LOWER PASSAIC RIVER RESTORATION PROJECT

LOWER PASSAIC RIVER STUDY AREA RI/FS

BACKGROUND TISSUE ADDENDUM TO THE QUALITY ASSURANCE PROJECT PLAN

FISH AND DECAPOD CRUSTACEAN TISSUE COLLECTION FOR CHEMICAL ANALYSIS AND FISH COMMUNITY SURVEY

DRAFT

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Acronyms

95% UCL	95% upper confidence limit on the mean
BERA	baseline ecological risk assessment
BRL	Ballistic Research Laboratory
CARP	Contaminant Assessment and Reduction Program
CA	corrective action
CAS	Columbia Analytical Services, Inc.
CCC	continuing calibration criteria
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
CPG	Cooperating Parties Group
CSO	combined sewer overflow
ddms	de maximis Data Management Solutions, Inc.
DL	detection limit
EDD	electronic data deliverable
ERA	ecological risk assessment
FC	field coordinator
FFS	focused feasibility study
FSP2	field sampling plan, Vol. II
GPS	global positioning system
GC/MS	gas chromatograph/mass spectrometer
HHRA	human health risk assessment
HP	Hewlett Packard
HRGC	high-resolution gas chromatography
HRMS	high-resolution mass spectrometry
HSP	health and safety plan
ICAL	initial calibration
ICP	inductively coupled plasma
ICV	initial calibration verification
ID	identification

LPR	Lower Passaic River
LPRSA	Lower Passaic River Study Area
MD	matrix duplicate
MEDD	multimedia electronic data deliverable
MPI	Malcolm Pirnie
MS	matrix spike
MSD	matrix spike duplicate
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NOAA	National Oceanic and Atmospheric Administration
NYDEC	New York Department of Environmental Conservation
NY/NJ	New York/New Jersey
OC	organic carbon
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
PFD	problem formulation document
PM	project manager
PQO	project quality objective
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
QM	Query Manager
RARC	risk analysis and risk characterization
RF	response factor
RI/FS	remedial investigation/feasibility study
RM	river mile
RSD	relative standard deviation
SGS	*Société Générale de Surveillance*
SIM	selective ion monitoring
SOP	standard operating procedure

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SPCC	system performance check compounds
SQT	sediment quality triad
SVOC	semivolatile organic compound
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
Windward	Windward Environmental LLC
WRDA	Water Resources Development Act

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Introduction

This is an addendum to the Lower Passaic River (LPR) Restoration Project *Quality Assurance Project Plan: Fish and Decapod Crustacean Tissue Collection for Chemical Analysis and Fish Community Survey* (Windward 2009), hereafter referred to as the Fish/Decapod Quality Assurance Project Plan (QAPP). The Fish/Decapod QAPP reviewed by the US Environmental Protection Agency (USEPA) and its Partner Agencies[1] was approved by USEPA on August 6, 2009.

Appendix B *(Use of Urban Regional Background and Reference Conditions Data in the Lower Passaic River Study Area Risk Assessments*) of the *Revised Risk Analysis and Risk Characterization Plan for the Lower Passaic River Study Area* (Windward and AECOM [in prep]-b), hereafter referred to as the Risk Analysis and Risk Characterization (RARC) Plan, recommended the collection of fish tissue above Dundee Dam in order to establish a freshwater fish tissue background dataset for the Lower Passaic River Study Area (LPRSA). This addendum to the Fish/Decapod QAPP, hereafter referred to as the Fish/Decapod QAPP Addendum No. 5, describes the background freshwater fish tissue sampling effort.

The field activities for the collection of fish above Dundee Dam will occur during in early fall 2012 over a 2-week period. Fish tissue data will be collected within a 4.1-mile area, extending above Dundee Dam from river mile (RM) 17.4 to RM 21.5. The target species will include: channel catfish (or surrogate catfish species [brown bullhead]), American eel, largemouth bass (or surrogate bass species [smallmouth bass]), and carp. Tissue samples will be analyzed for chemistry for comparison to tissue chemistry in samples collected from the LRPSA. The tissue samples will be analyzed for: polychlorinated biphenyl (PCB) congeners (and homologues), PCB Aroclors, polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs) (and homologues), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, semivolatile organic compounds (SVOCs) (including phthalates), metals (including methylmercury, inorganic arsenic, and butyltins), lipid content, and percent moisture. Separate fillet and carcass samples will be analyzed. Reconstituted whole-body concentrations will be derived for use in the ecological risk assessment (ERA) by combining the analytical results for fillet and carcass samples and adjusting for the relative weight of each fraction, consistent with the field sampling plan, Vol. II (FSP2) (Malcolm Pirnie et al. 2006). A compositing plan for tissue samples collected above Dundee Dam will be determined following the completion of collection, taking into account the compositing plan used to analyze fish samples from the LPRSA.

Additional fish will be collected during the sampling effort for a fish health evaluation. Gross internal and external pathological observations and examination results will be noted and recorded in the field laboratory. These data will be used to assist in the qualitative interpretation of results in terms of fish population health. As many as five individuals per species collected (including target and non-target species) will be sacrificed for the evaluation of gross internal and external pathological conditions. Analyzing target fish species for tissue chemistry will be prioritized over sacrificing these species for the health evaluation.

