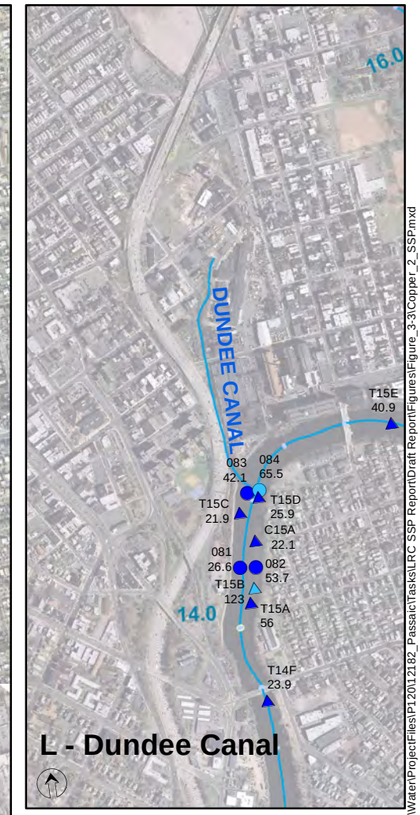

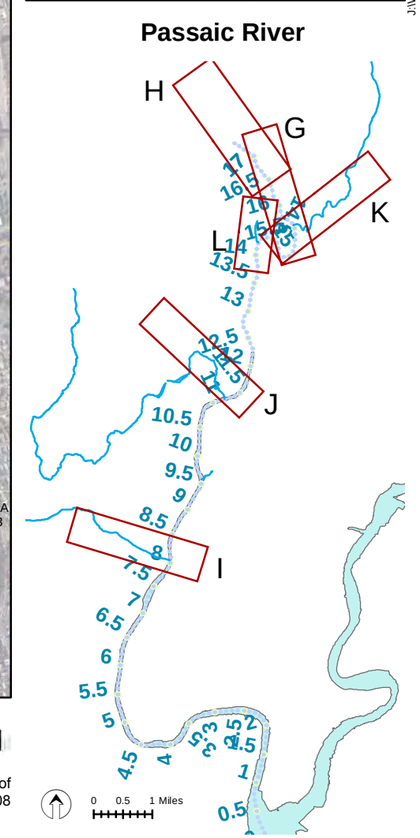

Figure 3-3.k LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Copper (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

● <=61.3 ● >61.3 - <=129 ● >129 - <=177 ● >177 - <=258 ● >258

Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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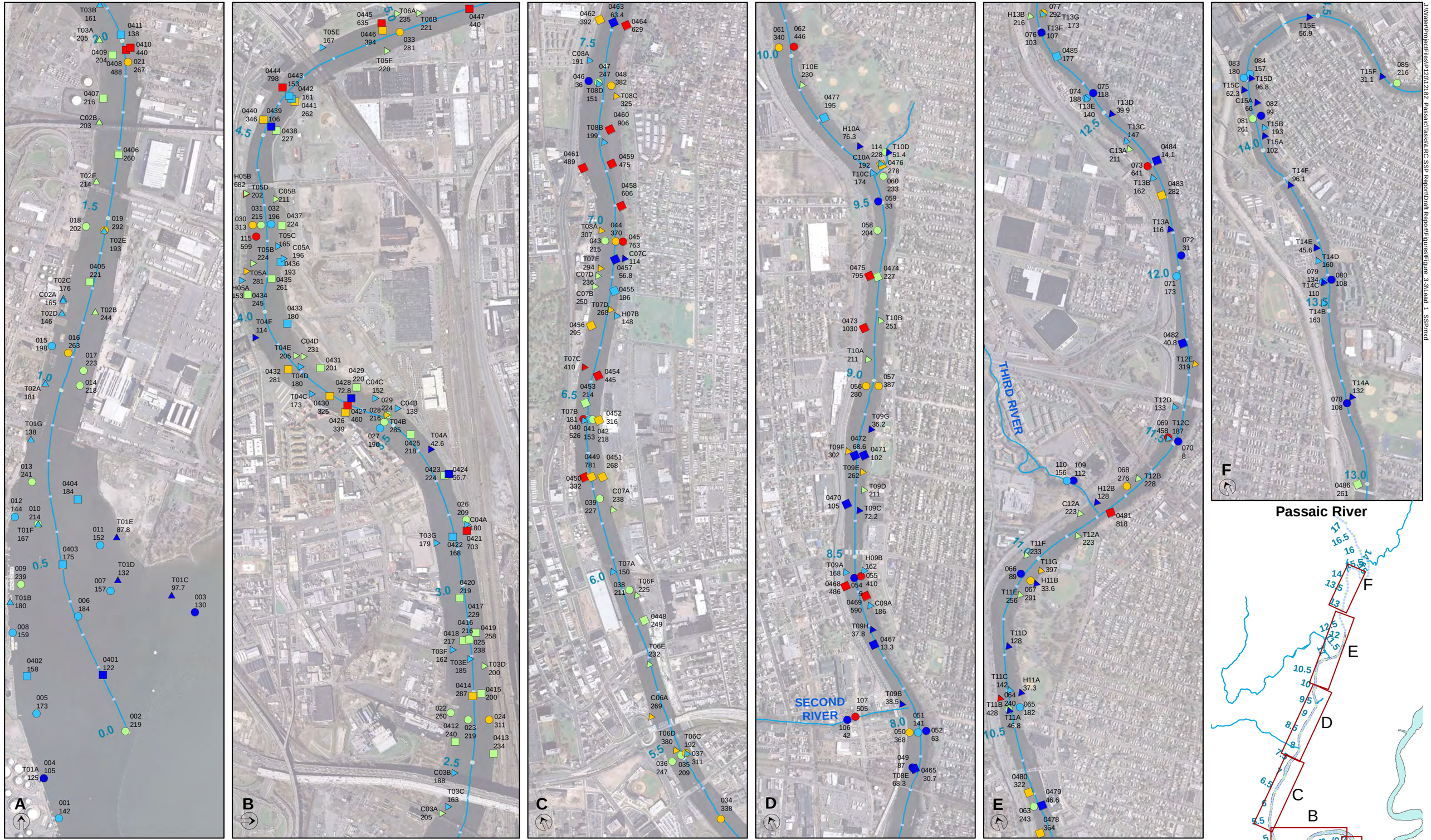

Figure 3-3.l LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Lead (mg/kg)

0 - 0.5 ft
(Page 1 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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Figure 3-3.l LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Lead (mg/kg)
0 - 0.5 ft
(Page 2 of 2)

NOTES: If ND, the numerical value associated with the DL was reported.

0 500 1,000 2,000 Feet

LRC Benthic SSP

<=132
>132 - <=199
>199 - <=261
>261 - <=397
>397
Passaic River Centerline (miles)

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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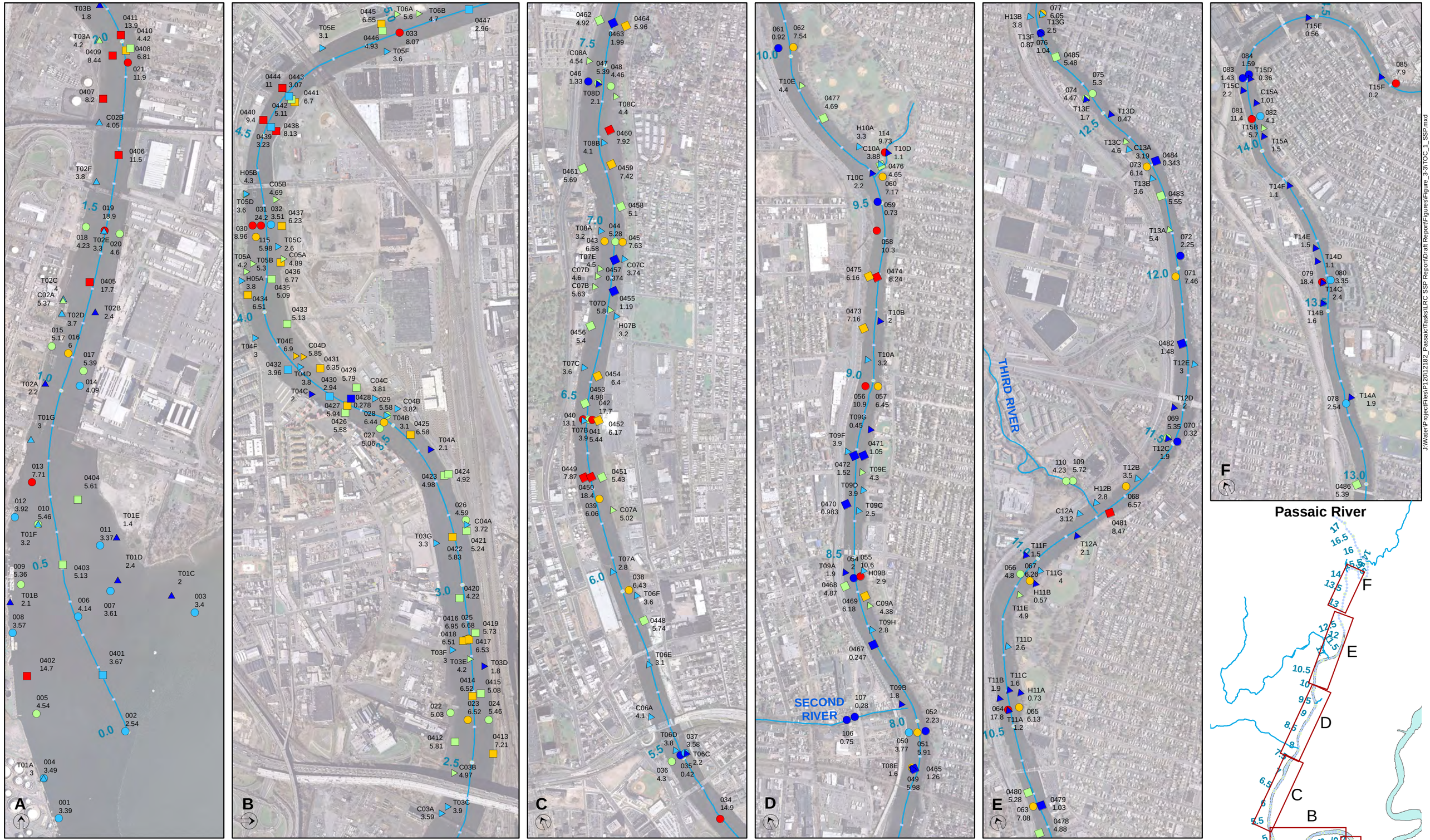
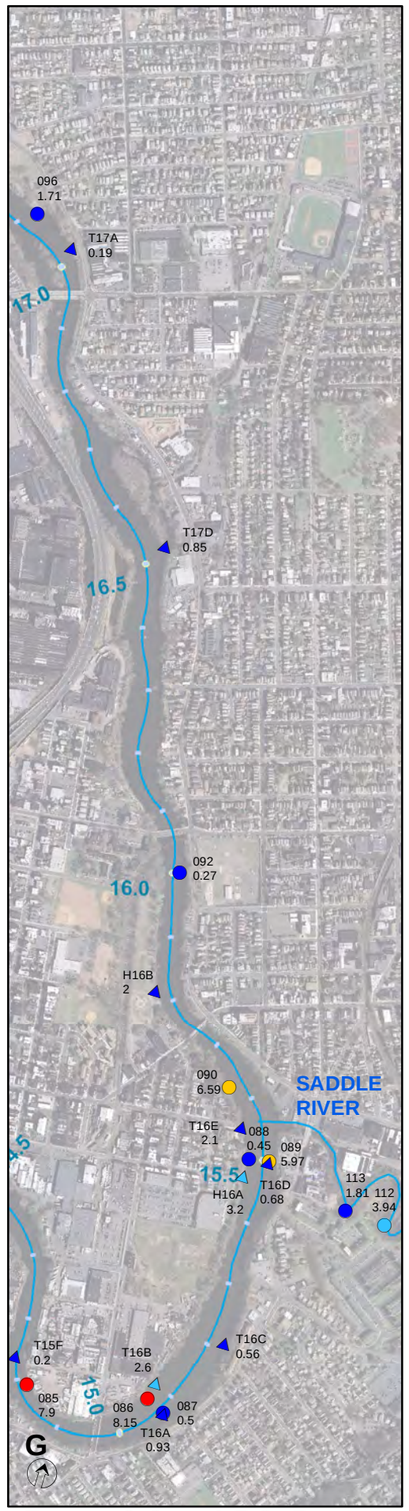
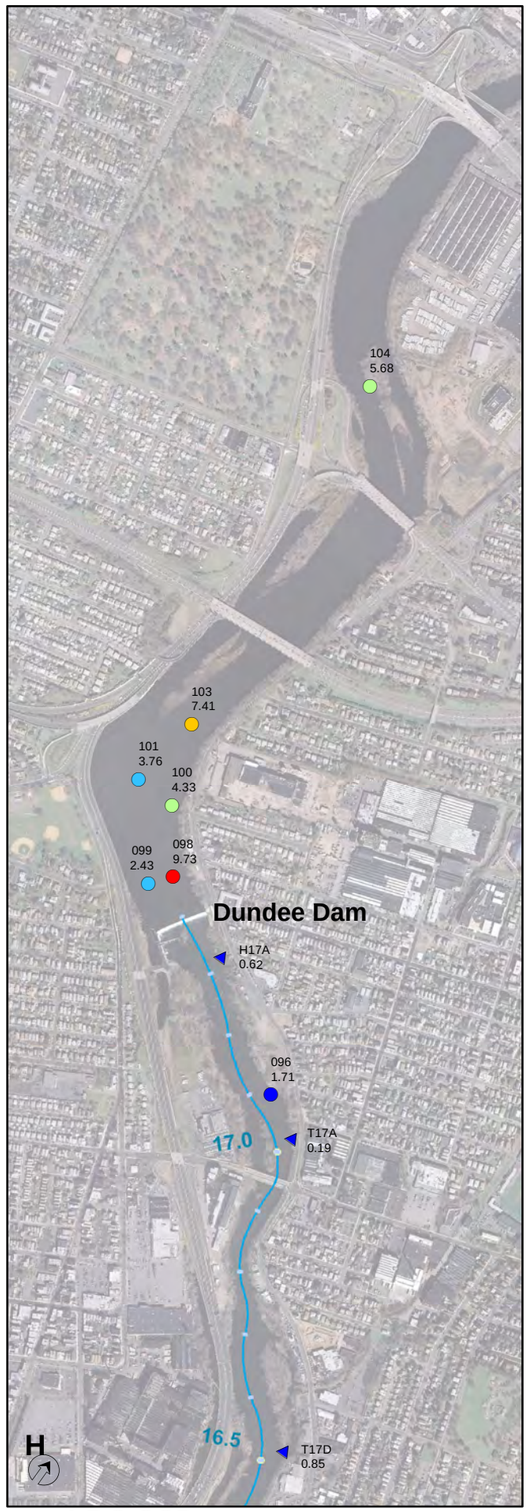
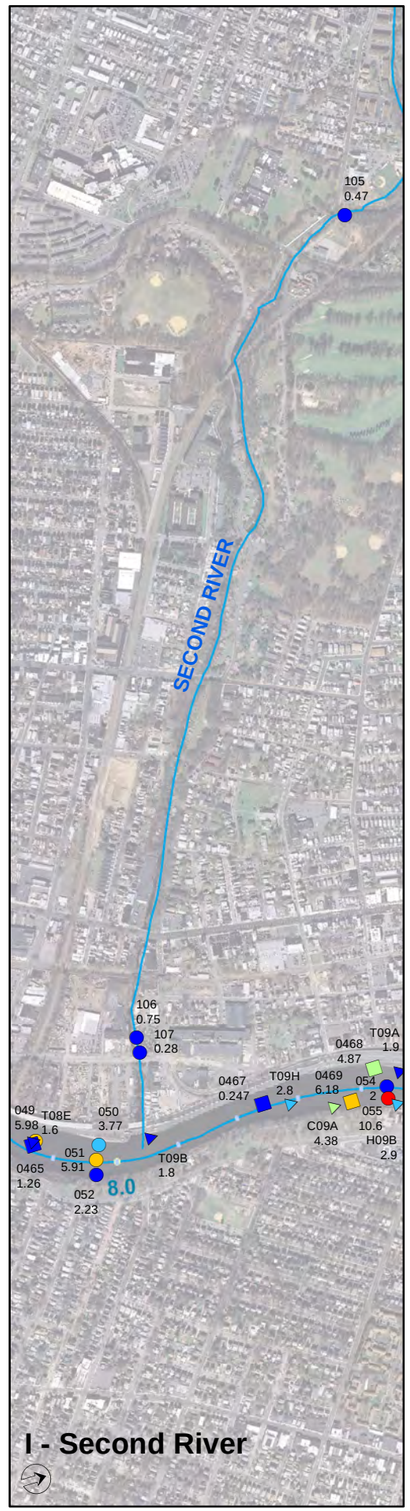
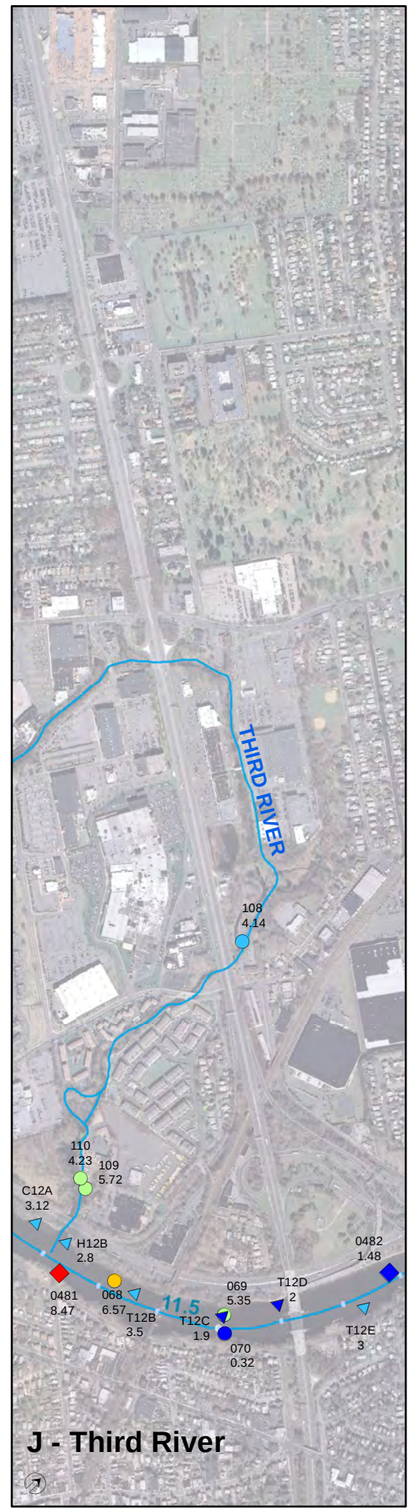


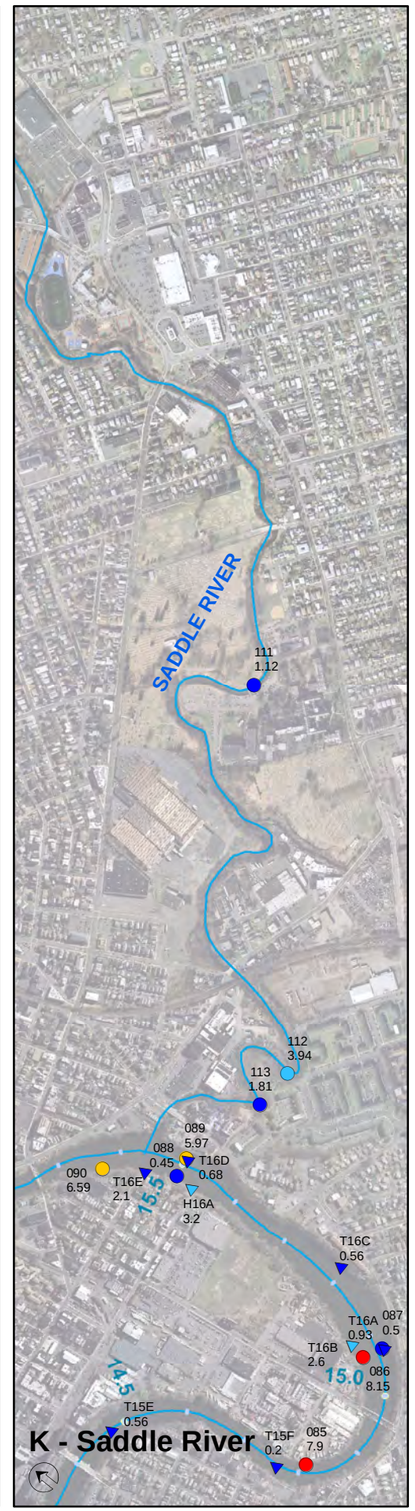
Figure 3-3.m LRC, Benthic, and LRC SSP Surficial Analyte Concentration: TOC (%)
0 - 0.5 ft
(Page 1 of 2)











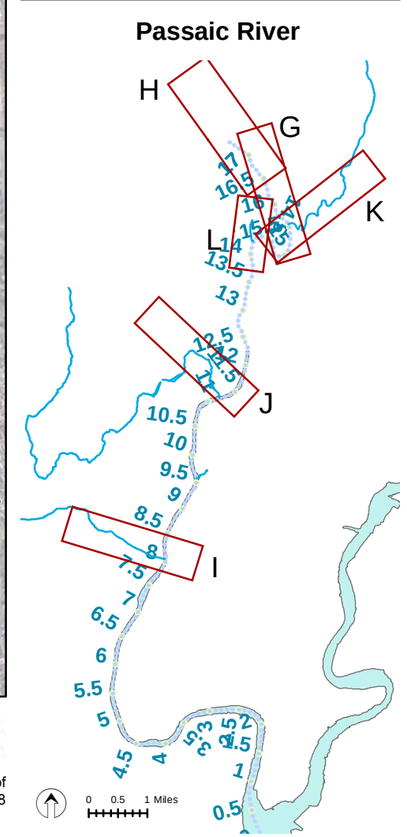


Figure 3-3.m LRC, Benthic, and LRC SSP Surficial Analyte Concentration: TOC (%)
0 - 0.5 ft
(Page 2 of 2)

0 500 1,000 2,000 Feet

○ LRC △ Benthic □ SSP

- <=2.40%
- >2.40% - <=4.14%
- >4.14% - <=5.81%
- >5.81% - <=7.69%
- >7.69%

Location 0466 not sampled.

022 Location Code
59.4 Concentration (Presented On Dry Weight Basis)

Passaic River Centerline (miles)

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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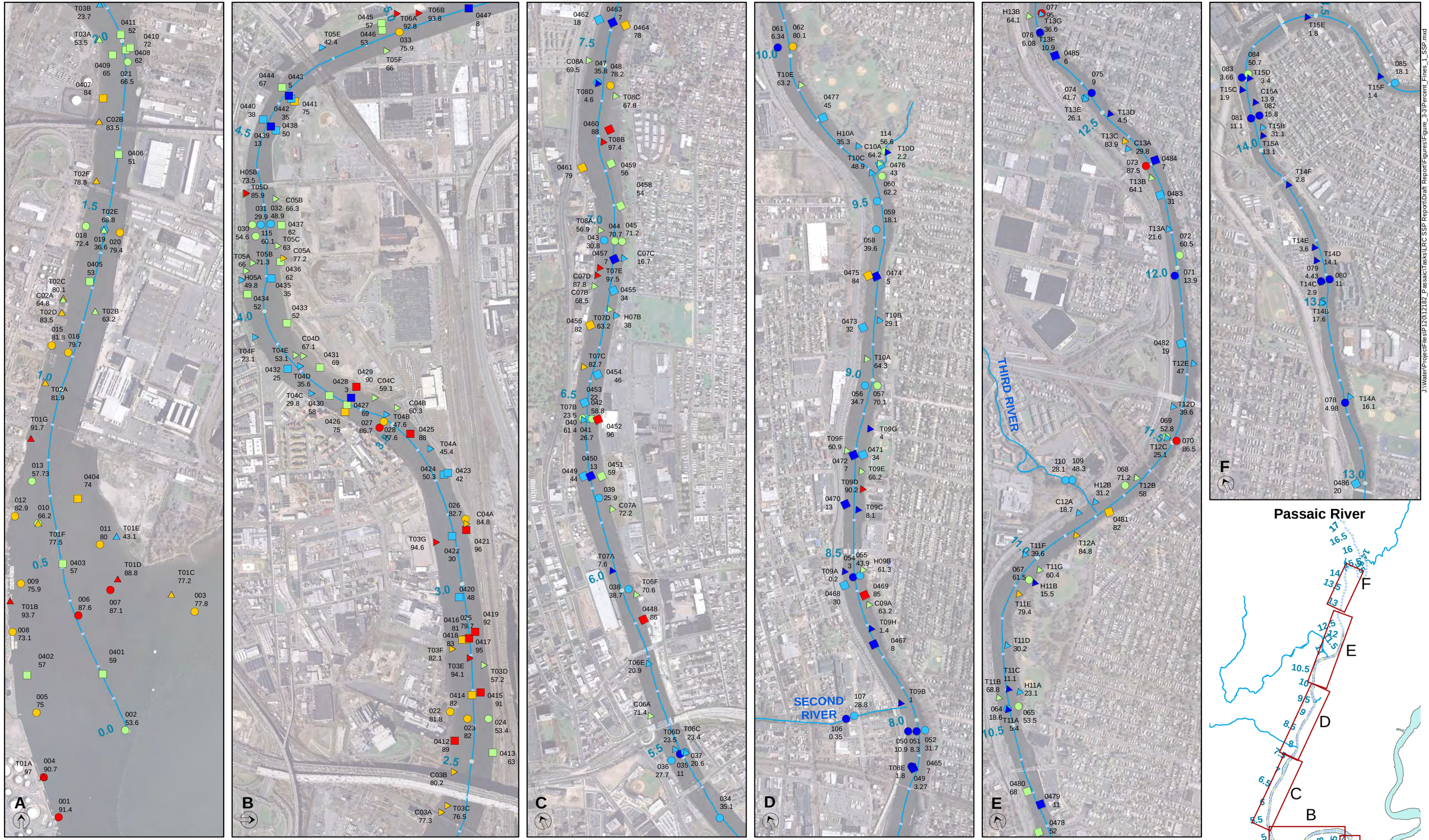

Figure 3-3.n LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Percent Fines (%)

0 - 0.5 ft
(Page 1 of 2)

NOTES: Percent passing Sieve #230 for LRC and LRC SSP (where data available); percent passing Sieve #200 for benthic and one location for LRC SSP (12A-0424, where Sieve #230 data not available); implied sum of silt and clay grain size fractions.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

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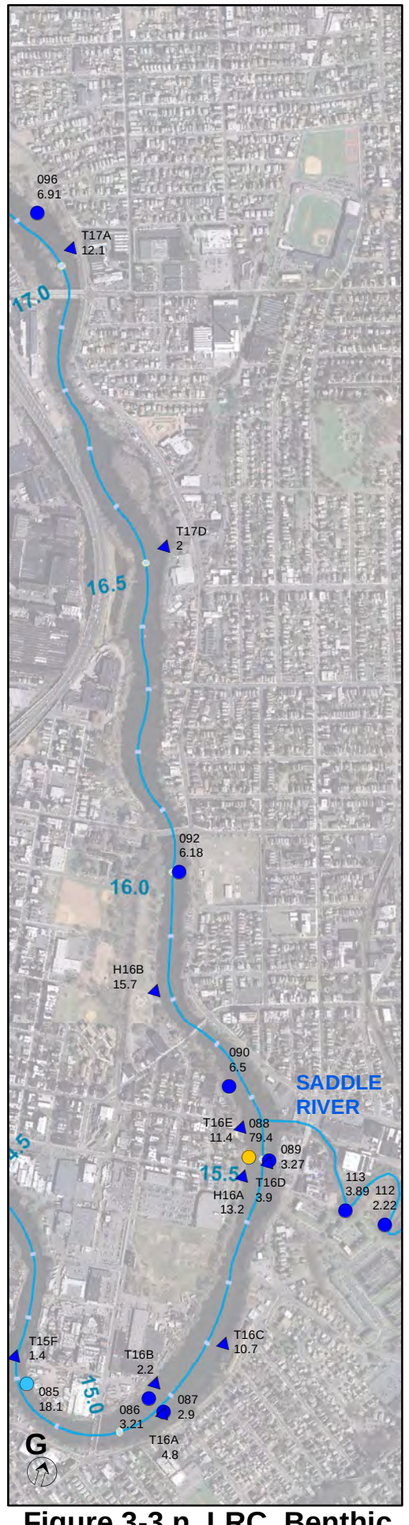

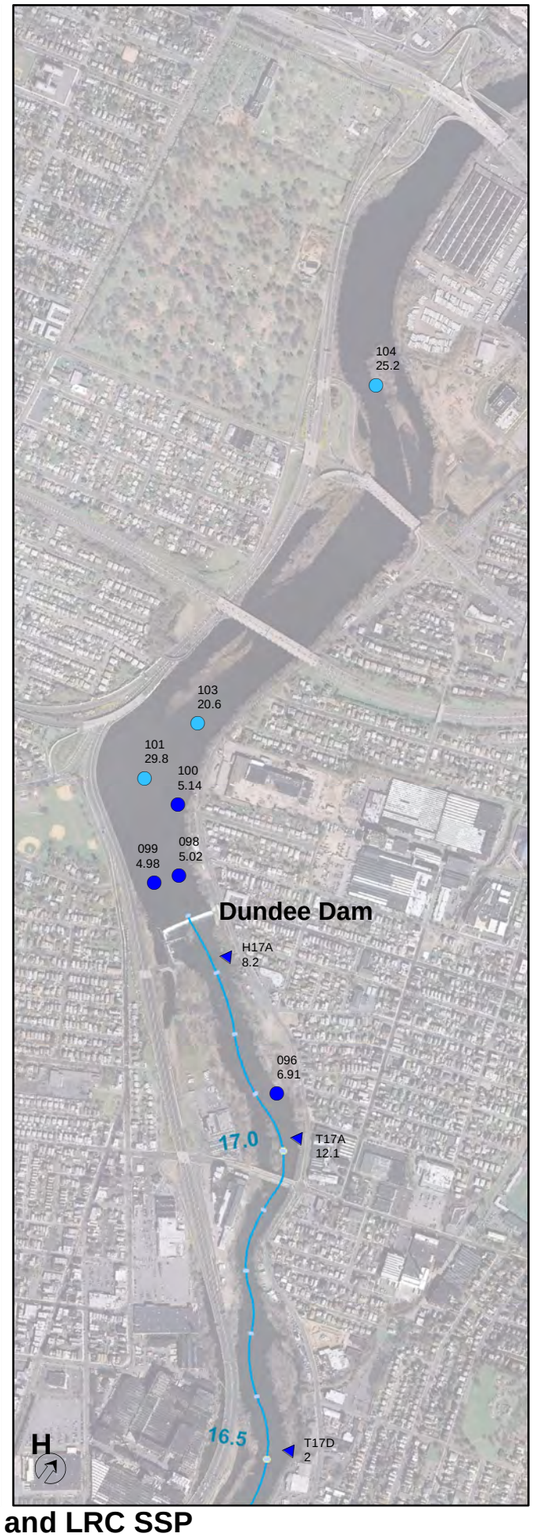

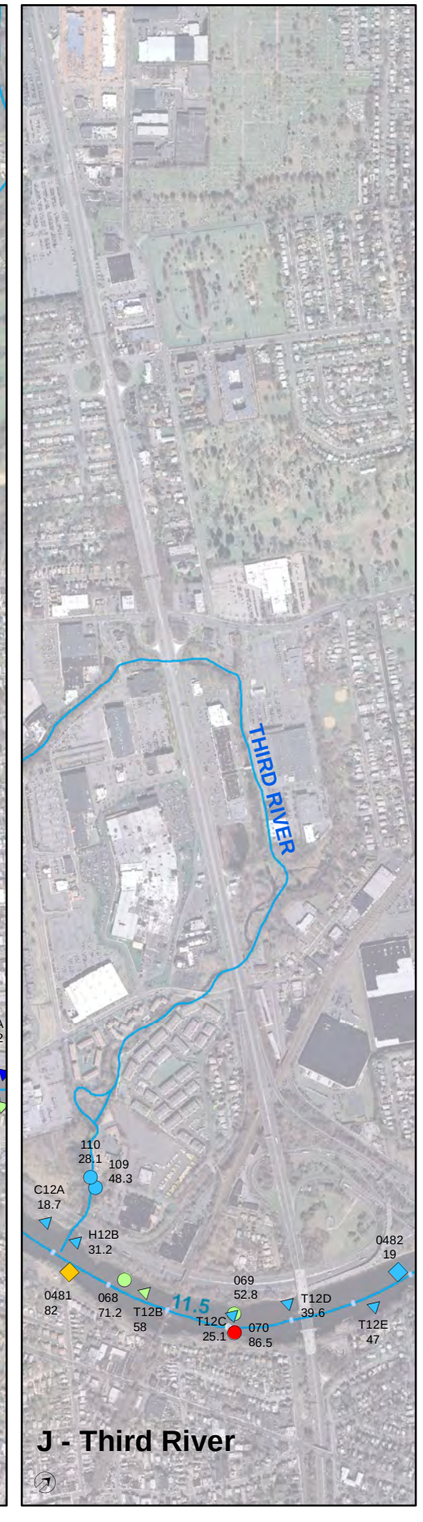

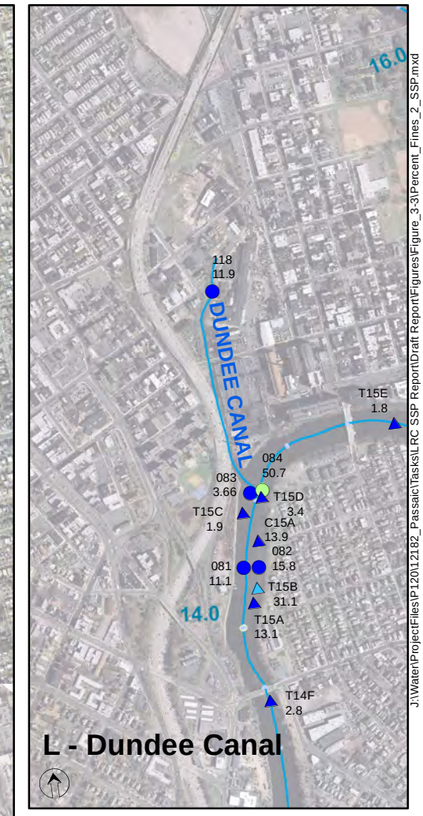

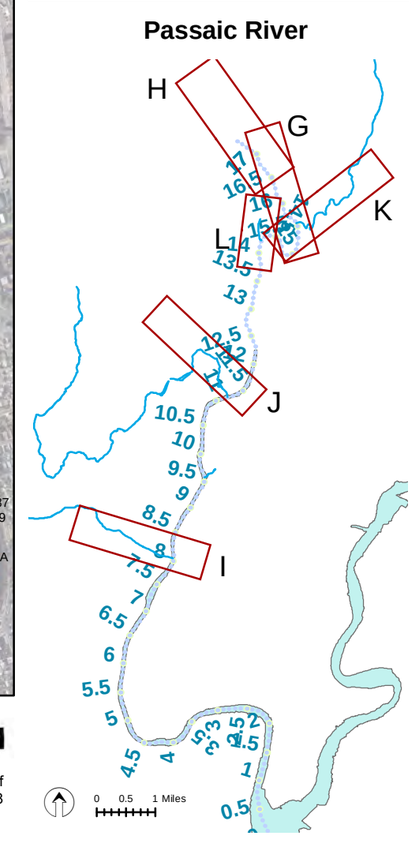

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Figure 3-3.n LRC, Benthic, and LRC SSP Surficial Analyte Concentration: Percent Fines (%)

0 - 0.5 ft
(Page 2 of 2)

NOTES: Percent passing Sieve #230 for LRC and LRC SSP (where data available); percent passing Sieve #200 for benthic and one location for LRC SSP (12A-0424, where Sieve #230 data not available); implied sum of silt and clay grain size fractions.

0 500 1,000 2,000 Feet

<=16.0%
>16.0% - <=50.5%
>50.5% - <=72.6%
>72.6% - <=84.8%
>84.8%
Passaic River Centerline (miles)

LRC Benthic SSP

022 Location Code
59.4 Percentage

Location 0466 not sampled.

November 2014

AECOM

Ortho: NJ Office of Information Technology (NJOIT, Office of Geographic Information Systems (OGIS), 2007-2008