The Fish/Decapod QAPP Addendum No. 5 includes updates to worksheets and attachments relevant to the upstream background tissue sampling. It does not include worksheets or

[1] The Partner Agencies include the US Army Corps of Engineers (USACE), New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (NJDOT), National Oceanic and Atmospheric Administration (NOAA), and the US Fish and Wildlife Service (USFWS).

attachments that are unchanged or irrelevant to this effort. Applicable and/or updated worksheets and attachments included in this addendum are presented below:

- Worksheet No. 1 contains the title and approval pages for the addendum.
- Worksheet No. 3 provides the distribution list.
- Worksheet No. 9 provides a summary of communication and meetings related to upstream tissue sampling
- Worksheet No. 10 describes the specific problem definition for the upstream tissue sampling effort.
- Worksheet No. 11 provides the project quality objectives (PQOs).
- Worksheet No. 13 provides the secondary data criteria and limitations.
- Worksheet No. 14 provides a summary of project tasks.
- Worksheet No. 16 provides the schedule and timeline.
- Worksheet No. 17 provides the sampling design and rationale.
- Worksheet No. 18 provides the proposed monitoring locations and sampling standard operating procedure (SOP) references.
- Worksheet No. 20 provides a summary of field quality control (QC) samples.
- Worksheet No. 23 presents the references to the analytical SOPs.
- Worksheet No. 24 presents the analytical instrument calibration criteria.
- Worksheet No. 35 provides the sampling and analysis validation process.
- Worksheet No. 36 provides the sampling and analysis validation summary.

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QAPP Worksheet No. 1. Title and Approval Page

Addendum to the *Quality Assurance Project Plan for Fish and Decapod Crustacean Tissue Collection for Chemical Analysis and Fish Community Survey*

Document Title

Windward Environmental LLC (Windward)

Lead Investigative Organization

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QAPP Worksheet No. 1. Title and Approval Page

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QAPP Worksheet No. 9. Project Scoping Session Participants Sheet

Project Name:	LPRSA Ecological and Human Health Risk Assessment
Site Name:	LPRSA
Projected Date(s) of Sampling:	September 2012
Site Location:	LPRSA
Project Managers:	Bill Potter/Robert Law, de maximis, inc.
Date of Session:	December 14 and 16, 2010
Scoping Session Purpose:	Meetings to discuss the LPRSA background approach as part of the discussion of USEPA comments on the *Risk Analysis and Risk Characterization Plan for the Lower Passaic River Study Area* (referred to as the RARC Plan) sent to USEPA on April 16, 2010

Participants:

Name	Affiliation	Phone No.	E-mail Address
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December 2010 RARC Plan Comments Meetings

Comments/Decisions:	Meetings were held to discuss RARC Plan comments related to the ERA and the Data Usability Memo comments, as well as RARC Plan comments related to the human health risk assessment (HHRA).
Action Items: **(Retrospective Summary)**	• The background appendix to the RARC Plan submitted to USEPA on April 16, 2010, was discussed with USEPA. • The Cooperating Parties Group (CPG) stated that it plans to evaluate the existing regional datasets for surface sediment chemistry, benthic toxicity, benthic community, and tissue, and then present USEPA with an approach for using existing regional data to develop a range of background and reference conditions.

QAPP Worksheet No. 9. Project Scoping Session Participants Sheet

Consensus Decisions:	• USEPA and CPG agreed that the background appendix to the RARC Plan submitted to USEPA on April 16, 2010, would not be included in the Revised RARC Plan (Windward and AECOM [in prep]-b) to be submitted to USEPA on February 10, 2011. Instead, CPG would evaluate the existing regional datasets for surface sediment chemistry, benthic toxicity, benthic community, and tissue, and then present USEPA with an approach for using existing regional data to develop a range of background and reference conditions. • USEPA and CPG agreed to evaluate existing data (Delaware Bay to southern New England) from regional datasets (benthic communities, benthic toxicity tests, fish tissue, and sediment chemistry) to develop a potential range of background conditions. • Once CPG compiles the data, a meeting will be set up with USEPA to discuss using these existing data for a range of background and reference conditions. • The outcome of these meetings was the February 2, 2011, ERA and Data Usability and HHRA term sheet, which documents the agreements reached during the December 14 and 16, 2010, meetings.

QAPP Worksheet No. 9. Project Scoping Session Participants Sheet

Project Name:	LPRSA Ecological and Human Health Risk Assessment
Site Name:	LPRSA
Projected Date(s) of Sampling:	September 2012
Site Location:	LPRSA
Project Manager:	Bill Potter/Robert Law, de maximis, inc.
Date of Sessions:	February 15, 2011
Scoping Session Purpose:	Meeting to discuss the LPRSA background and reference approach following the submittal of the Revised RARC Plan (Windward and AECOM [in prep]-b) on February 11, 2011

Participants:

Name	Affiliation	Phone No.	E-mail Address
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Stephanie Vaughn	USEPA	212.637.3914	vaughn.stephanie@epa.gov

February 2011 Background Approach Meeting

Comments/Decisions:	Meeting was held to discuss the approach for establishing background and reference area conditions for the LPRSA.
Action Items: **(Retrospective Summary)**	• CPG presented the proposed approach for defining background and reference area conditions for the LPRSA • CPG presented an overview of the available regional datasets that potentially could support the determination of LPRSA background and reference area conditions • USEPA requested additional analysis, including further evaluation of sediment data from upstream of Dundee Dam and a comparison of those sediment data to the data from the LPRSA. • USEPA requested an analysis of data from Chesapeake Bay or Delaware Bay, as well as an analysis of Mullica River toxicity and benthic community data. • USEPA asked CPG to provide additional summaries of regional tissue studies. • CPG discussed with USEPA that the focused feasibility study (FFS), which had been prepared by USEPA, had used background samples collected from directly above Dundee Dam. • After internal discussions, USEPA agreed to use background samples from directly above Dundee Dam. USEPA asked CPG to evaluate the current samples and determine whether additional samples will be required for a background dataset and if so, how many.
Consensus Decisions:	• The area above Dundee Dam was agreed upon for the potential development of a background dataset and CPG would continue evaluating regional datasets.

QAPP Worksheet No. 9. Project Scoping Session Participants Sheet

Project Name:	LPRSA Ecological and Human Health Risk Assessment
Site Name:	LPRSA
Projected Date(s) of Sampling:	September 2012
Site Location:	LPRSA
Project Manager:	Bill Potter/Robert Law, de maximis, inc.
Date of Sessions:	February 3, 2012
Scoping Session Purpose:	Meeting to discuss further the LPRSA background approach

Participants:

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February 2012 Background Approach Meeting

Comments/Decisions:	Meeting was held to provide USEPA and its Partner Agencies with a status briefing on the background and reference conditions approach for the LPRSA.
Action Items: **(Retrospective Summary)**	• CPG summarized the process to date on background and reference conditions approach. • CPG provided the definitions for background and reference conditions. • CPG presented criteria for evaluating available regional datasets that potentially could support the determination of LPRSA background and reference area conditions. • CPG provided the data sources for the background and reference conditions data. • CPG summarized the evaluation of existing data. • CPG recommended the collection of additional sediment (chemistry-only and sediment quality triad [SQT] samples) and fish tissue data above Dundee Dam to support the development of background and reference area conditions for the LPRSA • CPG recommended use of existing data for the estuarine dataset.
Consensus Decisions:	• USEPA asked CPG to start developing QAPPs for the collection of freshwater background and reference conditions data.

QAPP Worksheet No. 10. Problem Definition

The problem to be addressed by the project:
The LPR watershed is highly urbanized and receives inputs of industrial and municipal wastes. These inputs have resulted in widespread habitat and biodiversity losses, the accumulation of chemicals in river sediments and biota, and impacts on water quality – the cumulative effects of which have substantially degraded the ecosystem of the LPRSA. The LPRSA is the estuary portion of the Passaic River between Dundee Dam and Newark Bay that is the subject of a remedial investigation/feasibility study (RI/FS). Conceptual site models (CSMs) of the LPRSA presented in summary reports and planning documents (e.g., Battelle (2005), Windward and AECOM (2009), Malcolm Pirnie (MPI) (2007b), MPI et al. (2005); and MPI (2007a)), as well as USEPA guidance and recommendations (USEPA 2002, 2008a), recognize that conditions within the LPRSA and ongoing inputs of chemical and environmental stressors originating from areas both inside and outside the LPRSA need to be taken into account during the risk assessment and remedial decision-making processes. Each regional background input has a corresponding contribution to the overall risks potentially posed to humans and ecological receptors within the LPRSA. The LPRSA is the subject of a RI/FS, which includes the performance of an HHRA and baseline ecological risk assessment (BERA). These assessments will be used to evaluate the potential for hazardous substances present in environmental media to have current and future impacts on the health of human and ecological receptors within the LPRSA. Because the primary focus of the RI/FS is historically contaminated sediments present within the LPRSA and the impact of those sediments on biota, potential impacts associated with these sediments need to be distinguished from potential impacts from regional urban inputs to the LPR. Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b) describes an approach that involves identifying areas that represent background appropriate for quantifying the potential impacts of non-site-related inputs on tissue concentrations in the LPRSA. Due to the extent of regional estuarine tissue data available from the New York/New Jersey (NY/NJ) Harbor Estuary for a number of species collected in the estuarine portion of the LPR, available (i.e., existing) estuarine regional fish and blue crab tissue data will be used to establish the estuarine background tissue dataset. Because there are limited tissue data available for the species and analytes of interest for the LPRSA in the area above Dundee Dam, this QAPP addendum describes the activities that will be performed to collect data to establish freshwater background fish tissue concentrations for the LPRSA. Fish tissue concentrations above Dundee Dam will be compared to those fish species collected in the LPRSA to provide a better understanding of the impact of background conditions and background sources of contamination from chemical concentrations in sediment and surface water above Dundee Dam on LPRSA freshwater fish species tissue concentrations. Fish health condition data (i.e., gross internal and external pathological observations) will also be collected during the tissue sampling event to assist in interpreting the qualitative results in terms of fish population health.
The environmental questions being asked:
The specific question covered in this addendum is: "How do the chemical concentrations in tissue from freshwater fish species

QAPP Worksheet No. 10. Problem Definition

from upstream of the LPRSA compare to those within the LPRSA?" Further detail on how the data will be used is presented on Worksheet No. 11 of this QAPP addendum.
Observations from any site reconnaissance reports:
A site reconnaissance survey above Dundee Dam has not been performed to support this effort. A field reconnaissance to obtain general information regarding depth and initial target sampling locations is proposed as part of the sampling effort.
A synopsis of secondary data or information from site reports:
Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b) presents a summary of the available regional freshwater and estuarine tissue data, including an evaluation of the data quality of these regional data. This summary indicates that while some of the regional estuarine data are of sufficient quality and quantity to be used to establish background and reference conditions for the estuarine biota from the LPRSA, sufficient available freshwater data are not. A general summary of the secondary freshwater datasets is presented in Worksheet No. 13 of this QAPP addendum.
The possible classes of contaminants and the affected matrices:
The LPRSA contains several classes of organic and inorganic contaminants, many of which may accumulate in fish. Fish samples from within the LPRSA have been analyzed for the following: PCB congeners (and homologues), PCB Aroclors, PCDDs/PCDFs (and homologues), organochlorine pesticides, PAHs, alkylated PAHs, SVOCs (including phthalates), metals (including methylmercury, inorganic arsenic, and butyltins), lipid content, and percent moisture. The specific analytes presented in Worksheet No. 15 of the Fish/Decapod QAPP (Windward 2009) will also be evaluated in samples collected from above Dundee Dam.
The rationale for chemical and non-chemical analyses and sampling area:
Tissue chemistry data from invertebrates and fish have been collected from within the LPRSA from approximately RM 0 to Dundee Dam at RM 17.4. Available regional tissue data collected from outside the LPRSA are presented in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b). In Appendix B, it was recommended that, because of the limited tissue data available for the species and analytes of interest for the LPRSA in the area above Dundee Dam, additional freshwater fish tissue data should be collected to establish the freshwater background tissue dataset. Dundee Dam provides a physical barrier between the LPRSA and upstream, and the area above Dundee Dam represents the same river system and geologic foundation, and has an urban residential setting and contains urban sources (i.e., combined sewer overflows [CSOs] and runoff from major highways) similar to areas within the freshwater portion of the LPRSA. The 4.1-mile stretch between Dundee Dam and Fairlawn Avenue represents the upstream portion of the river where a relatively low water velocity is expected (i.e., a velocity similar to that of the upper portion of the LPRSA). Above Fairlawn Avenue, aerial photographs of the Passaic River indicate higher