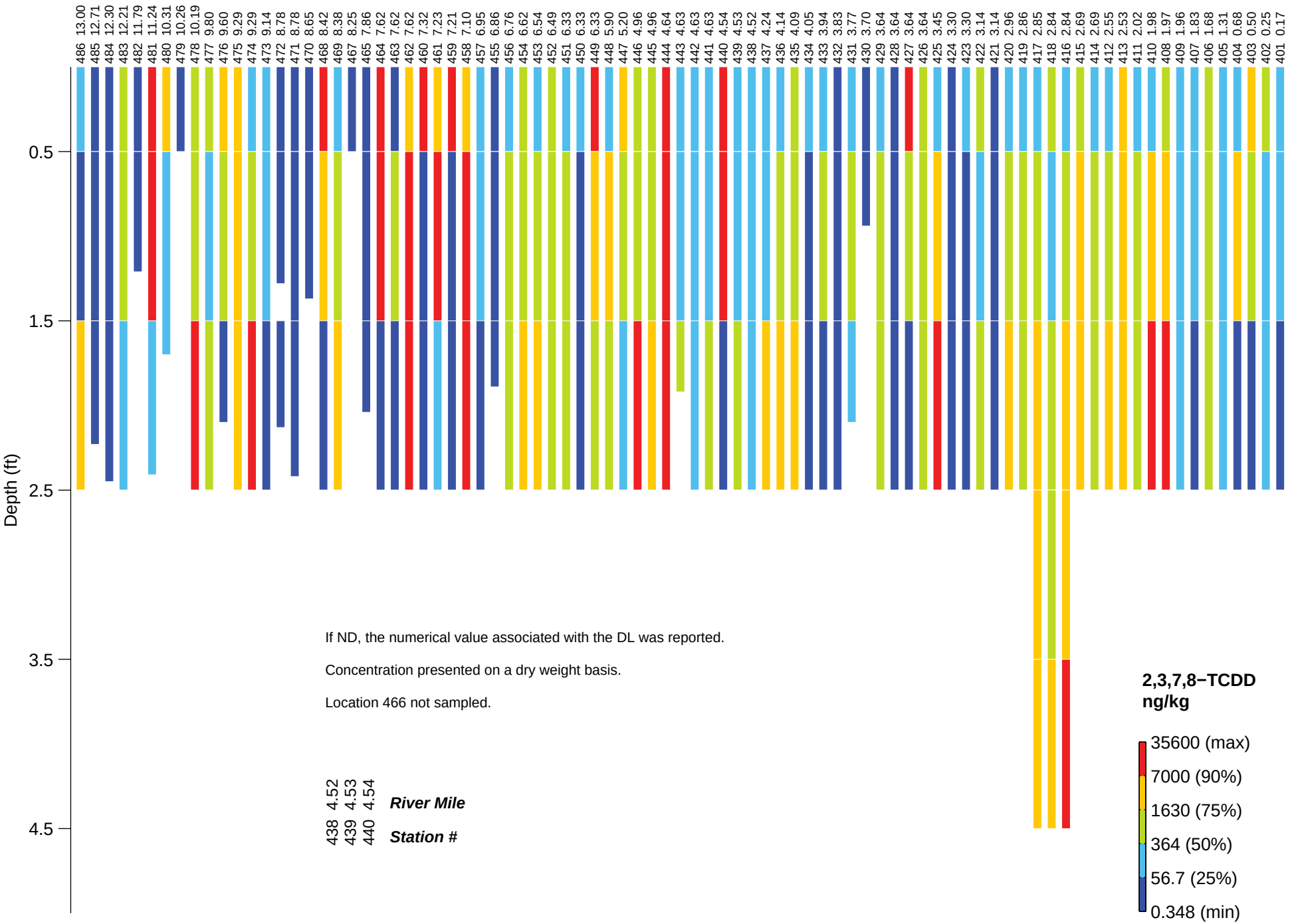

Figure 3−4.a Profiles of Core Data By River Mile and Depth: 2,3,7,8−TCDD

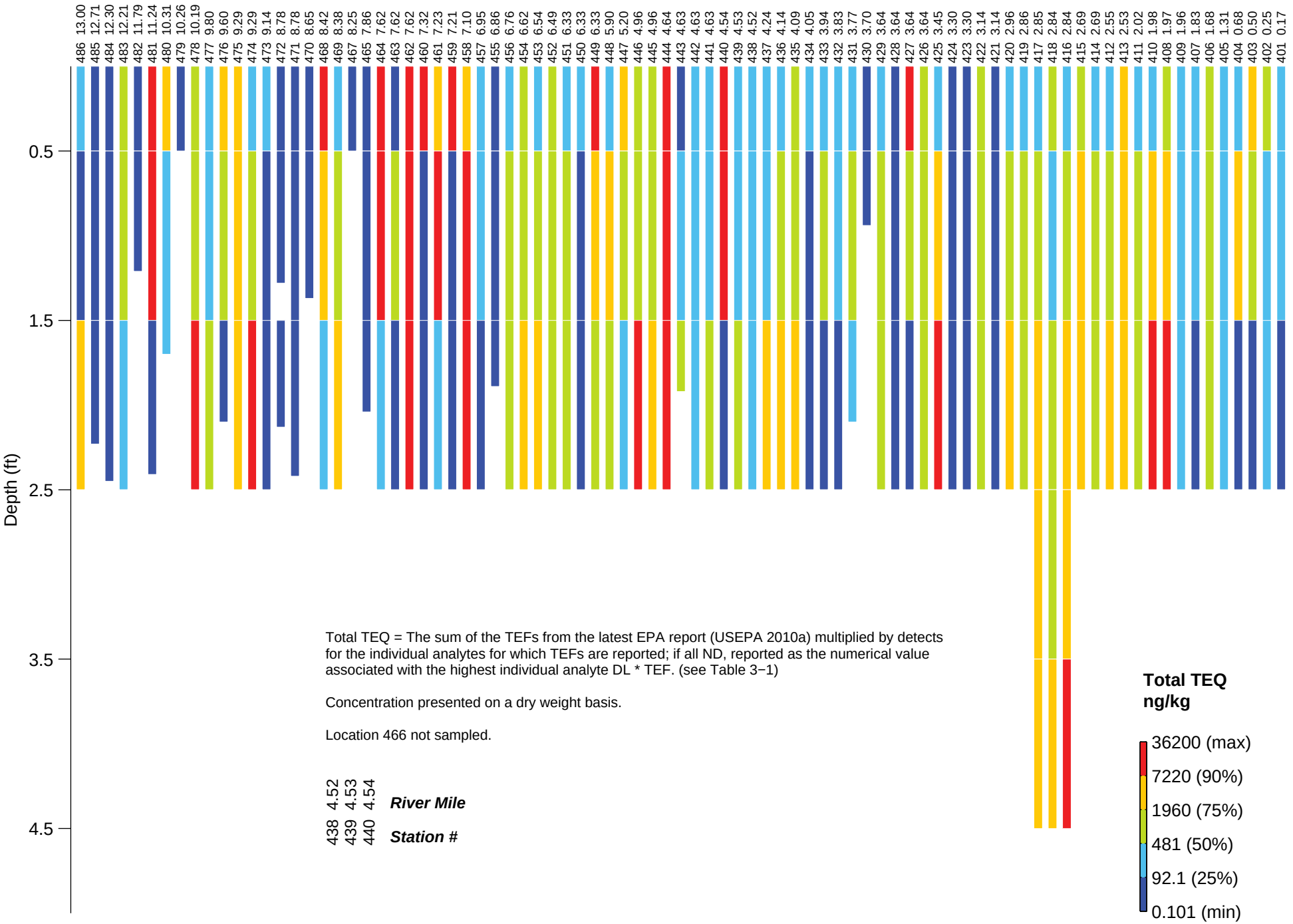

Figure 3−4.b Profiles of Core Data By River Mile and Depth: Total TEQ

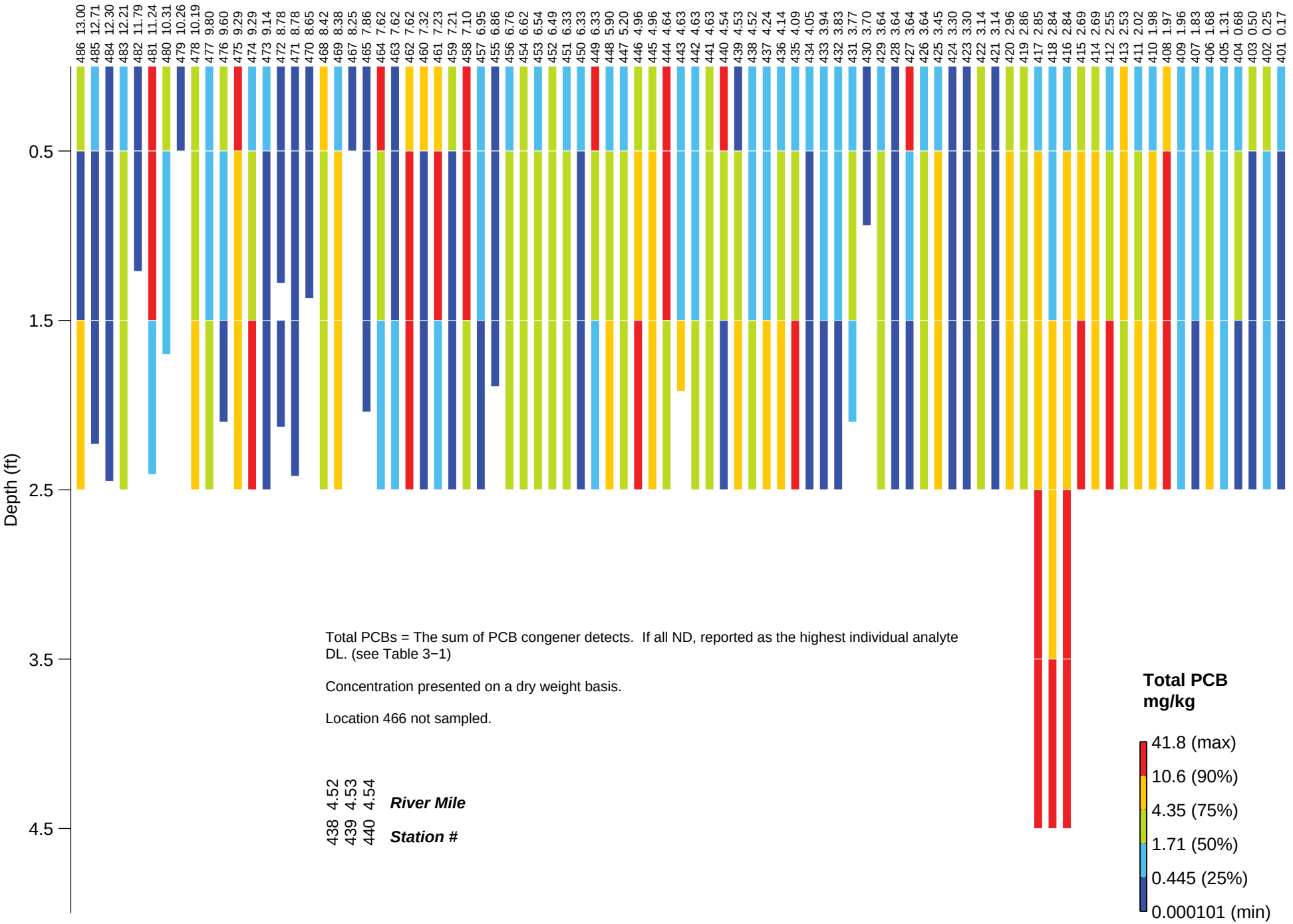

Figure 3−4.c Profiles of Core Data By River Mile and Depth: Total PCB

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November 2014

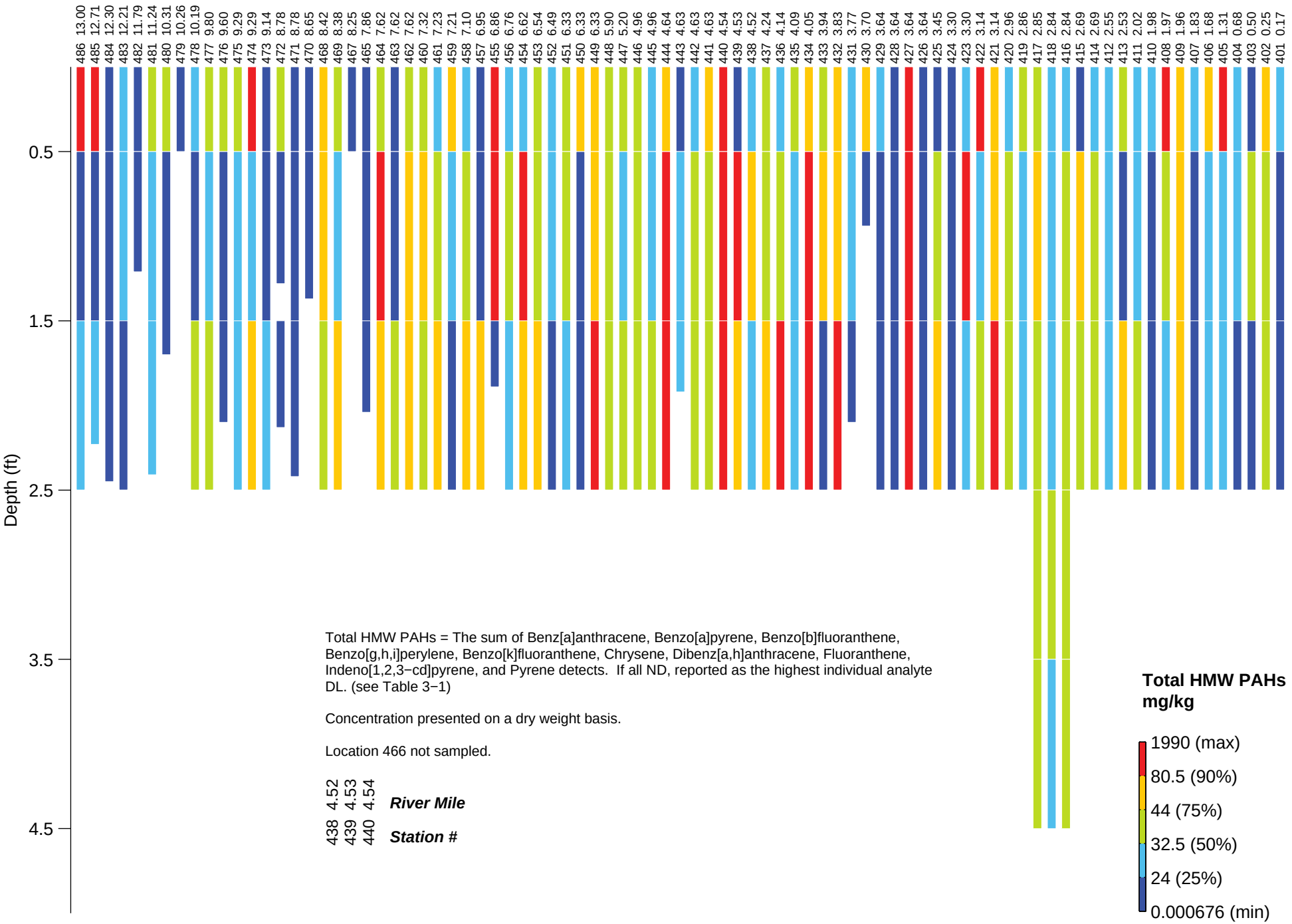

Figure 3−4.d Profiles of Core Data By River Mile and Depth: Total HMW PAHs

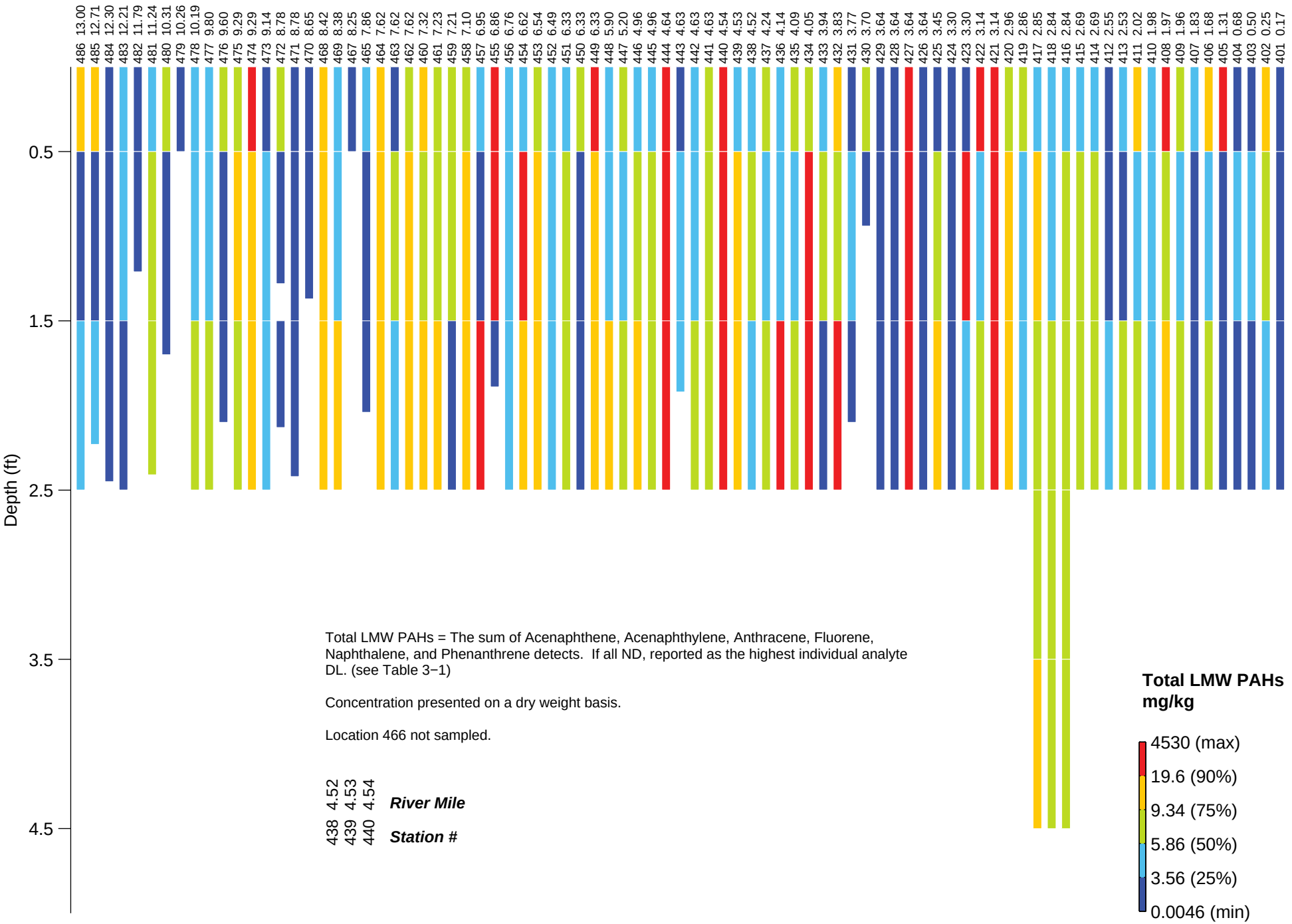

Figure 3−4.e Profiles of Core Data By River Mile and Depth: Total LMW PAHs

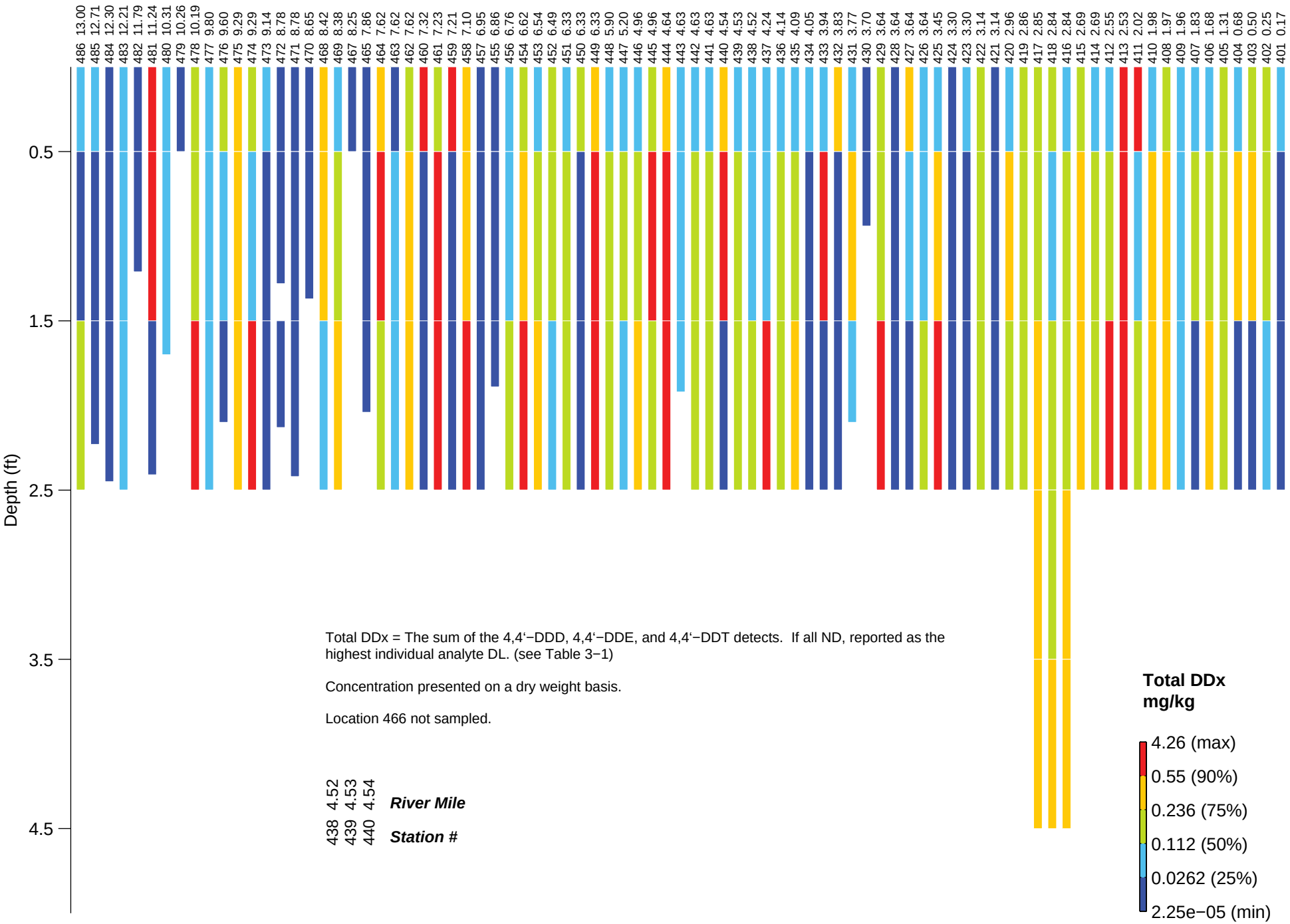

Figure 3−4.f Profiles of Core Data By River Mile and Depth: Total DDx

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November 2014

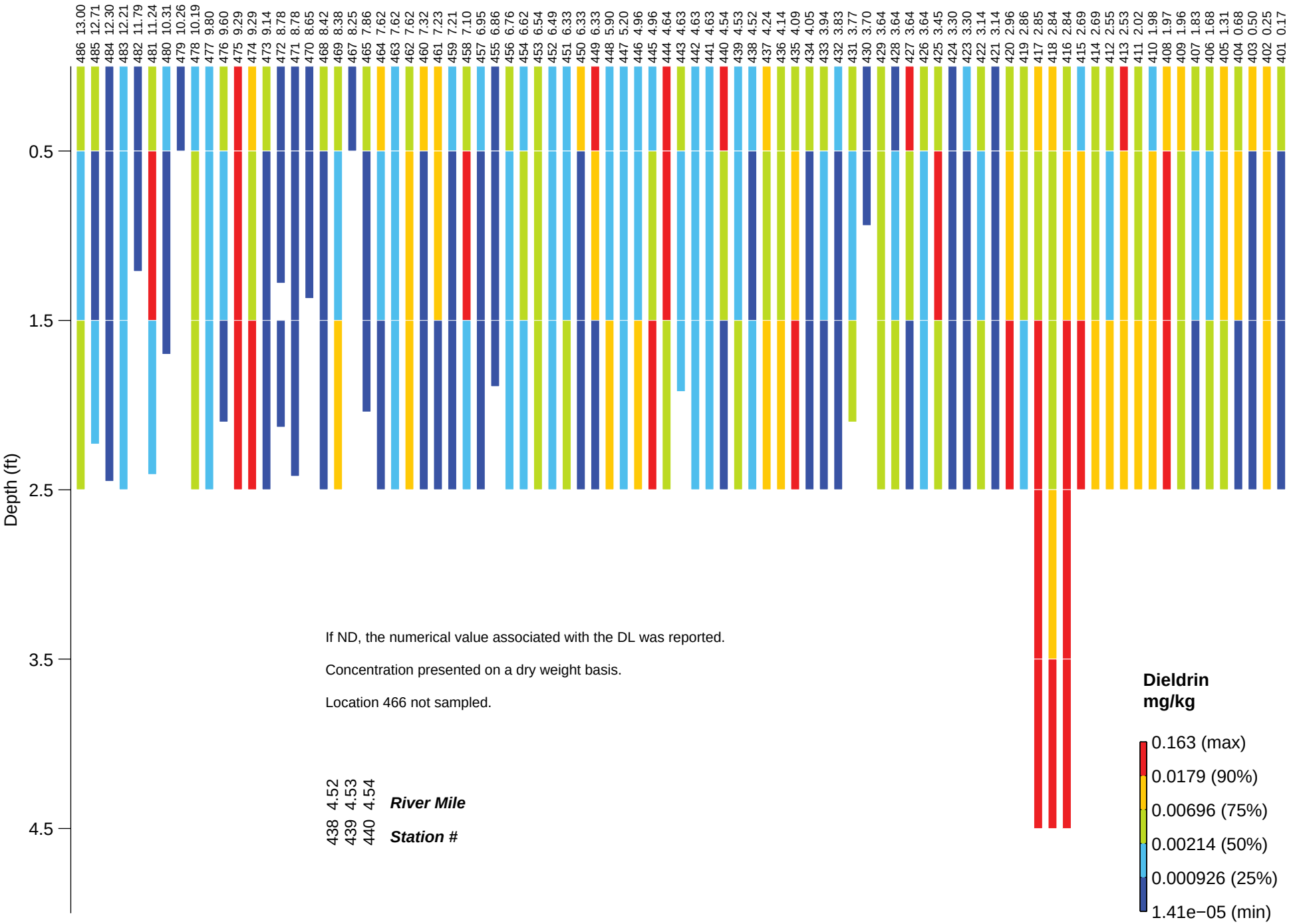

Figure 3−4.g Profiles of Core Data By River Mile and Depth: Dieldrin

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November 2014

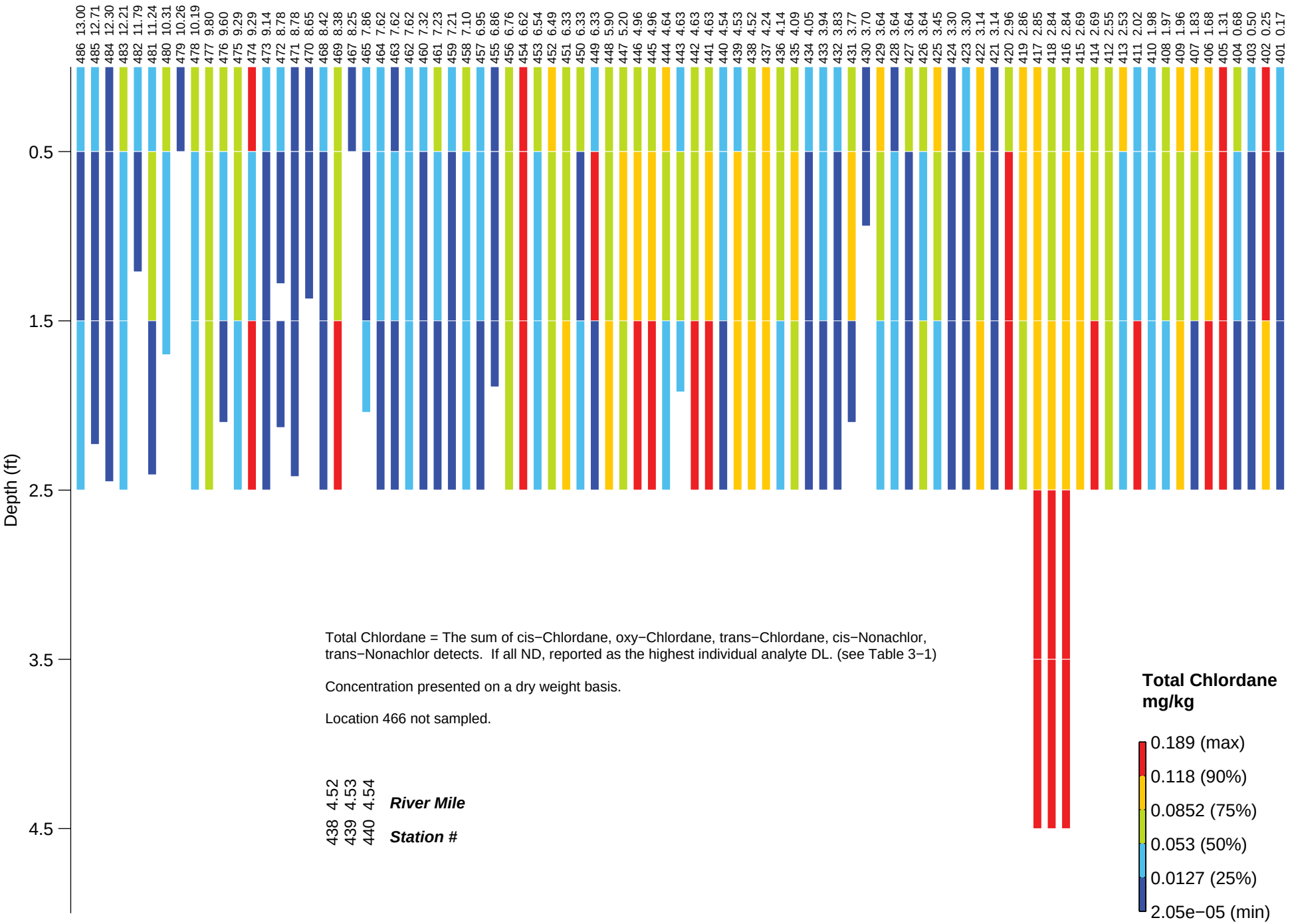

Figure 3−4.h Profiles of Core Data By River Mile and Depth: Total Chlordane

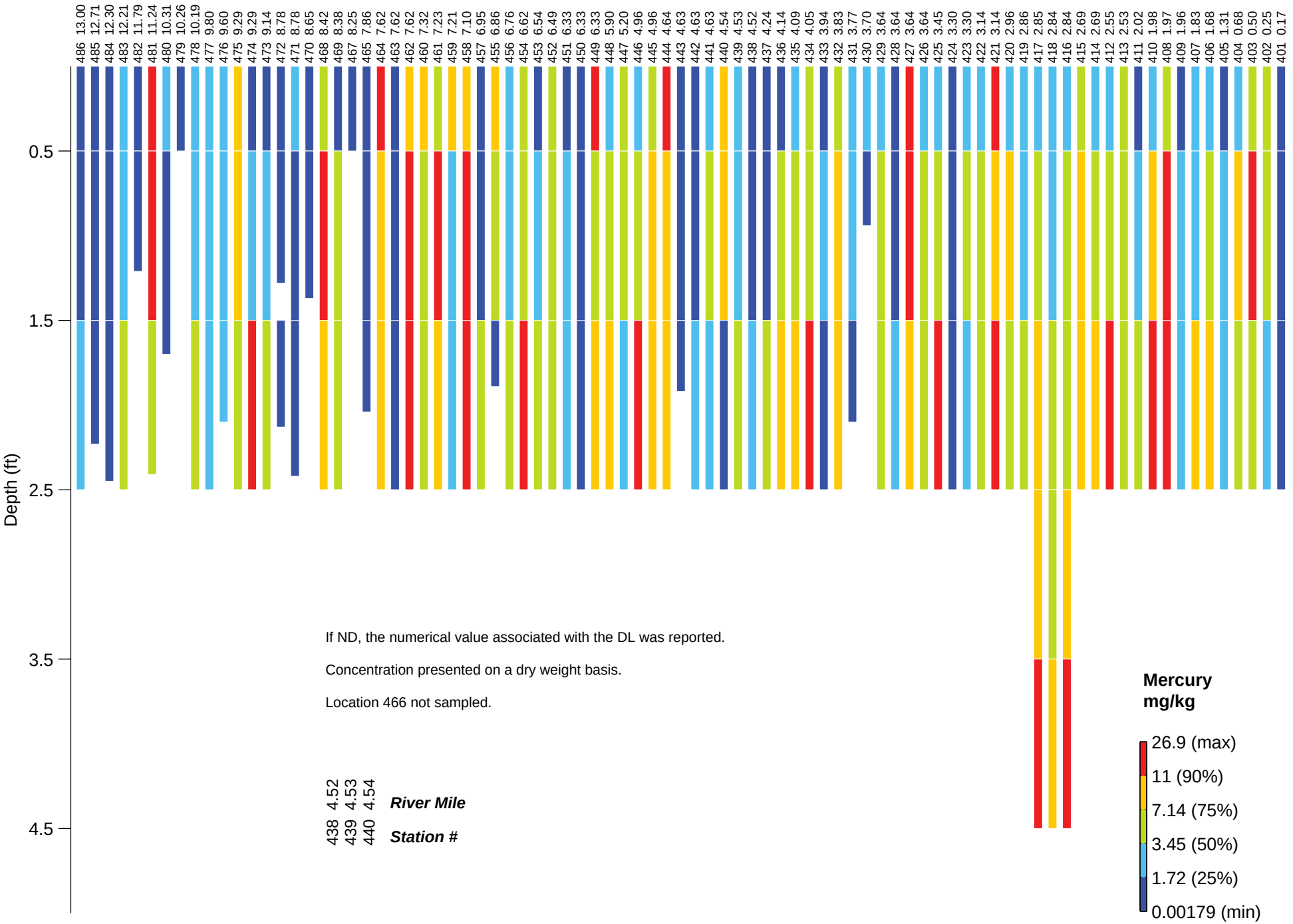

Figure 3−4.i Profiles of Core Data By River Mile and Depth: Mercury

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November 2014

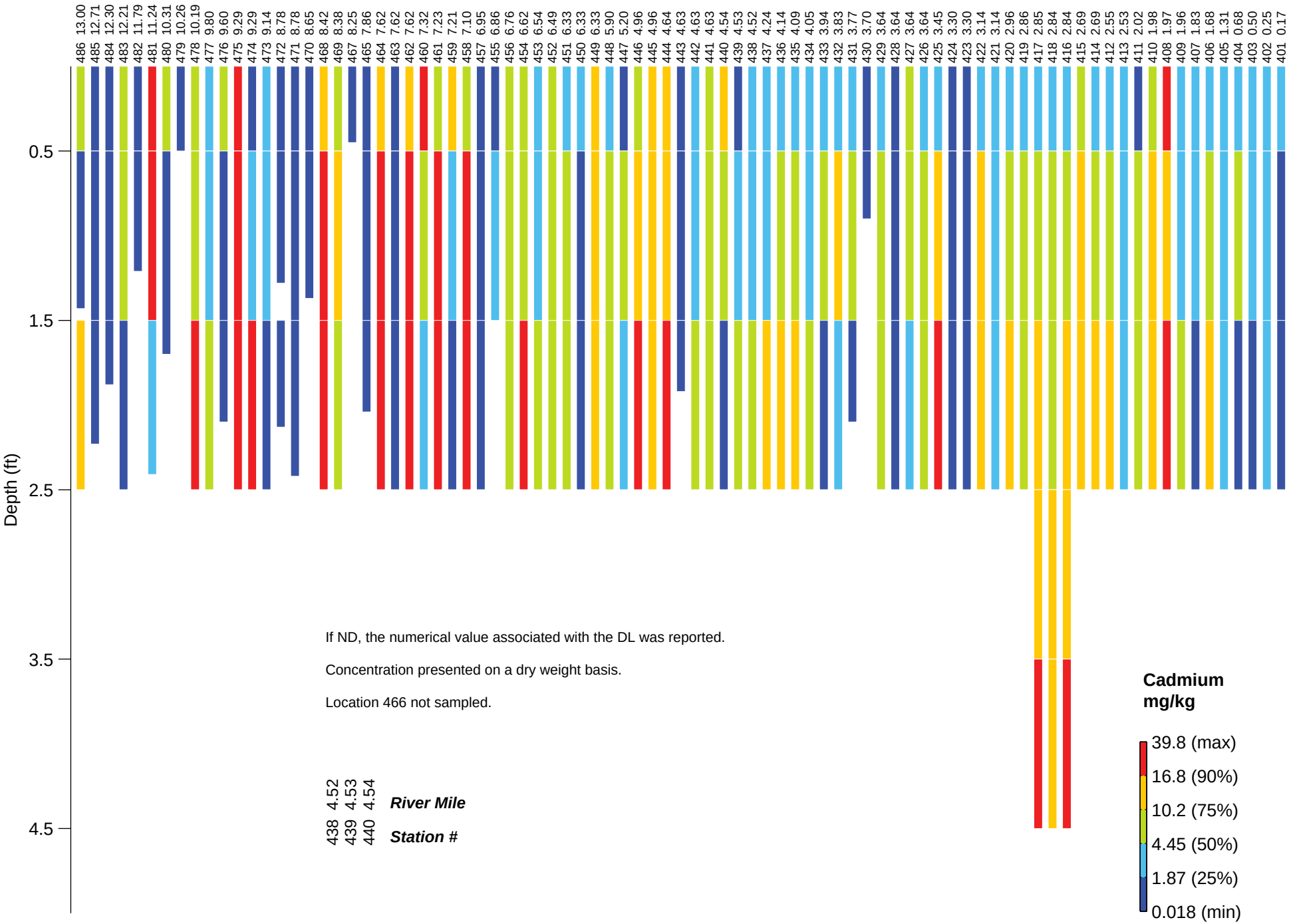

Figure 3−4.j Profiles of Core Data By River Mile and Depth: Cadmium

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November 2014

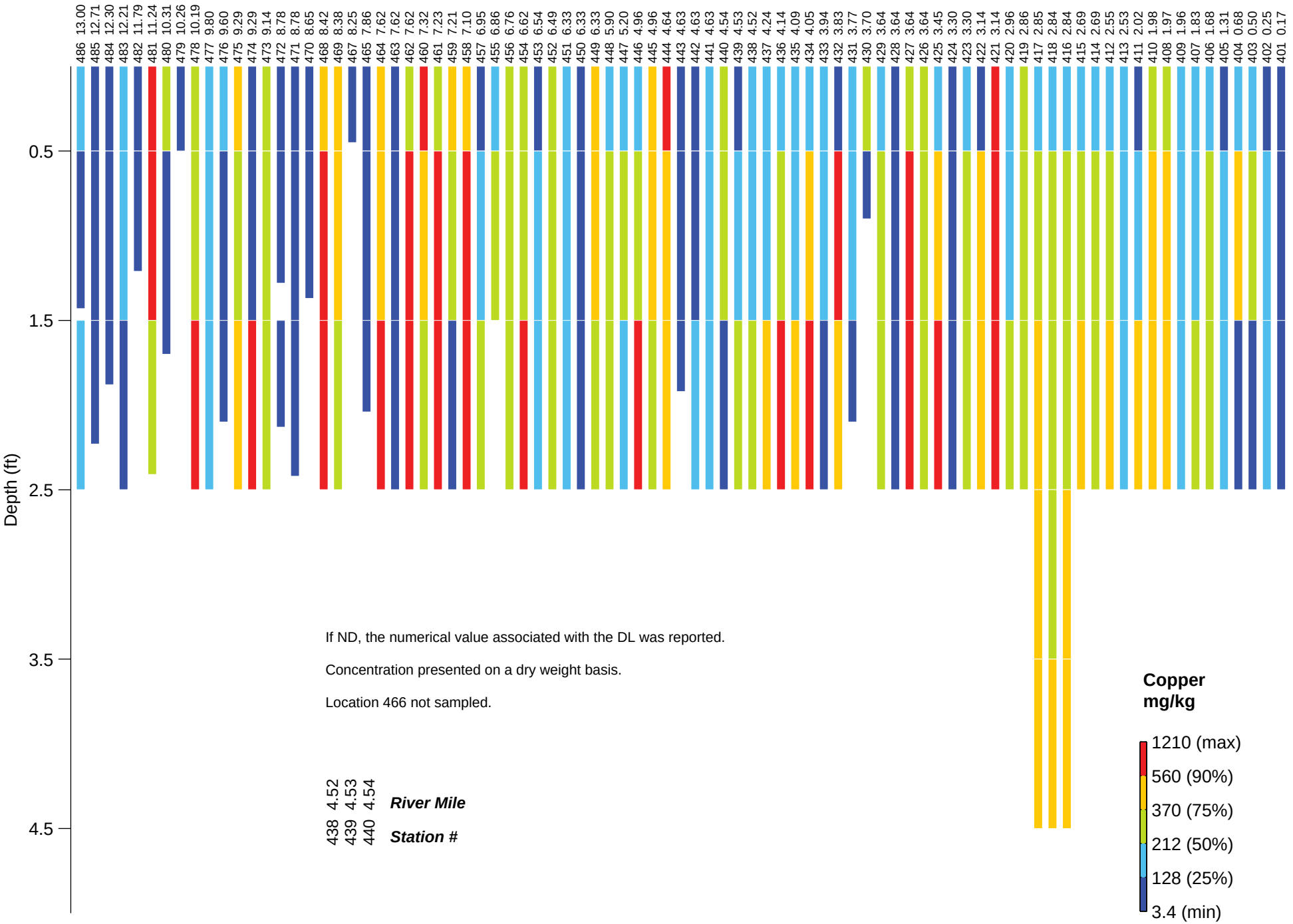

Figure 3−4.k Profiles of Core Data By River Mile and Depth: Copper

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November 2014

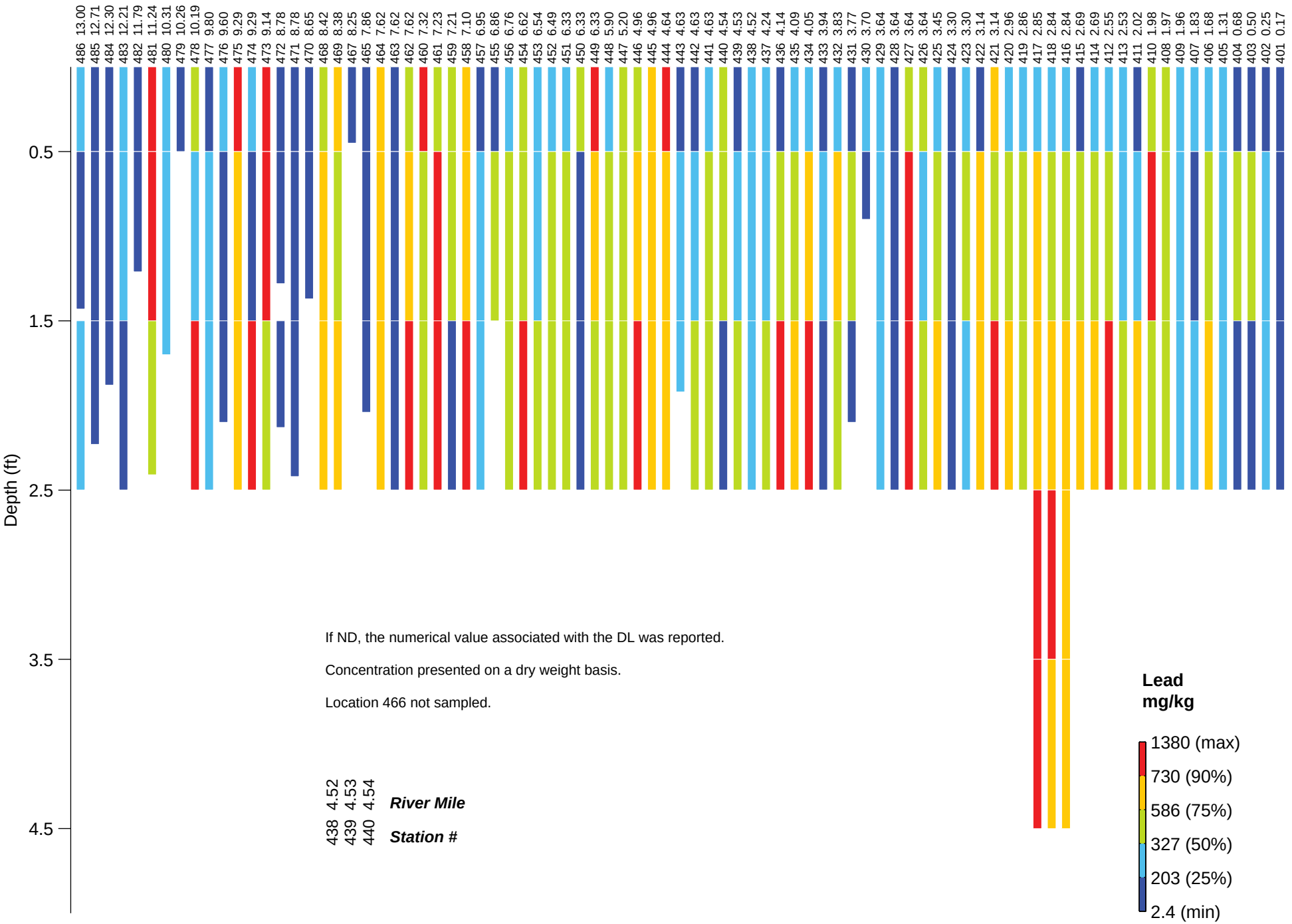

Figure 3−4.l Profiles of Core Data By River Mile and Depth: Lead

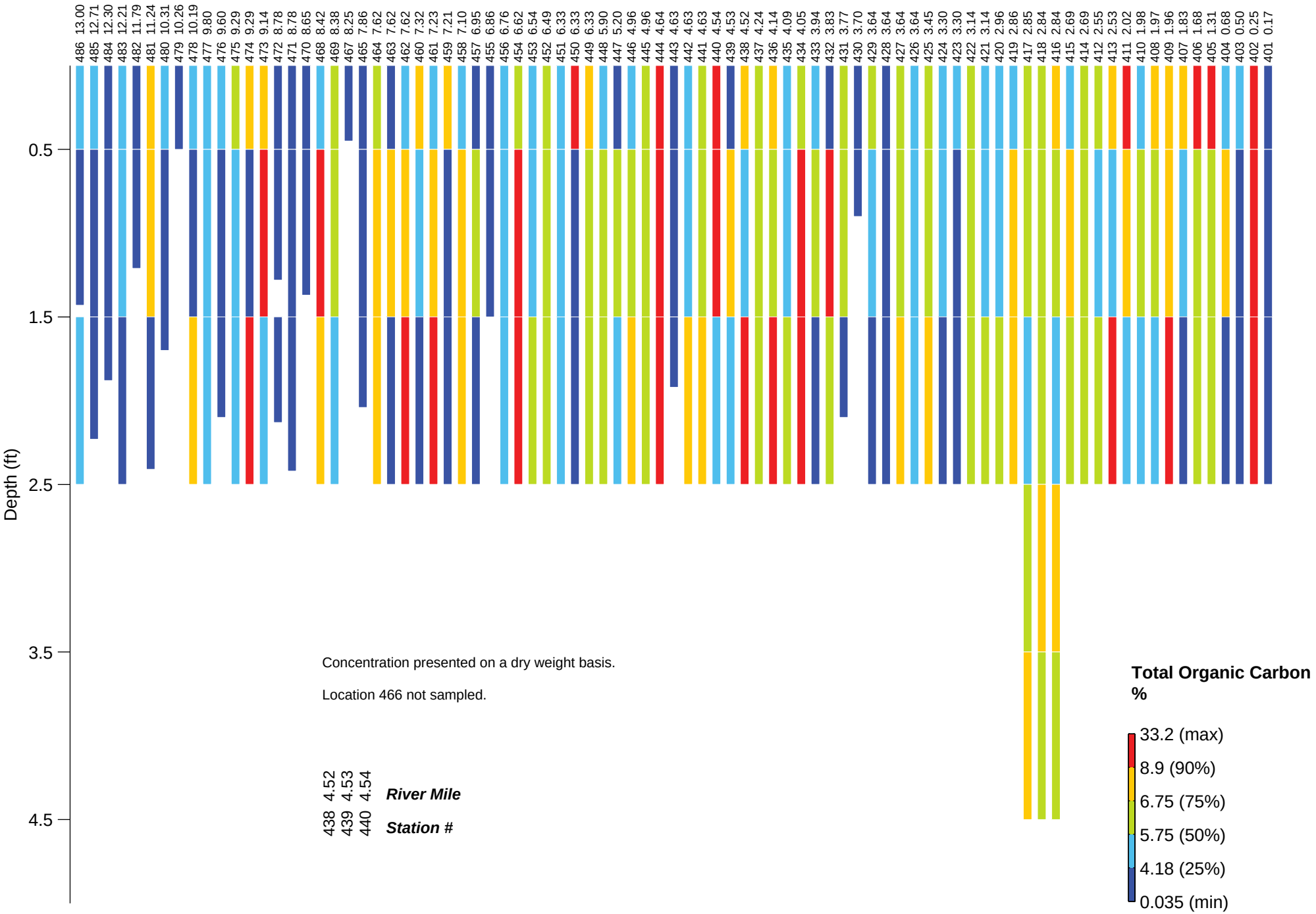

Figure 3−4.m Profiles of Core Data By River Mile and Depth: Total Organic Carbon

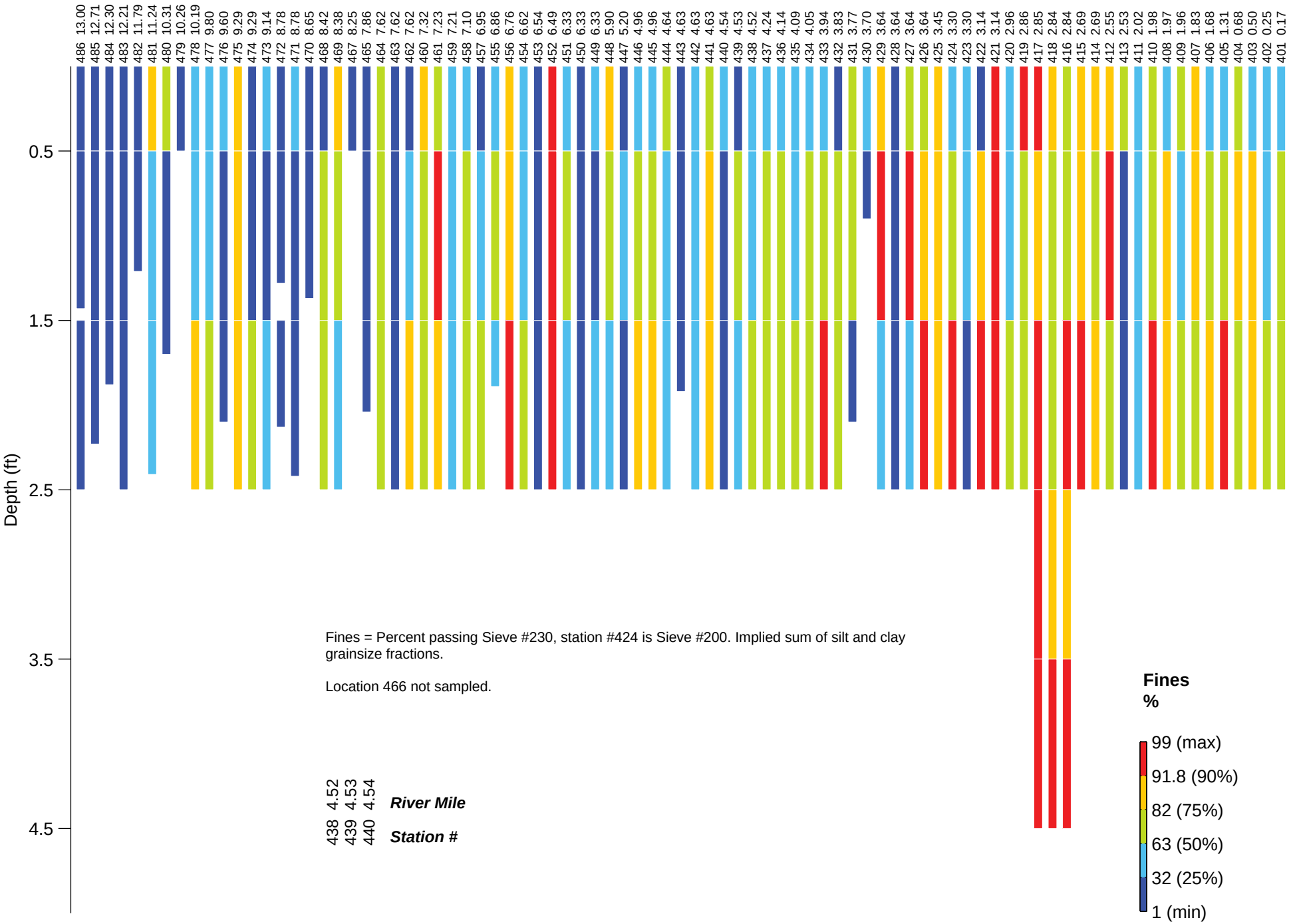