QAPP Worksheet No. 10. Problem Definition

velocities. Fish tissue residue concentrations from upstream of Dundee Dam are needed to characterize and compare the differences between concentrations inside and outside the influence of the LPRSA. Fish health condition data (i.e., gross internal and external pathological observations) will assist in the interpretation of qualitative results in terms of fish population health.
Information concerning various environmental indicators:
As described in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b), sufficient tissue chemistry data have been collected from estuarine environments in the LPR region to establish an estuarine background dataset for tissue. Tissue chemistry data of sufficient quality from regional freshwater environments in the LPR region (specifically upstream of Dundee Dam) are relatively limited, so the collection of data to establish a freshwater background dataset is proposed.
Project decision conditions:
The conditions for project decisions (i.e., those decisions that may require communication between CPG and USEPA during the field effort) include the need to delay or suspend sampling because of hazardous weather conditions. CPG will immediately suspend operations under conditions of extreme weather and/or environmental conditions that are a threat to worker health and safety.

QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

Who will use the data?

The data collected under this QAPP addendum will be used by CPG and USEPA for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related decisions, specifically for the ERA and HHRA, and by other interested parties (e.g., USACE, NJDEP, USFWS, NJDOT, and NOAA) for other purposes, including Water Resources Development Act (WRDA) activities, such as restoration planning.

What will the data be used for?

The data collected during this sampling effort will be used in the HHRA and BERA to differentiate site-related risks from risks resulting from regional background (i.e., non-site-related) sources. Specifically, the data will be used to:

- Document tissue chemical concentrations in fish related to background sediment and water quality impacted by sources outside the influence of the LPRSA.
- Provide context for the risk estimates for the LPRSA by determining background chemical concentrations of an urban river outside the influence of the LPRSA for those COPCs estimated in the risk characterization of the HHRA and BERA.
- Document the potential fish tissue concentrations expected in freshwater fish following remedial actions.

ERA Assessment Endpoints

The data collected will be used to support the ERA in evaluating the assessment endpoints for fish, bird, and aquatic mammal populations, which were presented in the problem formulation document (PFD) (Windward and AECOM 2009) and are summarized below.

Assessment Endpoint No. 5 – "Protection and maintenance (i.e., survival, growth, and reproduction) of omnivorous, invertivorous, and piscivorous fish populations that serve as a forage base for fish and wildlife populations and of fish populations that serve as a base for sports fishery."

Assessment Endpoint No. 6 and No. 7 – "Protection and maintenance (i.e., survival, growth, and reproduction) of herbivorous, omnivorous, sediment-probing, and piscivorous bird populations," and "Protection and maintenance (i.e., survival, growth, and reproduction) of aquatic mammal populations."

HHRA Assessment Endpoint

The background fish tissue chemistry data collected from above Dundee Dam (i.e., fish fillet data) will be compared to freshwater fish tissue chemistry data from the LPRSA. The comparison will provide context for the risk estimates from fish consumption within the LPRSA by determining background chemical concentrations of an urban river outside the influence of the LPRSA for those COPCs estimated in the risk characterization of the HHRA.

QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

What types of data are needed?

Fish tissue will be collected from RM 17.4 to RM 21.5, and fish fillet and carcass tissue samples will be analyzed for the following: PCB congeners (and homologues), PCB Aroclors, PCDDs/PCDFs (and homologues), metals (including methylmercury, inorganic arsenic, and butyltins), organochlorine pesticides, PAHs, alkylated PAHs, SVOCs (including phthalates), lipid content, and percent moisture. Fish will be collected using a variety of sampling methods, including gillnets, trotlines, eel traps, and boat electrofishing units. The sampling gear used will be determined at the time of sampling based on an assessment of which gear is most appropriate and potentially effective for that particular location in the LPRSA. Some factors to consider when selecting appropriate sampling gear and locations include site accessibility, target species and sizes, substrate, water depth, salinity, and habitat structure.

Gross internal/external pathological examinations will be conducted on fish, as described in the Fish/Decapod QAPP (Windward 2009) and based on Hunn (1988) and USGS (2002) procedures. The observations and examination results will be recorded electronically on the Specimen Data Form (Attachment C of the Fish/Decapod QAPP (Windward 2009)) in the field laboratory. These data will only be used to assist in the qualitative interpretation of results in terms of fish population health. Consistent with the sampling conducted in the LPRSA, as many as five individuals per species collected (including target and non-target species) will be sacrificed for the evaluation of gross internal and external pathological condition. Analyzing target fish species for tissue chemistry will be prioritized over sacrificing these species for the health evaluation. The results of the health evaluations will be used for qualitative comparisons only; quantitative and/or statistical comparisons will not be made.

Matrix

A summary of target species, organized by feeding guilds relevant to the ERA and sample type (or tissue type) proposed for collection for each species, is presented in Table 11-1. The targeted size for the targeted fish species are based on the range of sizes collected and analyzed from the LPRSA. During field sampling, however, all individuals will be retained regardless of target size, in case sufficient numbers of individuals that meet the target size requirements cannot be obtained. Total body lengths for fish will be measured as specified by USEPA (2000).