Figure 3−4.n Profiles of Core Data By River Mile and Depth: Fines

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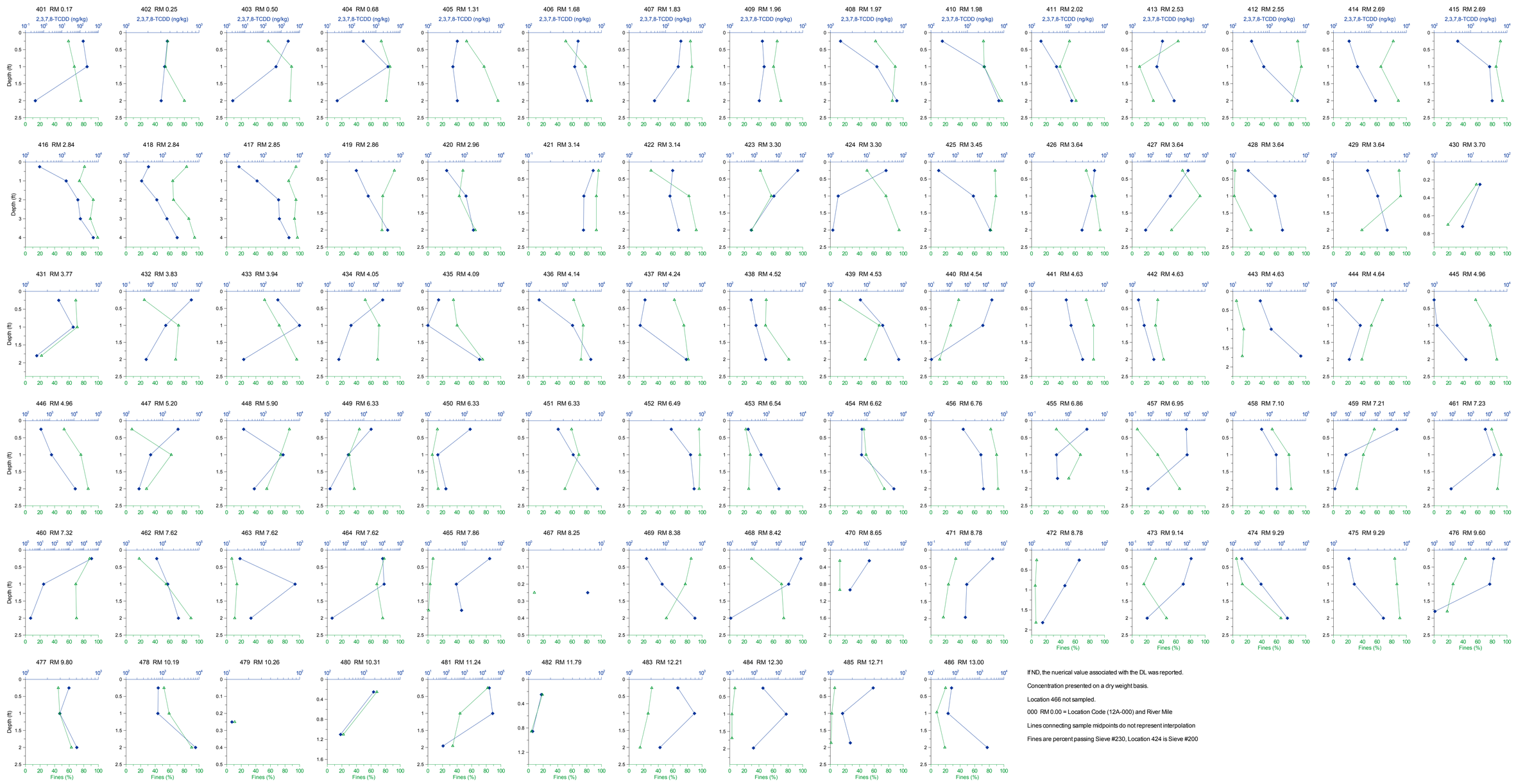
November 2014



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

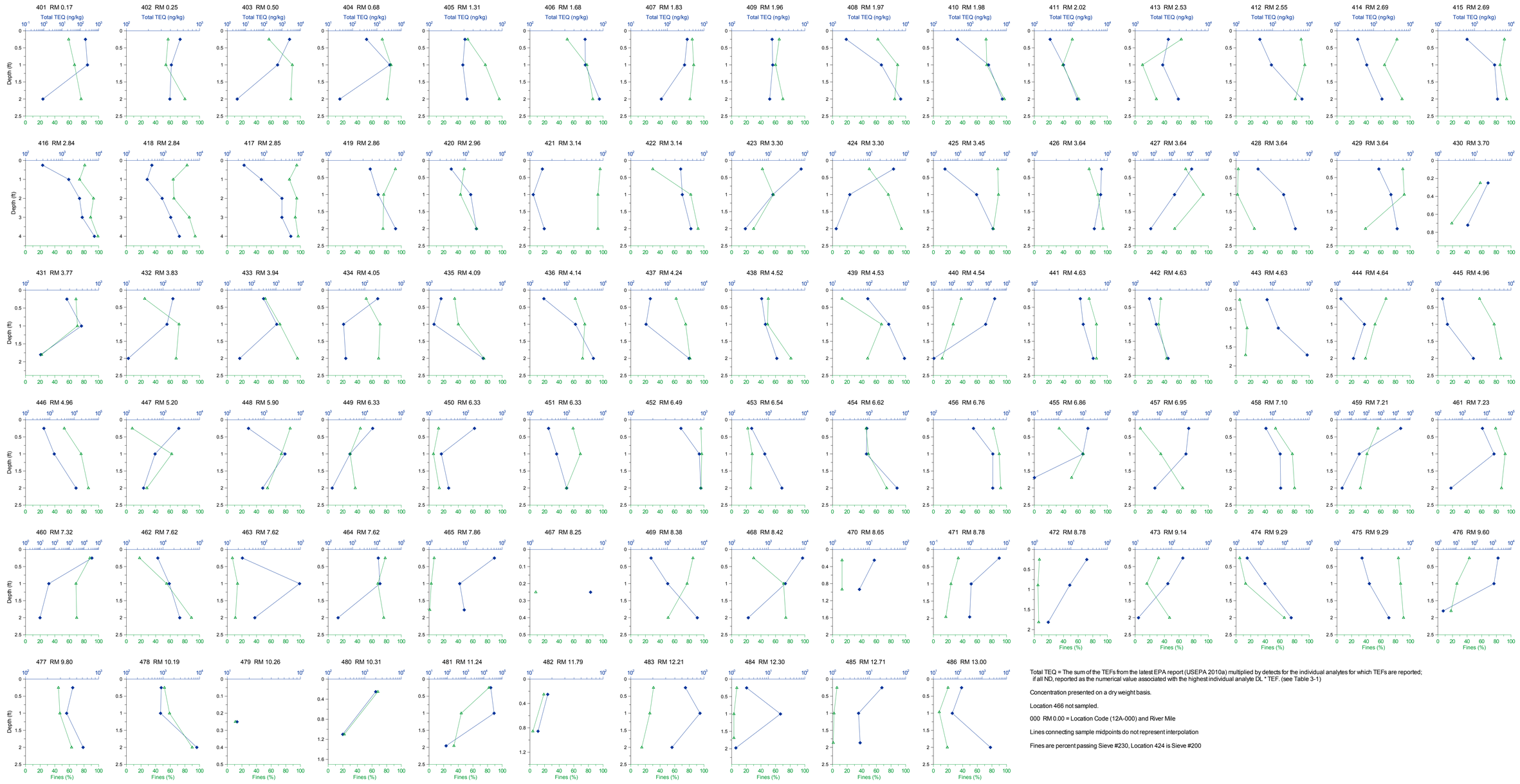
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.a
Depth Profiles of LRC SSP 2,3,7,8-TCDD with Fines

AECOM



Total TEQ = The sum of the TEFs from the latest EPA report (USEPA 2010a) multiplied by detects for the individual analytes for which TEFs are reported; if all ND, reported as the numerical value associated with the highest individual analyte DL * TEF. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

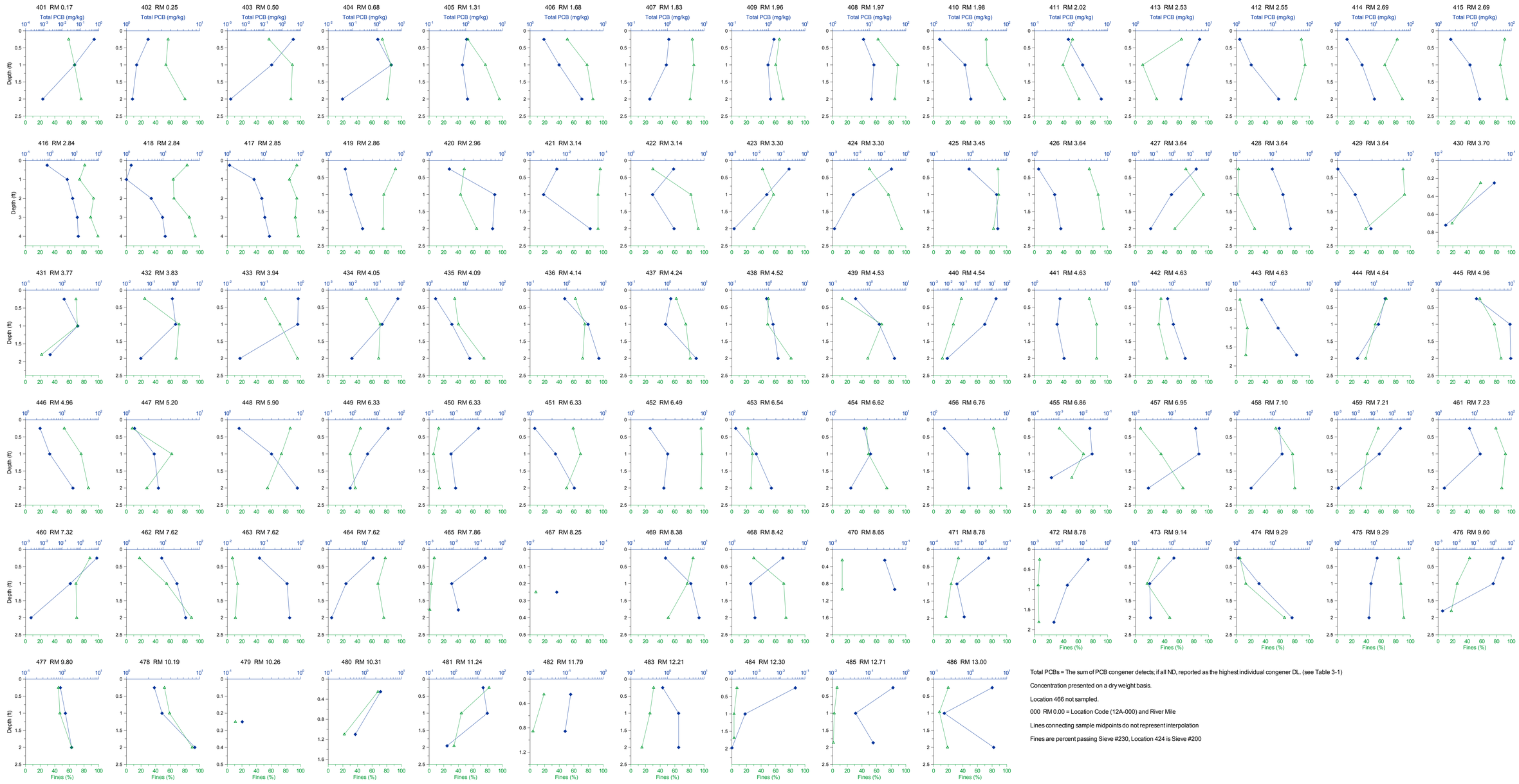
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.b
Depth Profiles of LRC SSP Total TEQ with Fines

AECOM



Total PCBs = The sum of PCB congener detects; if all ND, reported as the highest individual congener DL. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