Separate fillet and carcass fish tissue samples will be analyzed. Reconstituted whole-body concentrations will be derived for use in the ERA by combining the analytical results for fillet and carcass samples and adjusting for the relative weight of each fraction, consistent with FSP2 (Malcolm Pirnie et al. 2006).

The compositing plan for tissue samples collected from above Dundee Dam will be determined following the completion of collection, taking into account the compositing plan used for analyzing fish samples from the LPRSA. The following will be considered in the development of the compositing plan:

- The number fish needed in each analytical sample to meet the anticipated minimum sample mass requirements

QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

The number of fish and sizes of fish analyzed in samples from the LPRSA

- The relative difference in sizes of individual fish included in a given composite sample; the goal is that fish within a composite be of similar size so that the smallest individual in a composite is no less than 75% the length of the largest individual (USEPA 2000)

Fish tissue will be analyzed following the agreement of a final compositing plan is between CPG and USEPA.

How "good" do the data need to be in order to support the environmental decision?

Evaluation factors to establish an appropriate dataset for background freshwater tissue are discussed in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b). These factors include the following:

- Data represent background conditions.
- Data contain an adequate number of observations to allow comparisons to LPRSA dataset.
- Data should not be from non-LPRSA-comparable water bodies.
- Data must include verifiable location descriptions.
- Data should include parameters analyzed in LPRSA samples.
- Data should contain information from multiple locations to better estimate background conditions.
- Data should represent species and tissue types consistent with LPRSA samples.
- Data should include sufficient detail to verify calculated sums.
- Data should include detection limit (DL) values for non-detected concentrations.

The data usability memorandum (Windward and AECOM [in prep]-a) describes the data acceptability requirements for use in the HHRA and ERA.

How many data are needed?

A target number of 10 samples (10 samples each for fillet and carcass) is proposed for each of the 4 target fish species (i.e., a total of 80 analytical samples). The actual number of samples will depend on the success of the 2-week sampling effort. A sample size of 10 meets the requirements to calculate a 95% upper confidence limit on the mean (95% UCL) using ProUCL (USEPA 2011), allowing for some samples to have non-detected values. A sample size of 10 also allows for the ability to detect differences between LPRSA and upstream fish tissue concentrations using a one-sided t-test with 95% confidence and 80% power, assuming data are normally distributed and that differences between the datasets are at least 1.25 times the standard deviations of the pooled LPRSA and upstream datasets. If data are not normally distributed, and nonparametric tests are required, the power will be slightly reduced.

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Additional fish will be collected during the tissue sampling and community survey event for the qualitative fish health evaluation.

Gross internal/external pathological examinations will be conducted on fish, as described in the Fish/Decapod QAPP (Windward 2009) and based on Hunn (1988) and USGS (2002) procedures. The observations and examination results will be recorded electronically on the Specimen Data Form (Attachment C of the Fish/Decapod QAPP (Windward 2009)) in the field laboratory. These data will only be used to assist in the qualitative interpretation of results in terms of fish population health. Consistent with the sampling conducted in the LPRSA, as many as five individuals per species collected (including target and non-target species) will be sacrificed for the evaluation of gross internal and external pathological condition. Analyzing target fish species for tissue chemistry will be prioritized over sacrificing these species for the health evaluation. The results of the health evaluations will be used for qualitative comparisons only; quantitative and/or statistical comparisons will not be made.

Where, when, and how should the data be collected/generated?

River Segments

The general sampling design divides the portion of the Passaic River between Dundee Dam (at RM 17.4) and Fairlawn Avenue (RM 21.5) into two reaches: Reach 9 (RM 17.4 to RM 19.5) and Reach 10 (RM 19.5 to RM 21.5). Sampling efforts will be allocated between these two reaches. Sampling locations will be targeted within known or likely habitat areas in each of the two reaches. Initial target sampling locations will be identified during site reconnaissance, which will be conducted prior to the field sampling effort

Sampling Locations

At least three initial target bank-specific sampling locations will be identified within each reach during the reconnaissance survey. Additional sampling areas will be added during sampling based on field conditions, *in situ* observations, and success of attempted locations during sampling (e.g., sample locations will be based on observations of habitat suitability, as well as boat and gear accessibility). Inasmuch as it may not be possible to collect adequate tissue mass at each specified sampling location to constitute a full analytical sample, the following sampling design considerations will be implemented in coordination with USEPA during sampling to either ensure that QAPP elements are satisfied, or determine whether they need to be adjusted.

Collection Methods

A minimum of two gillnet attempts, nine eel traps (i.e., three traps at three locations), nine trotlines (i.e., three traps at three locations), and six electrofishing passes (i.e., two passes at three locations) will be attempted within both Reach 9 and Reach 10. Sampling will continue for a maximum of 2 weeks (12 days of sampling).

Timing

This effort for tissue sampling will be conducted in early fall 2012 (consistent with fall 2009 LPRSA fish tissue sampling). All changes to the proposed plan due to field conditions or lack of species availability will be communicated between USEPA and CPG technical coordinators or project managers (PMs).

QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

Who will collect and generate the data?
Windward will provide field sampling coordination and laboratory coordination and support. Windward will also provide the field personnel who will conduct the tissue collection efforts.
How will the data be reported?
Daily catch results will be communicated (e.g., telephone conversation, e-mail) to CPG PMs and Project Coordinators. An electronic database that includes the coordinates for the collection of each individual fish or fish trap will be provided. The database will include time of trap deployment and retrieval; time of fish collection; depth of collection or trap location; and species, length, weight, and (if determinable) gender of all individual fish collected for analysis. The electronic database will be updated daily and available for USEPA on a daily basis. A data report summarizing the tissue collection and analysis results will be provided 90 days after receipt of validated chemical data. The data report will include a map that presents the actual tissue collection locations from the sampling effort. A summary of abundance, diversity, lengths and weights by species, and dominance by catch effort will be presented. In addition, this report will include a map that presents the locations and corresponding information on habitat type, if available. The data report will summarize any modifications to the proposed sampling plan as outlined in this QAPP addendum.
How will the data be archived?
Data records, forms, and notes will be scanned and stored electronically in a project file. Hard copies will be archived by Windward's main office in Seattle, Washington. Similarly, after issuance, the data report will be archived electronically and as a hard copy. The analytical results will also be provided, as electronic data deliverables (EDDs), to the project database. Multimedia electronic data deliverables (MEDDs) will be provided to USEPA Region 2 by de maximis Data Management Solutions, Inc. (ddms) in USEPA's required format.

Table 11-1. Summary of sample design for fish freshwater background tissue collection

Feeding Guild	Target Species	Type of Sample	Target Size (total length)[a]	Estimated No. of Fish per Sample	Target No. of Individual Fish and Individual Samples	Target No. of Composite Samples	Total No. of Analytical Samples
Invertivore/ omnivore	Channel catfish (or surrogate catfish species [brown bullhead])	Skinless fillet and carcass with skin[b]	≥ 13.9 in.(≥ 9.6 in. for brown bullhead)	1 (individual sample)	10	0	20

QAPP Worksheet No. 11. Project Quality Objectives/Systematic Planning Process Statements

Carnivore/ piscivore	American eel	Skinless fillet and carcass with skin[b]	≥ 10 in.	1 (individual sample) 2–11 (composite samples)	TBD[c]	≤10[d]	20	
		Largemouth bass (or surrogate bass species [smallmouth bass])	Skin-on fillet and carcass[b]	≥ 8.6 in. (≥ 7.4 in. for smallmouth bass)	1 (individual sample) 2–3 (composite samples)	TBD[c]	≤10[d]	20
Benthic omnivore		Carp	Skin-on fillet and carcass[b]	≥ 20.6 in.	1 (individual sample)	10	0	20
Total							**80**

[a] Target sizes of fish were selected to be comparable to sizes of fish collected from the LPRSA. During field sampling, however, all individuals will be retained regardless of target size, in case sufficient numbers of individuals that meet the target size requirements cannot be obtained.

[b] Carcass tissue will be composed of the remaining (non-fillet) portion. Tissue type concentrations will be combined mathematically (proportionally to their average weights in each species) to calculate whole-body concentrations.

[c] No target number of individual fish was determined for species that were analyzed as both individuals and composites in the LPRSA (i.e., American eel and largemouth bass). All American eel, largemouth bass, and smallmouth bass collected over the two-week sampling period will be retained, and a compositing plan will be determined following the completion of sampling.

[d] A compositing plan (and number of individuals and composites to be analyzed) will be determined following completion of the sampling effort.

LPRSA – Lower Passaic River Study Area

TBD – to be determined

QAPP Worksheet No. 13. Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation/collection dates)	How Data Will Be Used	Limitations on Data Use
Fish tissue data	NJDEP monitoring program, (Ashley and Horwitz 2000; Horwitz et al. 2005; 2006; 2008, 2009)	NJDEP – Fish tissue chemistry data from the Passaic River above Dundee Dam and in other freshwater areas in New Jersey	Fish tissue chemistry data was used to select the species appropriate for tissue residue analysis.	A limited amount of tissue data and chemicals analyzed in samples collected above Dundee Dam that are comparable to fish tissue data were collected within the LPRSA.
	NOAA QM database (NOAA 2011)			
	NYDEC, NY/NJ Harbor Estuary CARP database (NYDEC 2007)			

Note: Only freshwater secondary data sources are included in the above table. Estuarine datasets reviewed for potential use in the development of background for freshwater tissue are presented in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b).

CARP – Contaminant Assessment and Reduction Program
LPRSA – Lower Passaic River Study Area
NJDEP – New Jersey Department of Environmental Protection
NOAA – National Oceanic and Atmospheric Administration
NYDEC – New York Department of Environmental Conservation
QM – Query Manager
USEPA – US Environmental Protection Agency