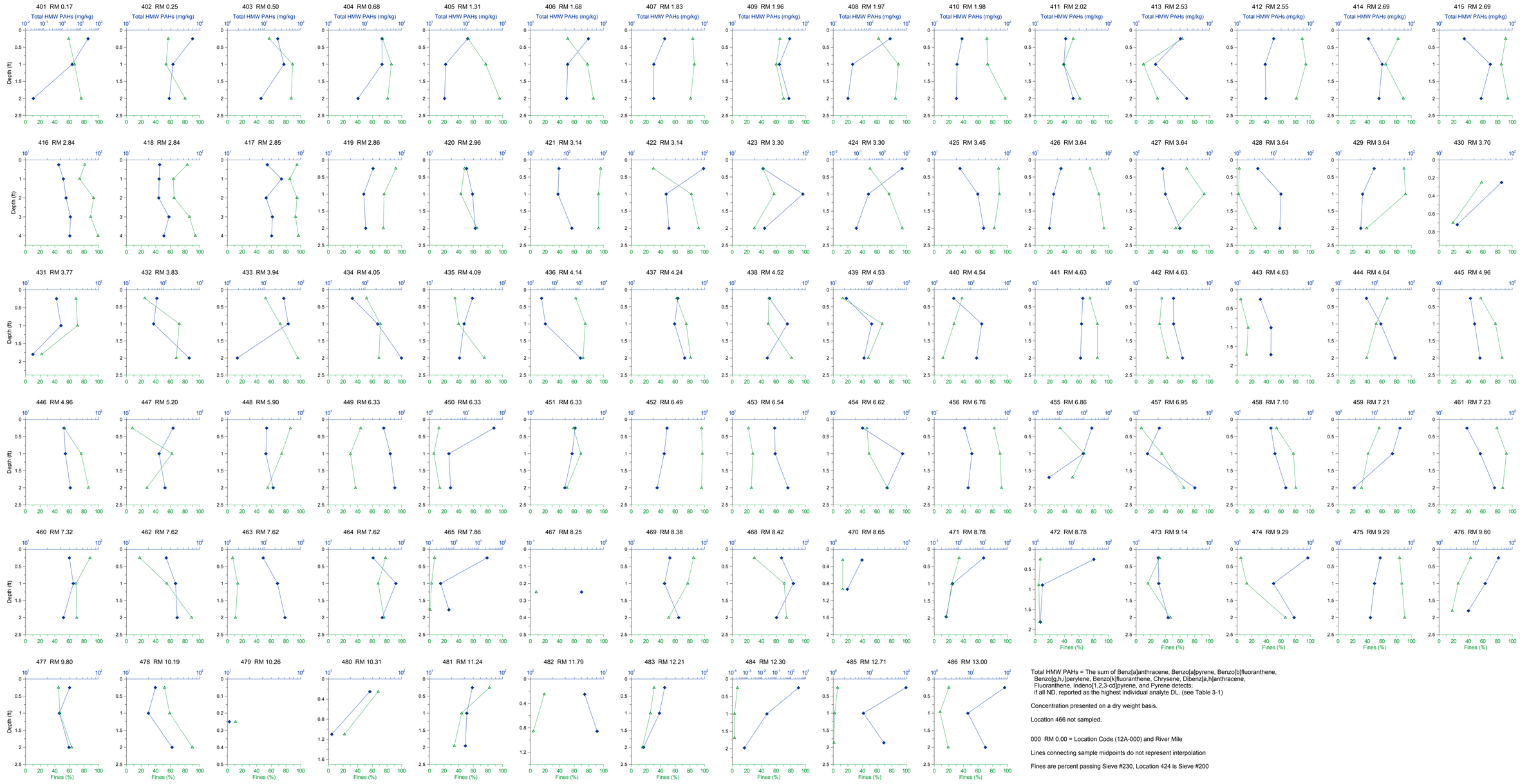
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.c
Depth Profiles of LRC SSP Total PCB with Fines

AECOM



Total HMW PAHs = The sum of Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, and Pyrene detects; if all ND, reported as the highest individual analyte DL. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

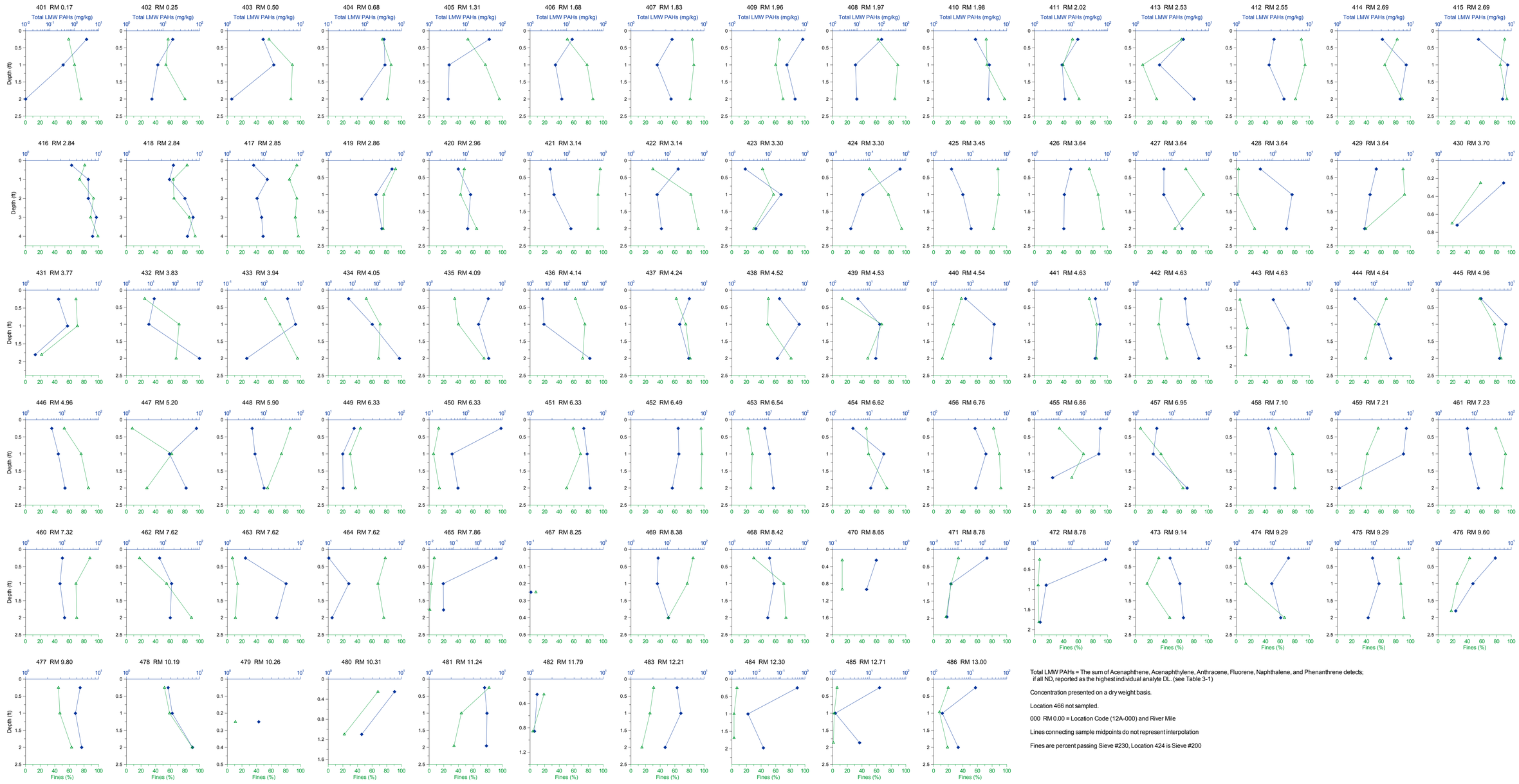
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.d
Depth Profiles of LRC SSP Total HMW PAHs with Fines

AECOM



Total LMW PAHs = The sum of Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene detects; if all ND, reported as the highest individual analyte DL. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

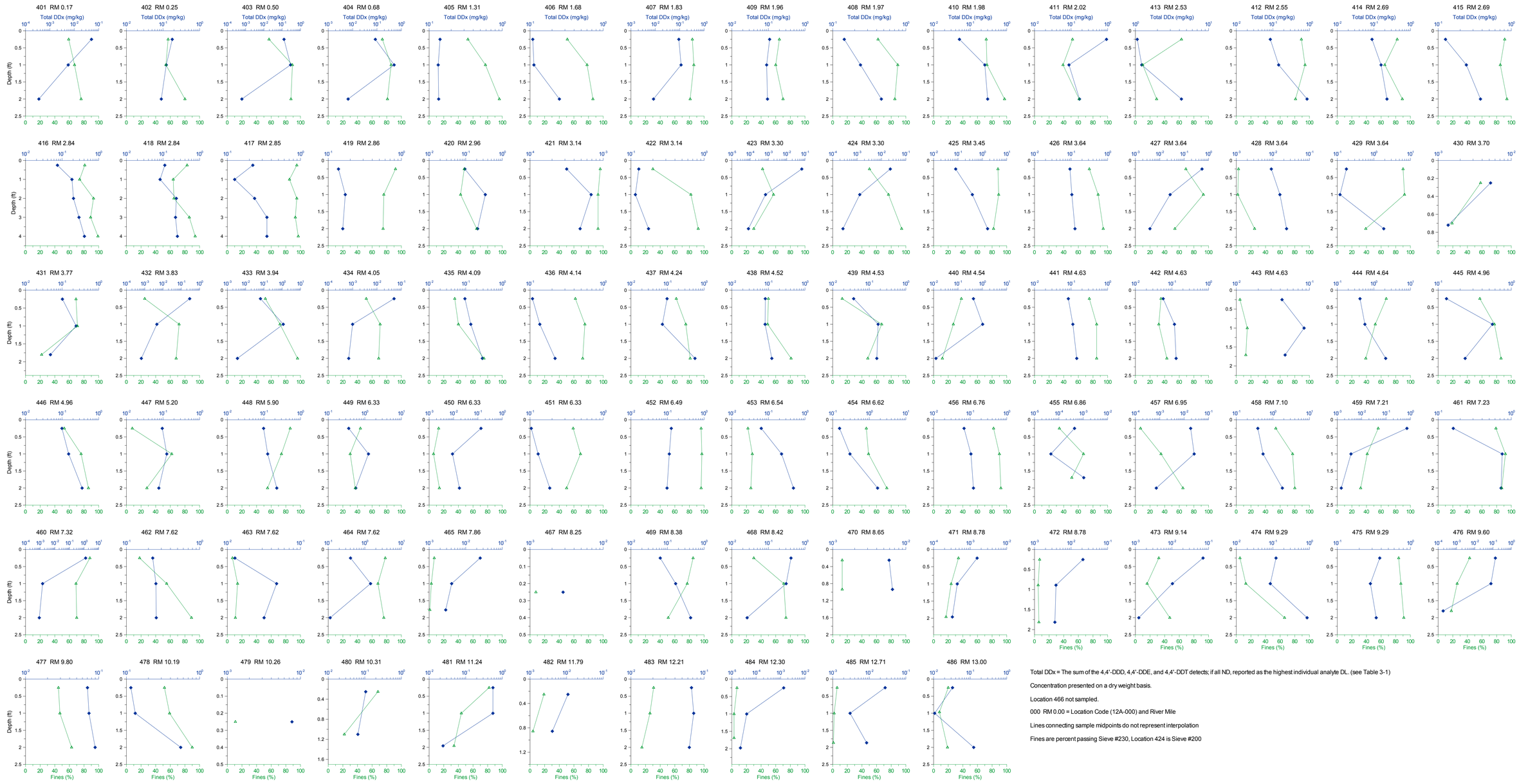
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.e
Depth Profiles of LRC SSP Total LMW PAHs with Fines

AECOM



Total DDx = The sum of the 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT detects; if all ND, reported as the highest individual analyte DL. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

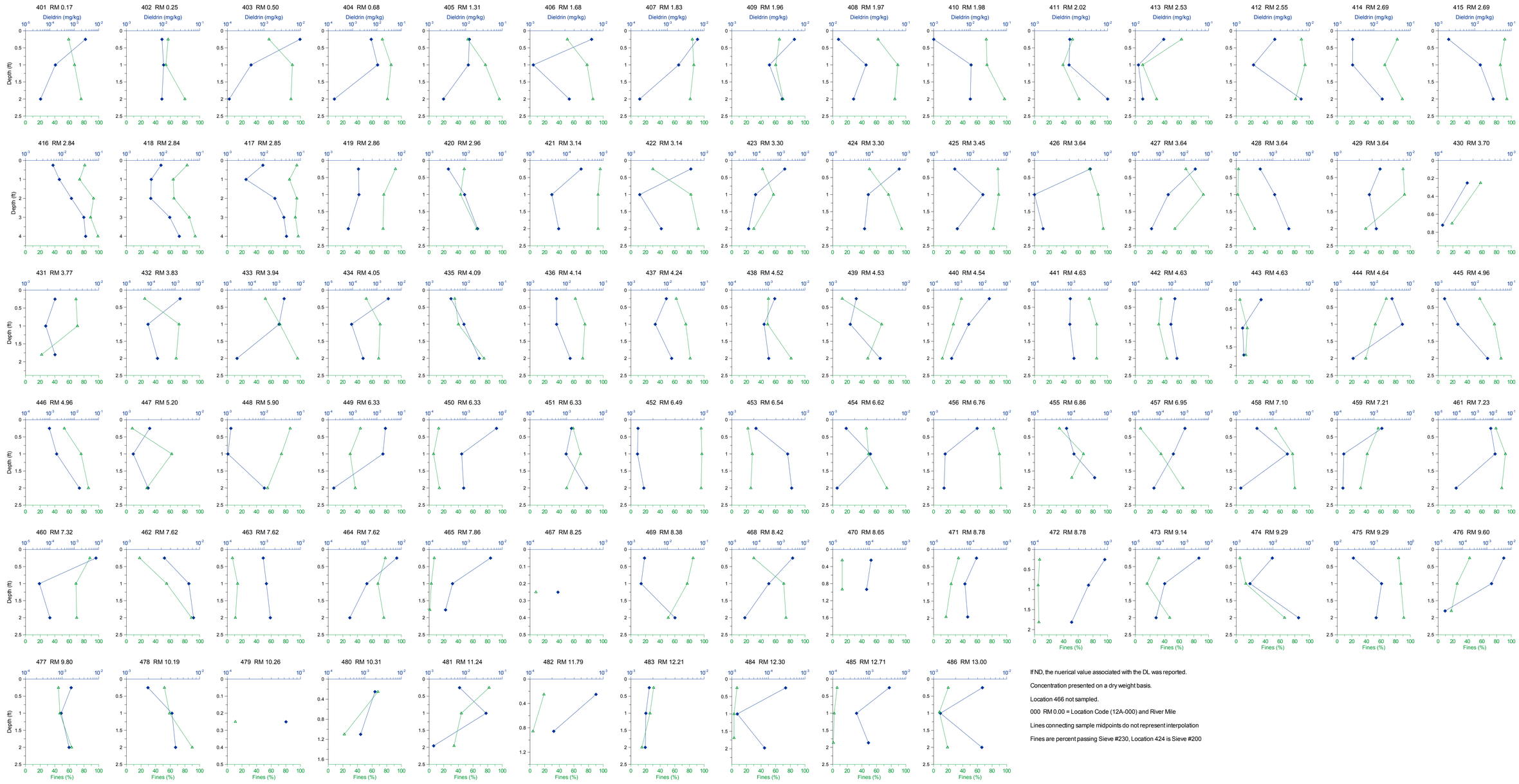
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.f
Depth Profiles of LRC SSP Total DDx with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

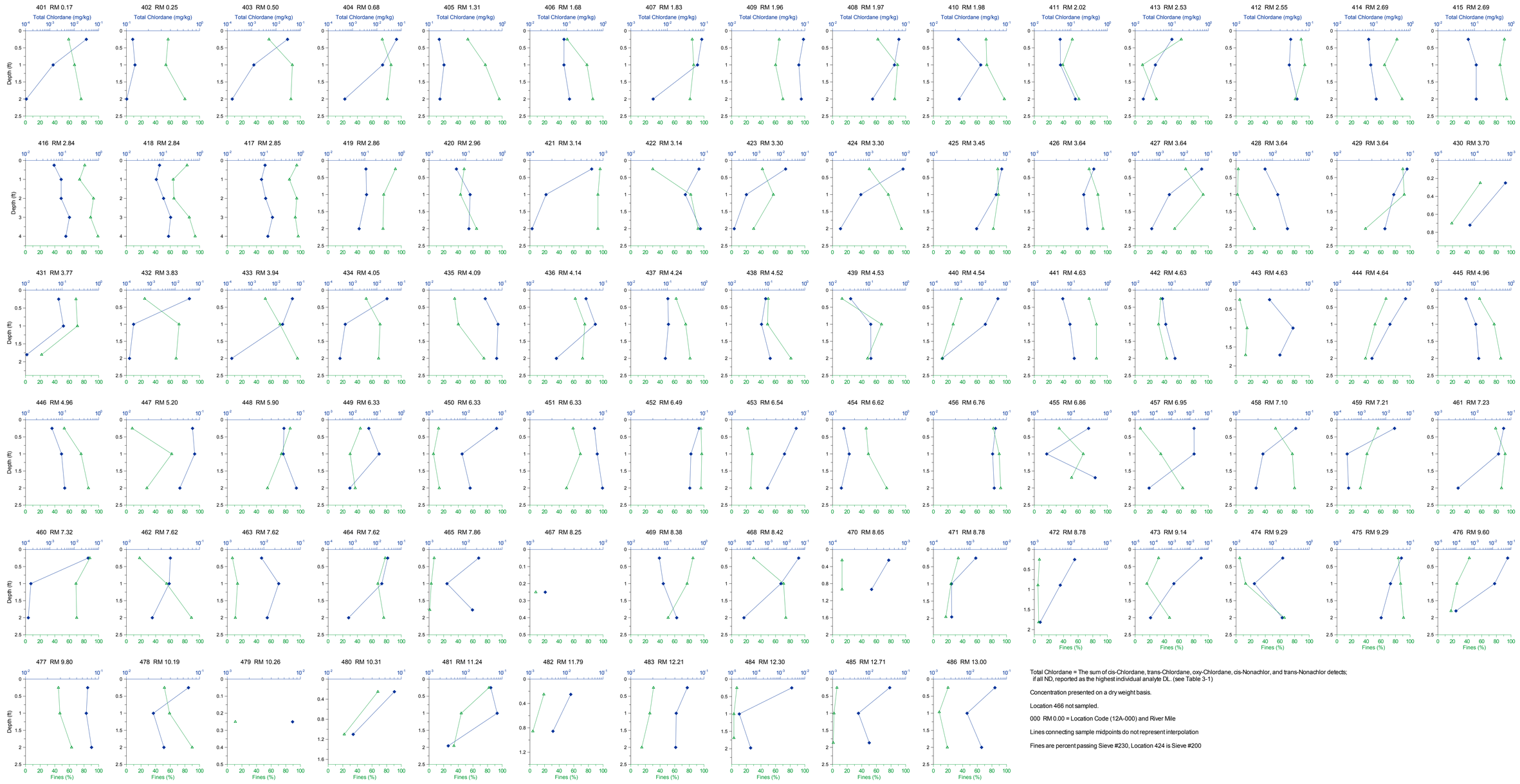
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.g
Depth Profiles of LRC SSP Dieldrin with Fines

AECOM



Total Chlordane = The sum of cis-Chlordane, trans-Chlordane, oxy-Chlordane, cis-Nonachlor, and trans-Nonachlor detects; if all ND, reported as the highest individual analyte DL. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

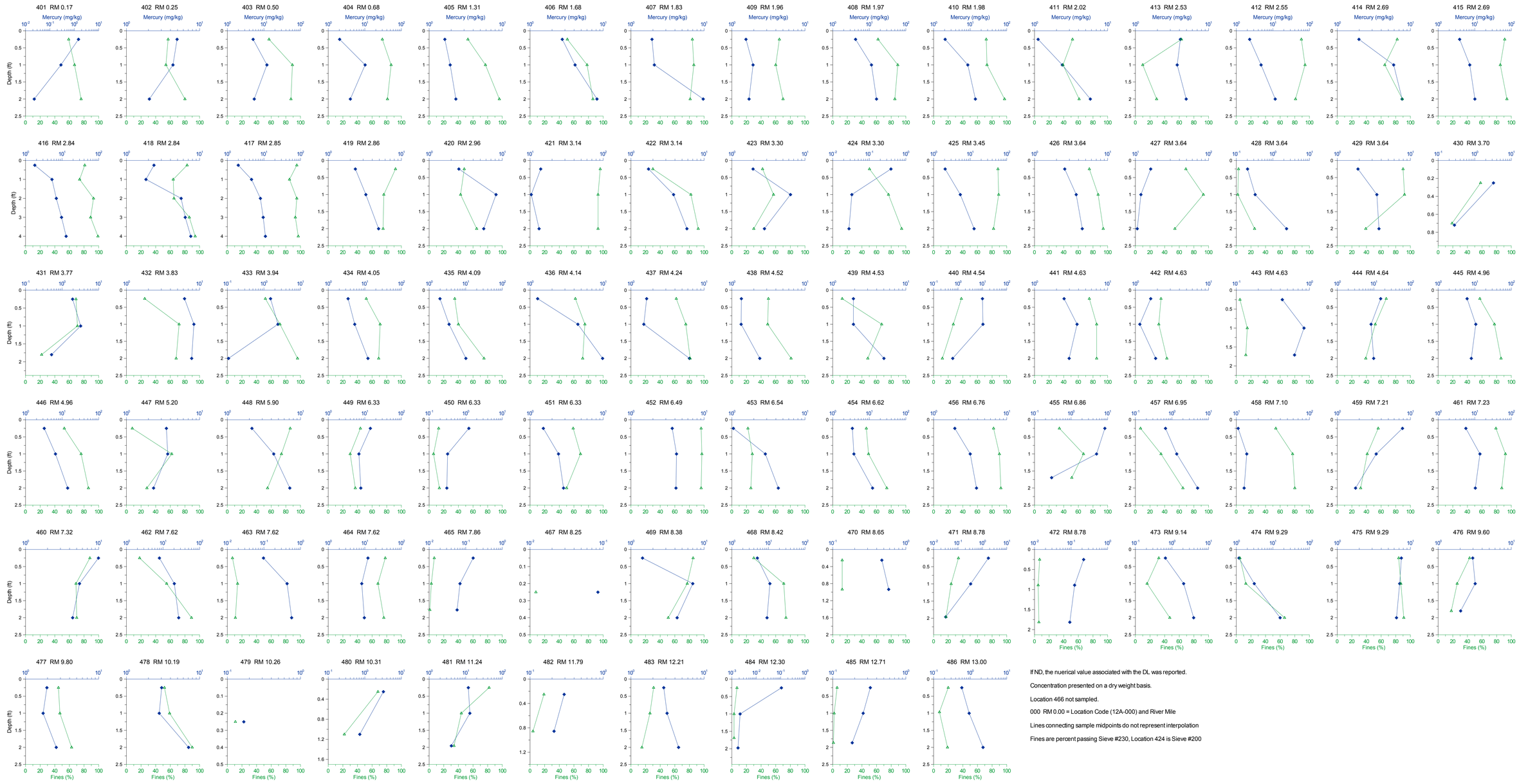
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.h
Depth Profiles of LRC SSP Total Chlordane with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

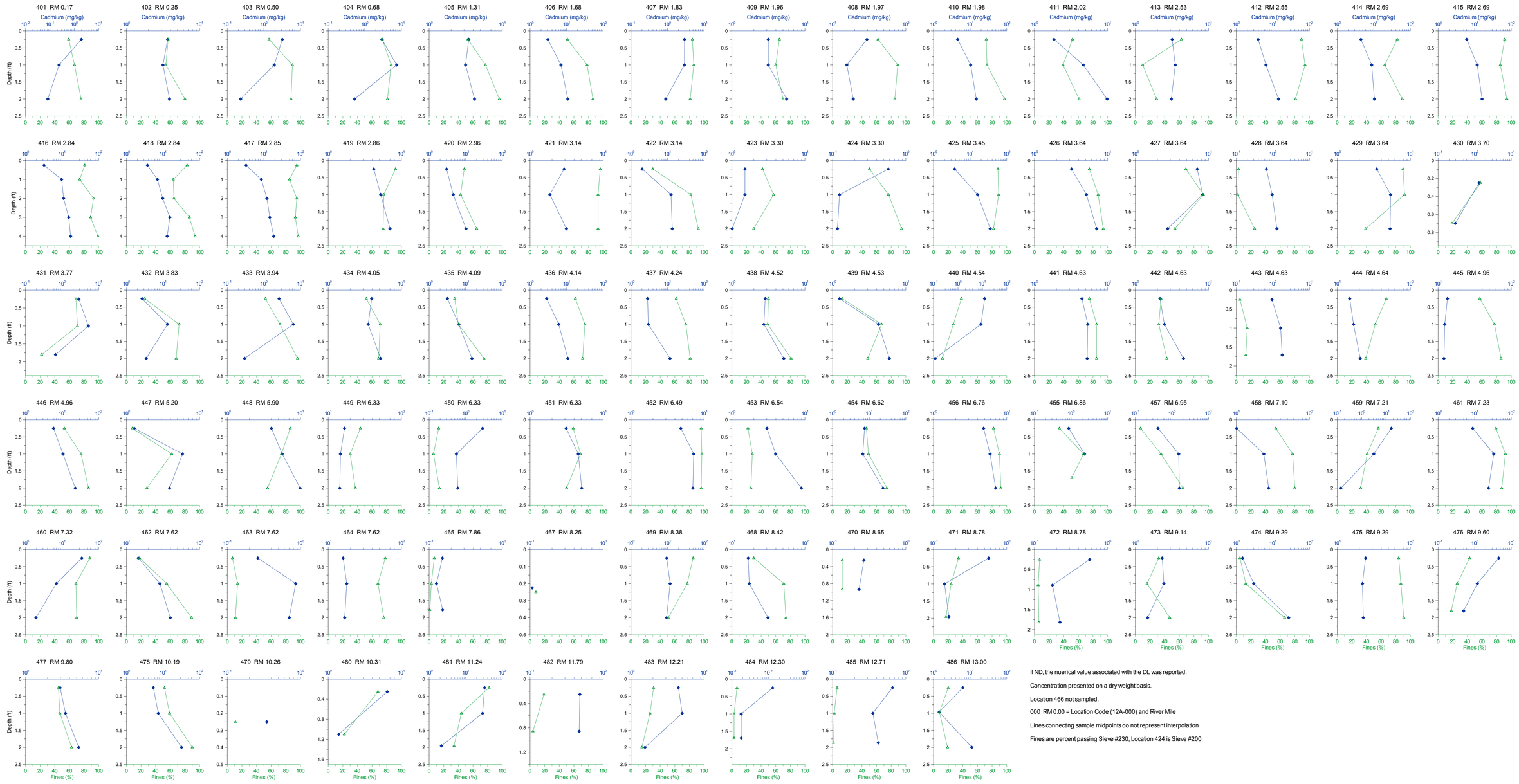
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.i
Depth Profiles of LRC SSP Mercury with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

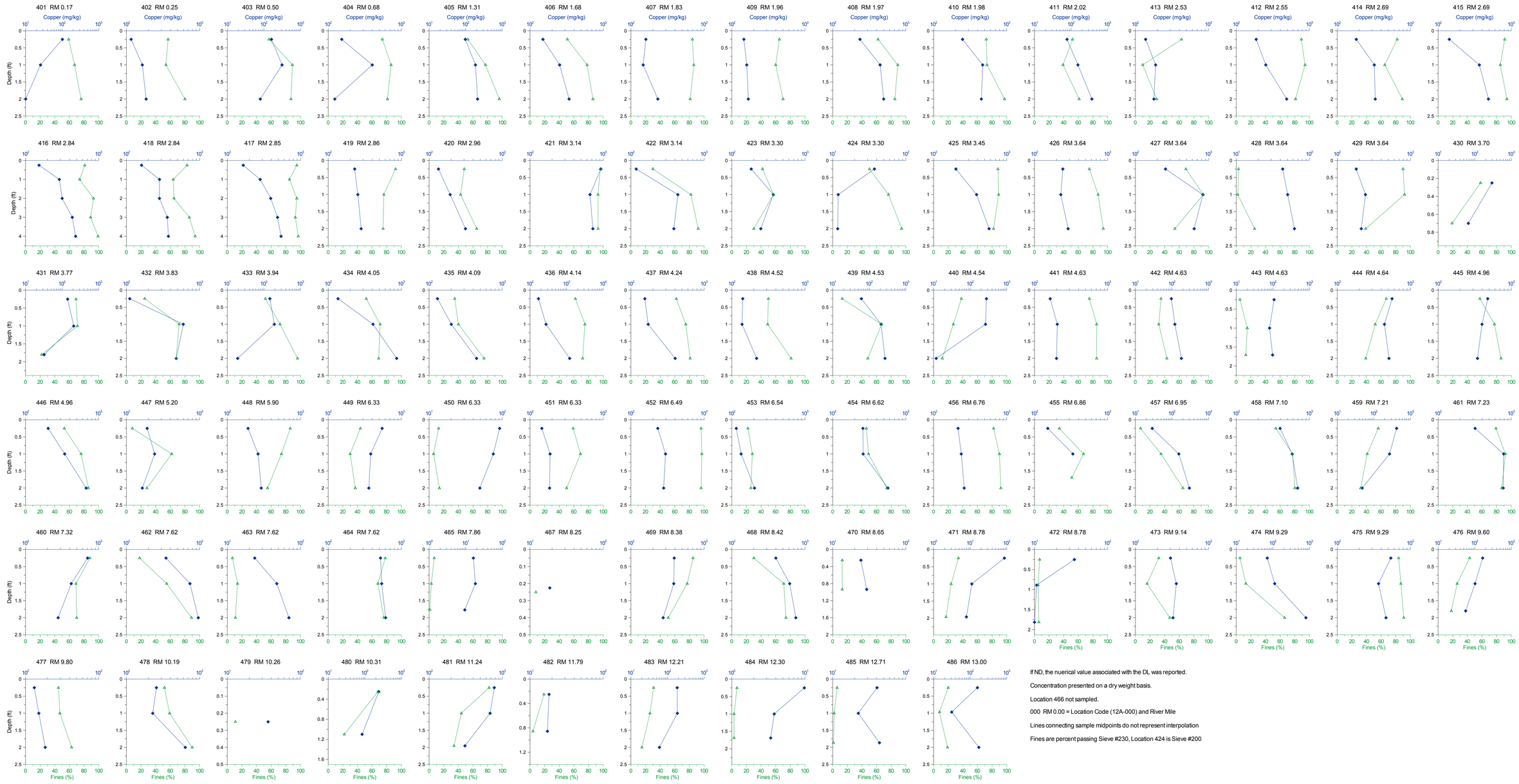
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.j
Depth Profiles of LRC SSP Cadmium with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

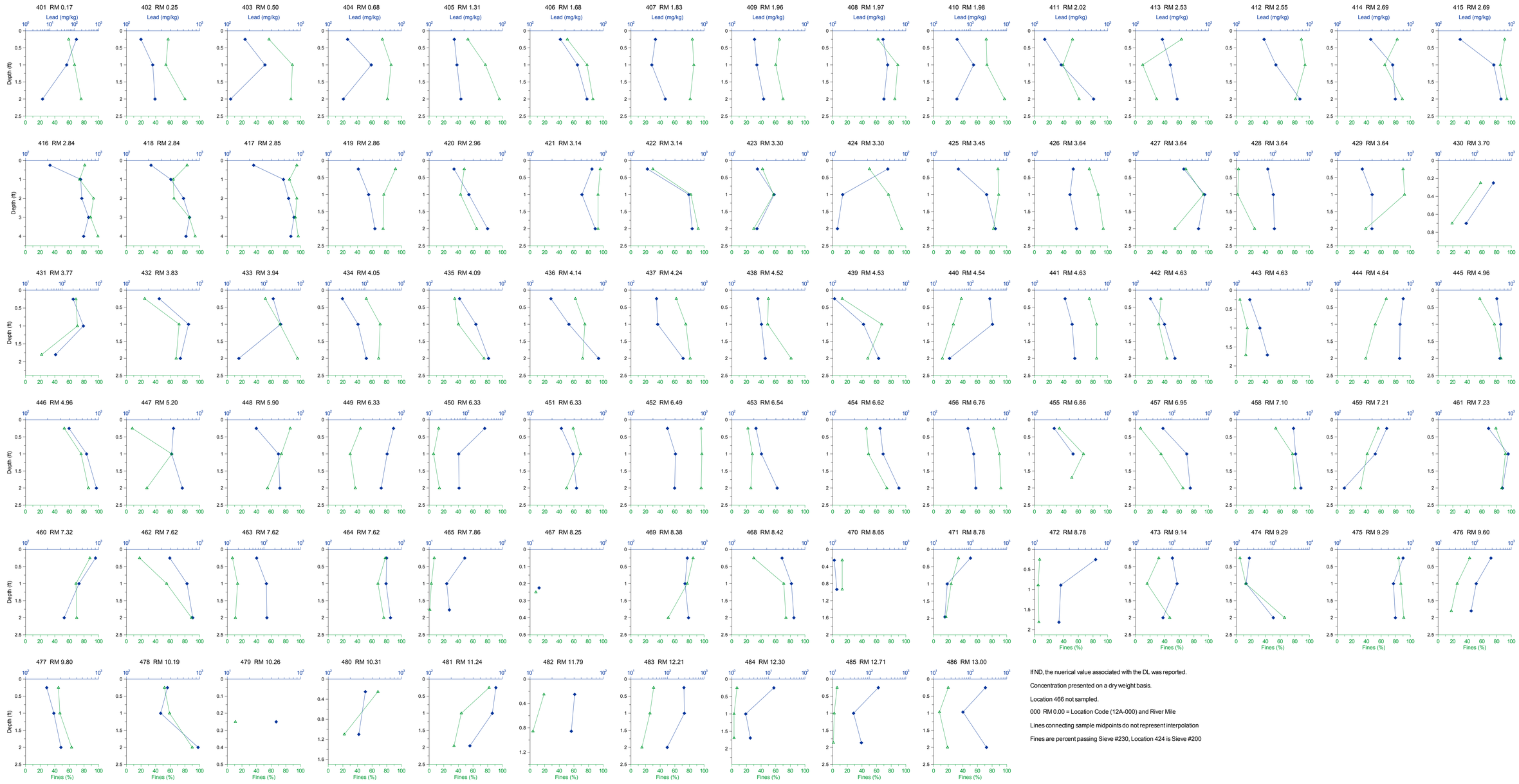
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.k
Depth Profiles of LRC SSP Copper with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

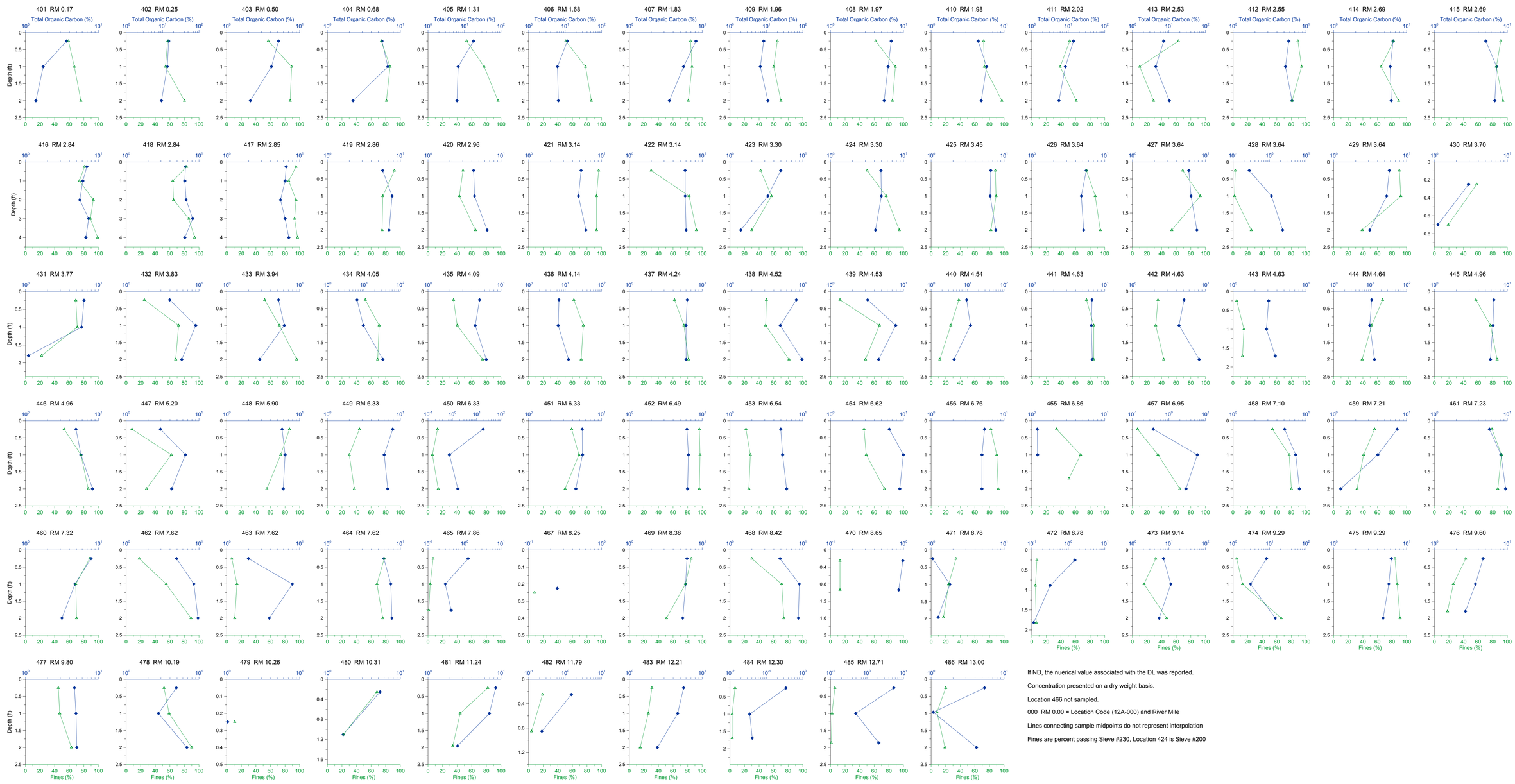
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.l
Depth Profiles of LRC SSP Lead with Fines

AECOM



If ND, the nuerical value associated with the DL was reported.

Concentration presented on a dry weight basis.

Location 466 not sampled.

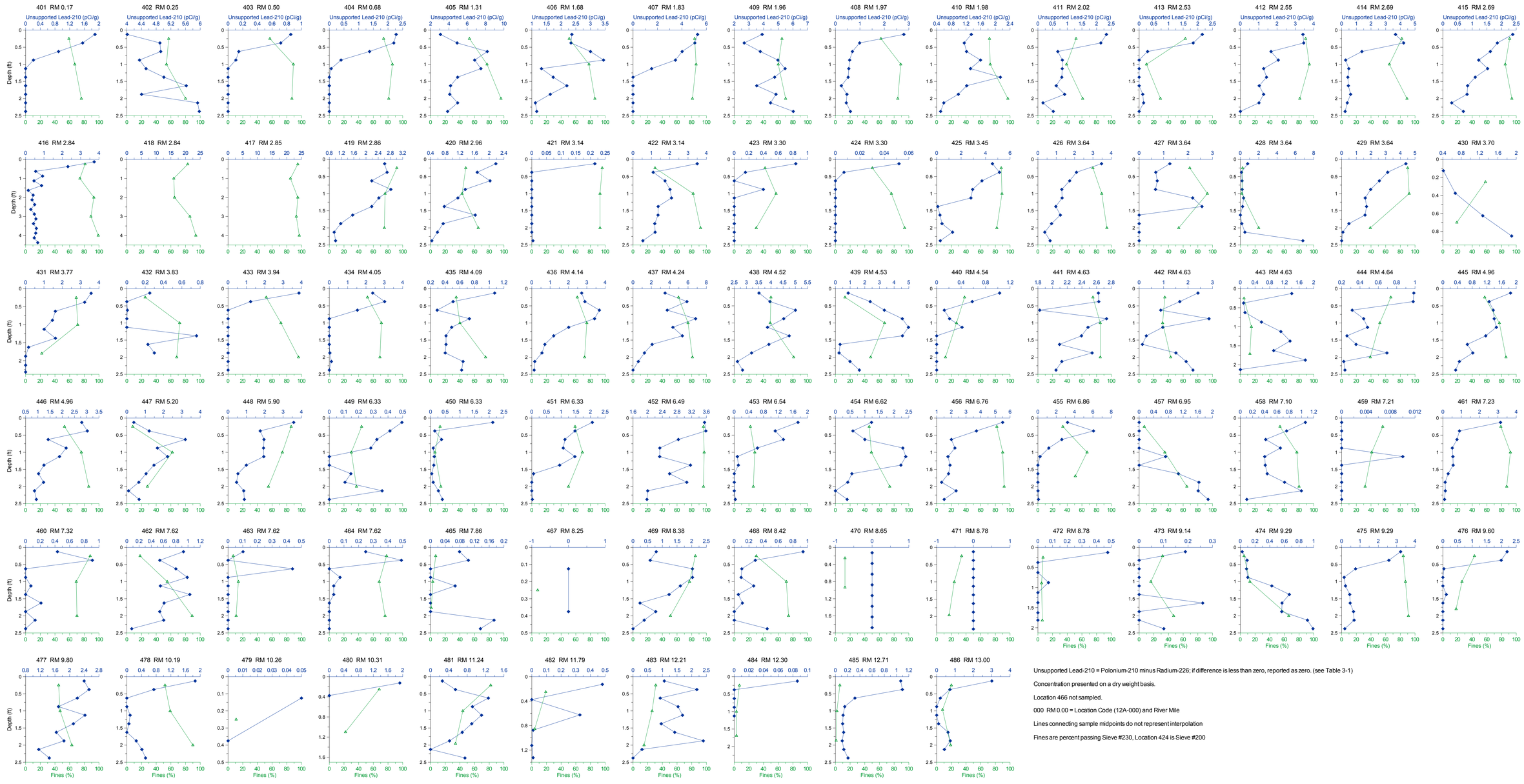
000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.m
Depth Profiles of LRC SSP TOC with Fines

AECOM



Unsupported Lead-210 = Polonium-210 minus Radium-226; if difference is less than zero, reported as zero. (see Table 3-1)

Concentration presented on a dry weight basis.