QAPP Worksheet No. 14. Summary of Project Tasks

Project Area: Upstream LPRSA, a 4.1-mile stretch above Dundee Dam (RM 17.4 to FM 21.5)	
Sampling Tasks:	In late September 2012, a 2-week sampling effort will take place between RM 17.4 and RM 21.5, The following methods will be attempted within both Reaches 9 and 10 of the sampling area: gillnets, electrofishing, baited trotlines, and eel traps. The schedule for upstream fish collection is presented on Worksheet No. 16 of this QAPP addendum. The target fish species for tissue collection will be American eel, channel catfish (brown bullhead as an alternate target species), largemouth bass (smallmouth bass as an alternate target species), and carp. Tissue types per species are outlined on Worksheet No. 11, Table 11-1 of this QAPP addendum. Initial target sampling locations will be identified during the reconnaissance portion of the field sampling effort.
Analysis Tasks:	At each sampling site, location measurements (e.g., coordinates, depth, and any other relevant observations such as habitat type) will be recorded on the Location Data Form (Attachment B of the Fish/Decapod QAPP (Windward 2009)). Fish lengths and weights will be also measured, and species and sex will be documented (if possible). Gross external and internal pathological observations will be made and electronically recorded on the Specimen Data Form (Attachment C of the Fish/Decapod QAPP (Windward 2009)) during the tissue sampling event and first community survey on as many as five individuals per fish species collected. Analyzing target fish species for tissue chemistry will be prioritized over sacrificing these species for the health evaluation. The substrate at each sampling location will be grossly characterized using the sediment texture maps provided in FSP2 (Malcolm Pirnie et al. 2006). Following the tissue collection, samples will be shipped to the analytical laboratory for filleting, compositing (if necessary), homogenization, and analysis. The compositing plan for tissue samples collected from above Dundee Dam will be determined following the completion of collection, taking into account the compositing plan used to analyze fish samples from the LPRSA. Fish tissue will be analyzed following the agreement of a final compositing plan between CPG and USEPA. Tissue samples will be analyzed for the chemicals listed in Worksheet No. 10 of this QAPP addendum.
QC Tasks:	All field notes and forms completed during the field sampling task will be checked daily by the field coordinator (FC). The FC will also communicate daily with the Task QA/QC Manager to confirm PQOs are being met. Lengths and weights will be compiled in a table and reviewed as a QC step. Any lengths and weights that appear to be anomalous will be verified by a second team member by re-measuring. Sample identifications will be similarly verified. Electronic sampling equipment (e.g., scale, global positioning system [GPS] units) will be calibrated, maintained, tested, and inspected according to manufacturers' specifications as necessary to ensure they are functioning properly (see Worksheet No. 22 of the Fish/Decapod QAPP (Windward 2009)). The analytical laboratories will follow QC procedures outlined in this QAPP (see Worksheet No. 20 of this QAPP addendum, and see Worksheet Nos. 24 and 25 of the Fish/Decapod QAPP (Windward 2009)), their SOPs for the analytical methods being conducted (see Worksheet No. 23 of this QAPP addendum), and their quality management plan. Chemical data will be validated according to procedures outlined in this QAPP (see Worksheet Nos. 35 and 36 of this QAPP addendum).
Secondary Data:	Other chemistry data summarized in Worksheet No. 13 of this QAPP addendum and presented in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b) will also be reviewed and potentially used to accomplish project objectives.

QAPP Worksheet No. 14. Summary of Project Tasks

Data Management Tasks:	Data management tasks will include keeping accurate records of field activities and observations so that project team members using the data will have accurate and appropriate documentation. Data management activities will be conducted in accordance with the project data management rules. Data transfer to USEPA will include a MEDD that conforms to the 2007 USEPA Region 2 MEDD format. The MEDD will include all qualified and rejected data (including the reported numerical value for rejected data). Field data will be stored in its native format and in the project sampling database. GPS data will also be downloaded and stored electronically in a project file. Laboratory analytical data will be loaded into the project sampling database, verified against the laboratory reports, merged with corresponding field data, and updated based on validation. Subsequently, the spatial data will be mapped for the data report.

QAPP Worksheet No. 14. Summary of Project Tasks

Documentation and Records:	It is important that field activities be documented in an organized, chronologically accurate manner. All field activities will be recorded in an field logbook maintained by the FC. The field logbook is intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period. Procedures for documentation are presented in Attachment P of the Fish/Decapod QAPP (Windward 2009). All relevant forms and records are presented on Worksheet No. 29 of the Fish/Decapod QAPP (Windward 2009). In general, the following information must be recorded: • The identities and affiliations of the personnel conducting field activities • Model numbers and serial numbers of instruments and/or equipment being used, to the extent available • A description of the type of field work being conducted and the equipment used • The date and time the field activities were initiated and completed, with specific temporal information for each task (e.g., record the time activities commenced at each individual location, if applicable) • The site where the field activities were conducted and also any locations within that site where work was performed (e.g., specific sampling sites, coordinates, and depths) • The general methodology used to conduct the activities • Communications with PMs and personnel regarding field activities • Field-collected data (e.g., GPS measurements, catch totals) • Daily health and safety briefings • Deviations from QAPP, SOP, or project health and safety plan (HSP) (Attachment R of the Fish/Decapod QAPP (Windward 2009)), reason for change, and any corrective actions taken; corrective actions will be electronically documented on the Protocol Modification Form (Attachment A) • Photos, which are required to document gross external abnormalities on trapped fish. When photos associated with sampling locations, field activities, or samples are taken, they will include the date, time, photographer, and a brief description. All entries must be made in language that is objective, factual, and free of personal feelings or other terminology that might prove inappropriate. The Location Data Form (Attachment B of the Fish/Decapod QAPP (Windward 2009)) and Specimen Data Form (Attachment C of the Fish/Decapod QAPP (Windward 2009)) will also be filled out electronically by field personnel to document sampling location information and gross external and internal pathological observations of collected fish. A daily tally of all species caught will also be recorded in the Specimen Tally Form (Attachment D of the Fish/Decapod QAPP (Windward 2009)) and the Non-Target Species Tally Form (Attachment E of the Fish/Decapod QAPP (Windward 2009)). A record of all personnel briefed on the HSP will be maintained by the FC, Site Safety and Health Officer, or designee. The record will be archived at Windward's Seattle office upon completion of the sampling efforts.
Assessment/Audit Tasks:	The FC will communicate frequently with the Investigative Organization Task QA/QC Manager to confirm PQOs are being met. Assessment/audit tasks will be conducted, as summarized in Worksheet No. 31 of the Fish/Decapod QAPP (Windward 2009). Reviews of field activities/sampling method compliance and laboratory method compliance will be conducted periodically.

QAPP Worksheet No. 14. Summary of Project Tasks

Data Review Tasks:	All field records will be reviewed by the FC for completeness and accuracy, and verified by the Task QA/QC Manager or a designee. As part of data report preparation, chemical data will be reviewed to determine if differences related to species and/or location are evident. In addition, the data report will also undergo a senior and peer review process before the final draft is submitted to USEPA (see Worksheet Nos. 34 and 37 of the Fish/Decapod QAPP (Windward 2009), and Worksheet No. 35 and No. 36 of this QAPP addendum) for relevant procedures.
Deliverables:	A tissue chemistry data report will be prepared once the chemistry results have been validated. This data report will be provided to USEPA 90 days after receipt of validated data, and will include validation results. A data report summarizing the sampling effort will be provided to USEPA within 90 days of completion of each fish community survey. This data report will also include fish community data and gross internal and external pathological conditions of a subset of the captured fish. A map illustrating the actual sampling locations will also be prepared.