Location 466 not sampled.

000 RM 0.00 = Location Code (12A-000) and River Mile

Lines connecting sample midpoints do not represent interpolation

Fines are percent passing Sieve #230, Location 424 is Sieve #200

Figure 3-5.n
Depth Profiles of LRC SSP Unsupported Lead-210 with Fines

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4.0 Data Usability

The DQOs developed for the LRC SSP program are presented in LRC SSP QAPP (AECOM 2012a) and are summarized in Section 1.0 of this report. These DQOs establish the level of data quality that was considered necessary to support the objectives of the study. This section describes the data usability assessment that was performed to verify the quality of the data generated during the LRC SSP program and to evaluate its acceptability for use in site decisions.

The data usability assessment was based primarily on the results of the data validation process described in Section 2.8.2. The validation process consisted of two steps: verification of adherence to program specifications (QAPP, analytical methods, contractual documents) and an evaluation of the quality of the data in terms of precision, accuracy, representativeness, comparability, and completeness. These elements (precision, accuracy, representativeness, comparability, and completeness), referred to as data quality indicators (DQIs), were assessed by comparing the sample results generated during the LRC SSP program to pre-established standards or criteria documented in the LRC SSP QAPP.

During validation data associated with minor deviations from established criteria were considered acceptable and appropriate for use, and were flagged with a qualifier (for example, with a “J” as estimated); Region 2 data validation guidance does not provide a mechanism for assigning bias. No major deviations from project criteria requiring rejection of data were reported during the data validation process. Decisions as to the acceptance or rejection of data were based on USEPA Region 2 validation guidance where available; in the absence of Region 2 guidance, professional judgment was used.

In addition to the data validation process the data usability assessment was based on the results of in-program PE sample analytical results. PE samples of known concentration for: PCDD/PCDFs, PCBs (homologs and congeners), PAHs, and organochlorine pesticides were analyzed at a rate of 1 PE sample per 20 field samples.

This section of the report is separated into three subsections: Section 4.1 discusses overall data usability of the sediment sample results. Section 4.2 presents the DQIs of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Section 4.3 discusses the results of the in-program PE analyses.

Note that the data usability evaluation focuses on the sediment sample and field duplicate results and does not include the aqueous QC samples (equipment rinsate blanks). Qualifications of the aqueous QC samples are discussed in the DVRs. Data for the QC samples, including any qualifiers that were applied, are presented in **Appendix J**.

4.1 Data Usability

Of the 123,676 reportable sediment data points generated during the LRC SSP, 100 percent of the total number are valid and acceptable for assessment purposes; no data points were rejected during the validation process. Forty-four percent of the valid data were accepted as reported by the laboratory, with no further qualification required; 56 percent of the valid data were qualified during the validation process. The most common reason for qualification was low percent solids (approximately 44 percent of the data was qualified during validation solely on the basis of percent solids). Qualification of this data as “estimated” is required under USEPA Region 2 validation rules when solid samples contain less than 50 percent solids, and rejection of data is required if a sample contains less than 10 percent solids. This USEPA Region 2 validation convention is based on the recognition that it may be difficult for both the sampler and the analyst to take a subsample that is truly representative of semisolid material. In addition, high levels of moisture can cause matrix interferences for many of the organic analytical techniques. Sediment samples, particularly surface samples, were expected to contain elevated levels

of moisture. Therefore, sampling procedures (AECOM 2012a) were designed to minimize the sample moisture content while maintaining the representativeness of the sample.

In addition to low percent solids, quantitation and calibration were frequently cited as the basis for data qualification; these qualifiers were primarily related to EMPCs and values which had been flagged as "E" by the laboratory since they were reported above the calibration range. Reporting of data above the calibration range was permitted for selected analyses if the laboratory was already using the minimum permitted sample size of 1 g for PCB congeners (5 g for PCDD/PCDFs s) and detector saturation did not occur.

4.2 Data Quality Indicators

The following sections discuss each of the data quality indicators.

4.2.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions and includes both field and analytical components. Overall, 98.8 percent of the data were usable without qualification based on precision criteria described in Worksheet #28 of the LRC SSP QAPP (AECOM 2012a). Data that did not meet the criteria were qualified. Field precision was assessed through the collection and measurement of field duplicates and expressed as the relative percent difference (RPD) of the sample and field duplicate results. Field duplicates were collected from the same bowl of homogenized sediment and placed into a duplicate set of storage jars. Field duplicates were collected at a frequency that met or exceeded the program goals established in the LRC SSP QAPP (AECOM 2012a).

Field duplicate RPD results were primary triggers for the application of validation qualifiers to selected data generated for AVS/SEM, TOC, PCDD/PCDFs, TAL metals, sulfide, PAHs, and PCB congeners; a detailed discussion of field duplicate results is contained in the individual DVRs provided in **Appendix H**. Less than 0.5 percent of all reportable sediment results were qualified as estimated on the basis of field duplicate results.

Laboratory precision was assessed through the RPD results for matrix duplicates, LCS/laboratory control sample duplicates (LCSD) pairs, and MS/MSD pairs. Matrix duplicates and MS/MSD pairs do not reflect laboratory precision as effectively as LCS/LCSD pairs since sample heterogeneity may impact both matrix duplicate and MS/MSD precision. However, it should be noted that for the LRC SSP data, no differentiation is made between RPD exceedances for matrix duplicates, LCS/LCSD, or MS/MSD precision. The percent of all reportable sediment results that was qualified as estimated on the basis of laboratory duplicate RPDs was 0.62 percent; no data were rejected. The analyses for which laboratory duplicate RPD results (either LCS/LCSD, laboratory duplicates, or MS/MSD) caused the application of validation qualifiers are presented in the individual DVRs provided in **Appendix H**.

The butyltin method that employed dual column analysis also provides an indication of precision; 11.7 percent of the data generated by this method (less than 0.1% of the total data set) was qualified as estimated (J) based on validation criteria for dual column precision.

Overall, the program precision objectives (AECOM 2012a) were achieved. Approximately 1.2 percent of the reportable data points generated were qualified for reasons related to either field or laboratory precision, but these data points are considered valid and acceptable for use.

4.2.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. Overall, 99.76 percent of the results were considered acceptable and usable without qualification

following comparison to program accuracy criteria (AECOM 2012a). Data that did not meet the criteria defined in QAPP worksheets were qualified. No data were rejected based on accuracy.

Laboratory accuracy was assessed using the recoveries of positive control samples (i.e., MS/MSD, LCS/LCSD, and surrogate spikes). **Table 4-1** shows that 0.02 percent of the total reportable sediment results was qualified as estimated for LCS/LCSD nonconformance; these data are considered acceptable for use. As shown in **Table 4-1**, 0.22 percent of data points were qualified as estimated for MS/MSD recovery nonconformance. Surrogates are applicable to organic analysis only. The percent of results qualified as estimated due to surrogate recovery was 0.002 percent (**Table 4-1**). Surrogate and MS recovery issues, unlike LCS recoveries, can be indicative of extraction difficulties or interferences from the sample matrix.

Additional measures of accuracy and frequency of qualification are shown in **Table 4-1**.

Accuracy also was indirectly addressed via the negative control samples for field activities (i.e., equipment rinsate blanks), as well as laboratory negative control samples, such as method blanks. Equipment blanks were collected weekly. The percentages of results that were qualified due to associated laboratory or equipment blank contamination were 0.027 percent and 0.019 percent, respectively. Overall, the program accuracy objectives (AECOM 2012a) were achieved. All data are valid and acceptable for use.

4.2.3 Representativeness

Representativeness is a qualitative and quantitative measure of the degree to which data suitably represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Aspects of representativeness addressed during validation included the review of sample collection information in the COC documentation, conformity of laboratory analyses to the LRC SSP QAPP, adherence of the documented laboratory procedures to method requirements, and completeness of the laboratory data packages. Most of the issues identified during this evaluation did not result in the qualification of laboratory data but did involve resubmittals of data by the laboratories to correct problems that were discovered during the validation process. All of these issues were resolved. Other aspects of data representativeness, such as adherence to recommended holding times, instrument calibration requirements, as well as field and laboratory precision assessments, are discussed in the individual DVRs contained in **Appendix H**.

The need to utilize small sample aliquot sizes for certain analyses to avoid reporting results over the highest calibration standard may have impacted the analyst's ability to obtain a representative sample aliquot in some instances. For the isotope dilution PAH, PCB congeners, and pesticide analyses sample aliquots as small as 1 gram were required for some analyses to avoid calibration exceedances.

In accordance with the USEPA Region 2 validation guidance documents, samples that contained less than 50 percent solids were qualified as estimated. This requirement resulted in qualification of approximately 44 percent of the reportable sediment data during the LRC SSP. Note that radiochemistry and TOC results were not qualified on the basis of percent solids since those analyses included a drying step. USEPA Region 2 validation guidance requires rejection of non-detect results if percent solids is less than 10 percent; no data points were rejected on the basis of this criterion.

4.2.4 Comparability

Comparability is a qualitative expression of the measure of confidence that two or more data sets may contribute to a common analysis and interpretation. Comparability of data within the investigation was maximized by using standard methods for sampling and analysis, reporting of data, and data validation. To the extent possible, analytical procedures and laboratories used in previous programs were used in order to ensure data comparability with previous sediment investigations. In general, standard Resource Conservation and Recovery Act program methods from SW-846 or other program-compliant method

compendia were employed for all analyses, with the exception of methods for which no SW-846 method exists (e.g., specialty analyses, some general chemistry, and radiochemical parameters). In these cases, alternate USEPA or other accepted methods were used. To eliminate interlaboratory variability, specific analytical methods were assigned to each laboratory for the duration of the project. The one exception to this procedure was grain size analysis. At one station the samples for grain size analysis was submitted to the back-up laboratory (PTS Laboratories, Inc.) (see Section 2.1.4). For these samples PTS used a different mesh size (#200 versus #230) than that used by the primary laboratory.

PAHs were analyzed as a subset of SVOCs by Method 8270C and by the HRGC/LRMS SIM isotope dilution method. PCBs were analyzed as congeners (USEPA Method 1668A). For both of these analyses, the HRMS and isotope dilution procedures offer greater sensitivity, improved accuracy, and enhanced compound identification.

Metals analyses were performed using either Inductively Coupled Plasma/Atomic Emission Spectrometry (ICP/AES) or ICP/MS, with the exception of mercury. Results from ICP/AES and ICP/MS are regarded as comparable by USEPA, although the ICP/MS is generally more sensitive.

4.2.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that were or should have been collected. Valid data are defined as all data points judged to be usable (i.e., not rejected as a result of the validation process).

Field completeness is defined as the percentage of samples actually collected versus those intended to be collected. The planned total number of samples to be submitted to the laboratories was 5,630 (AECOM 2012a). The actual number of samples processed and sent to laboratories was 5,242, or 93.1 percent. The goal stated in the LRC SSP QAPP was greater than 95 percent field completeness. Samples could not be collected at all target locations and all target depths. Detailed information on sampling completeness and non-conformances is provided in Section 2.4.

Laboratory completeness is defined as the percentage of valid data points versus the total expected from the laboratory analyses. Valid data points are those that have not been rejected during the validation process. The objective for this project was greater than 90 percent laboratory completeness (AECOM 2012a). Overall laboratory completeness was 100 percent (123,676 valid and acceptable results out of 123,676 total reportable sediment results).

4.2.6 Sensitivity

Sensitivity is the ability of a method or instrument to discriminate between measurement responses representing varying levels of the analyte of interest; in particular, the capability of measuring a constituent at low levels. For the USEPA methods employed in this project, sensitivity was measured by the Method Detection Limit (MDL) (or estimated detection limit [EDL] for isotope dilution methods) and Quantitation Limit (QL). Both nominal MDLs and QLs were provided by the analytical laboratories in their analytical report and were verified during validation. All RLs, both MDL (or EDL) and QL, were corrected by the laboratory for sample-specific factors, such as exact aliquot size, dry weight for soils, and dilutions. The laboratories were instructed to report estimated (J) results if concentrations were above the MDL/EDL but below the QL.

In general, the methods selected were sufficiently sensitive to meet the project DQLs (AECOM 2012a). Those methods that could not meet the project DQLs were identified in the LRC SSP QAPP (AECOM 2012a). During validation, the actual laboratory QLs also were compared to the achievable laboratory limits shown in the LRC SSP QAPP (AECOM 2012a). Results for selected analytes in some samples did not meet the QL goals listed in the LRC SSP QAPP (AECOM 2012a) due to sample specific matrix issues, primarily the need for sample dilution to overcome elevated background interferences. A

detailed discussion of quantitation issues is provided in the individual DVRs contained in **Appendix H** as well as the laboratory report narratives.

4.2.7 Rejected Data

Of the 123,676 individual data points generated during the LRC SSP site characterization, 123,676 (or 100 percent) are valid and usable. Data limitations identified during the validation process were identified using data qualifiers applied by the validator. Issues identified during validation have been summarized here. Specific details regarding selected analytes or locations are provided in the individual DVRs provided in **Appendix H**. No data were rejected based on these data quality indicators and all data points judged to be usable.

4.3 In-Program PE Analytical Results

In addition to evaluation of PE data performed by the laboratories as part of their routine participation in USEPA Water Supply (WS) and Water Pollution (WP) certification programs, laboratories performing analysis for PCDD/PCDFs, PCBs (homologs and congeners), PAHs, and organochlorine pesticides analyzed known PE samples, which are not blind, submitted with sample shipments at a rate of 1 PE sample per 20 field samples. The results of these PE samples are presented in this section.

All PAH in-program PE results were within the vendor acceptance range. Of a total of 260 PCDD/PCDF PE results, 3 (1.2 percent) were outside of the vendor acceptance range. OCDD was reported above the acceptance range in 3 of the 13 PE samples. Of a total of 208 PCB congener PE results, 24 (12 percent) were outside of the vendor acceptance range. PCB 81 was reported above the acceptance range in 12 of the 13 PE samples; PCB 118 was reported above the acceptance range in 6 of the 13 PE samples; and PCB 156/157 was reported above the acceptance range in 6 of the 13 PE samples. Of a total of 260 pesticide PE results, 22 (8.5 percent) were outside of the vendor acceptance range. Endosulfan I was reported below the acceptance range in 11 of the 13 PE samples; Endosulfan II was reported below the acceptance range in 10 of the 13 PE samples; and Endrin Aldehyde was reported below the acceptance range in 1 PE sample.

Since the majority of the pesticide PE Endosulfan I and Endosulfan II were below the acceptance criteria, the laboratory, TestAmerica in West Sacramento, reviewed the pesticide PE sample raw data and associated data reduction, and confirmed the results. In addition, TestAmerica West Sacramento reviewed their internal QA pesticide PE results, which used the same vendor, Phenova (formerly Wibby Environmental, Inc.), and found that the Endosulfan I and Endosulfan II results were within acceptance criteria. Phenova was contacted and asked to review the Endosulfan I and Endosulfan II true values and acceptance limits for the LRC SSP pesticide PE samples, which were confirmed. AECOM and TestAmerica in West Sacramento initiated a comparability study in which the backup pesticide PE samples from the LRC SSP program along with a new pesticide PE samples from Phenova were analyzed by SW-846 Method 8081 and EPA Method 1699 for comparability. Based on the results of comparability study, it was determined that the low Endosulfan I and Endosulfan II recoveries in the PE samples were due to degradation of these compounds in the PE samples and not due to low bias in the analyses.

PE acceptance limits published by suppliers and used to evaluate the reported results are based on data from actual laboratory analyses but the data pool used to generate these statistics may be small or the analytical methods used for analysis may differ from those used in this program. Variations in PE sample concentration or degradation due to shelf life or storage conditions may not be detected immediately by the PE supplier; conversations with suppliers have indicated that certified values and acceptance limits may change over time as additional data become available. The results of the PE samples analyzed during the SSP indicate that the associated analyses are in control; these results should be used in conjunction with other method quality control results to interpret the bias of associated data for individual compounds.

Table 4-1
Data Qualification Based on Accuracy Indicators
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Accuracy Indicator	Data Qualified[1, 2]		Comments
	Affected Analyses	Percent	
LCS recovery	PAHs by HRGC/LRMS-SIM, PCB congeners	0.02	
MS Recovery	Butyltins, PCDDs/PCDFs, mercury, metals by 6010 and 6020, phosphorus, PCB congeners, PAHs by HRGC/LRMS-SIM, pesticides by HRGC/HRMS, TPH-extractables, and SVOCs	0.22	MS recovery issues, unlike LCS recoveries, can be indicative of extraction difficulties or interferences from the sample matrix.
Surrogate recovery	TPH-extractables	0.002	Surrogate recovery issues, unlike LCS recoveries, can be indicative of extraction difficulties or interferences from the sample matrix.
Calibration	Butyltins, PCB congeners, PCDDs/PCDFs, and SVOCs	2.3	The complexity of the sample matrix had a significant impact on continuing calibration results for certain analyses and required laboratories to recalibrate with greater frequency. Qualification of PCB congeners and PCDDs/PCDFs for both quantitation and calibration was related to data reported as EMPCs or flagged with an E by the laboratory due to results reported above the upper calibration standard.
Internal standard	SVOCs	0.58	High or low area counts.
EMPCs	PCDDs/PCDFs, PAHs by HRGC/LRMS-SIM, PCB congeners, and pesticides by HRGC/HRMS	3.1[3]	Qualified due to ion ratio, signal to noise ratio, or peak retention issue.
Quantitation	PCDDs/PCDFs, , PAHs by HRGC/LRMS-SIM, , PCB congeners, and pesticides by HRGC/HRMS	2.6	Qualification of PCB congeners and PCDDs/PCDFs for both quantitation and calibration was related to data reported as EMPCs or flagged with an E by the laboratory due to results reported above the upper calibration standard.

Table 4-1
Data Qualification Based on Accuracy Indicators (Continued)
Low Resolution Coring Supplemental Sampling Program
Lower Passaic River Restoration Project

Accuracy Indicator	Data Qualified[1, 2]		Comments
	Affected Analyses	Percent	
Holding time	CN and TKN	0.001	Holding time deviations resulted in some cases from the need to reanalyze samples.
Ether interference	PCDD/PCDFs	0.0024	
Sample result uncertainty	Radiochemistry (Pb-210and Ra-226)	0.023	
Serial dilution	Metals by 6010 and 6020	0.62	Serial dilution results that differ by more than 10 percent can indicate that an interference to a particular element is present and is being reduced through the dilution.
ICS results	Metals by 6010 and 6020	0.88	The potential may exist for interference from other sample constituents.

[1] Based on total number of reportable sediment results.
[2] Includes the application of all qualifiers in Table 2-9 no data were rejected.
[3] This percentage includes data qualified for quantitation and calibration issues identified during validation.

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Appendix A

Sample Summary Table

Appendix A1

Sediment Samples

Appendix A2

Field Quality Control Samples

Appendix B

Tide Gauge Data and Water Level Record

Appendix C

Hazardous and Non-hazardous Shipping Documents and Analytical Data from Investigation Derived Waste

Appendix D

Field Records

Appendix E

Lithology Core Records

Appendix F

Core and Grab Photos

Appendix G

Performance Evaluation Sample Results

Appendix H

Data Validation Reports

Appendix I

Sediment Sample Results Summary

Appendix J

Equipment Blank Results Summary