QAPP Worksheet No. 16. Project Schedule/Timeline Table

Activities	Organization	Date (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date of Initiation	Anticipated Date of Completion		
QAPP preparation and delivery to USEPA	Windward	07/23/12	09/03/12	Fish/Decapod QAPP Addendum No. 5	09/03/12
Fish tissue collection and health assessment	Windward	09/24/12	10/05/12	See below for data report deliverable	See below
Preparation and delivery of the background freshwater tissue data report to USEPA	Windward	Upon completion of sampling event	90 days after receipt of validated data	Background freshwater fish tissue data report	90 days after receipt of validated data

Note: The projected tissue chemistry data report date is based on the assumption that an individual and composite sample analysis memorandum is approved shortly after completion of the sampling event, and that the analytical data will be available for validation 40 days after the memorandum is approved.

QAPP – quality assurance project plan

USEPA – US Environmental Protection Agency

QAPP Worksheet No. 17. Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

The results of the proposed 2012 background freshwater fish tissue sampling effort will be used to support the ERA and HHRA, specifically to address the assessment and measurement endpoints described in Worksheet No. 11 and outlined in Appendix B of the Revised RARC Plan (Windward and AECOM [in prep]-b). The specific goals of this effort are to collect target freshwater fish above Dundee Dam for chemical analyses, and to perform gross internal/external pathological examinations on fish based on Hunn (1988) and US Geological Survey (USGS) (2002) procedures to assist in the interpretation of the health of the fish population above Dundee Dam.

The general sampling design uses two reaches in the freshwater area above Dundee Dam, each approximately 2 miles in length Reach 9 and Reach 10. At least three target bank-specific sampling locations will be identified within each reach; these initial target locations will be identified in the field during site reconnaissance as part of the field sampling effort. Additional sampling areas will likely be identified in the field throughout the sampling effort in order to collect sufficient numbers of fish to meet the tissue mass requirements of the recommended number of samples.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

Locations

At least three target bank-specific sampling locations will be identified within each reach; these initial target locations will be identified in the field during site reconnaissance as part of the field sampling effort. Additional sampling areas will likely be identified in the field throughout the sampling effort in order to collect sufficient numbers of fish to meet the tissue mass requirements of the recommended number of samples. The targeted numbers of samples per species (and per tissue type) are presented in Table 11-1 (Worksheet No. 11 of this QAPP addendum). The compositing plan for tissue samples collected from above Dundee Dam will be determined following the completion of collection.

Protocols

Sampling protocol and methods (including gillnets, baited eel traps, trotlines, and boat electrofishing) that will be used to target fish above Dundee Dam are described in detail in Worksheet 17 of the Fish/Decapod QAPP (Windward 2009). Attachments J, L, and N of the Fish/Decapod QAPP (Windward 2009) detail the protocol that will be implemented for the various methods used to collect fish above Dundee Dam. Collection of fish above Dundee Dam will be conducted using gillnets, baited eel traps and trotlines, and electrofishing gear. These sampling methods are appropriate for surveying the fish species that inhabit the Passaic River. Supplemental sampling methods may be employed at certain locations depending on the success of the primary methods listed

QAPP Worksheet No. 17. Sampling Design and Rationale

above, and at the discretion of field personnel and per consultation with USEPA.

Timing

The fish tissue collection effort will be conducted in early fall 2012.

QAPP Worksheet No. 18. Proposed Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number[a]	Easting (X)[b]	Northing (Y)[b]	RM	Fishing Method	Analytical Group(s)	No. of Samples[c]	Sampling SOP Reference[d]	Rationale for Monitoring Location
UPR8A	TBD[e]	TBD[e]	TBD[e]	Baited eel traps (oriented on the river bottom), trotlines (oriented on river bottom), electrofishing (< 10-ft deep), and gillnets (deployed > 3-ft deep)	PCDDs/PCDFs, metals (including inorganic arsenic and butyltins), PCB congeners, organochlorine pesticides, PCB Aroclors, PAHs, alkylated PAHs, SVOCs (including phthalates), percent lipids, percent moisture, total mercury, and methylmercury	10 (per species)	1 – 10	TBD[e]
UPR8B	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR8C	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR8D	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR8E	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR9A	TBD[e]	TBD[e]	TBD[e]	Baited eel traps (oriented on the river bottom), trotlines (oriented on river bottom), electrofishing (< 10-ft deep), and gillnets (deployed > 3-ft deep)	PCDDs/PCDFs, metals (including inorganic arsenic and butyltins), PCB congeners, organochlorine pesticides, PCB Aroclors, PAHs, alkylated PAHs, SVOCs (including phthalates), percent lipids, percent moisture, total mercury, and methylmercury	10 (per species)	1 – 10	TBD[e]
UPR9B	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR9C	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR9D	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]
UPR9E	TBD[e]	TBD[e]	TBD[e]			10 (per species)	1 – 10	TBD[e]

[a] Additional sampling locations in each sampling area may be added based on field conditions and *in situ* observations, and targeted species for collection may not be collected from all proposed target sampling locations. All sampling locations are bank specific.
[b] New Jersey State Plane (US survey feet).
[c] Refer to Table 11-1 in Worksheet No. 11 of this QAPP addendum for details.
[d] Refer to Project Sampling SOP References table (Worksheet No. 21 of the Fish/Decapod QAPP (Windward 2009).
[e] Target locations will be selected following a site reconnaissance.

ID – identification
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
RM – river mile
SOP – standard operating procedure
SVOC – semivolatile organic compound
TBD – to be determined

QAPP Worksheet No. 20. Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	SOP Reference[a]	No. of Samples	No. of Matrix Duplicates[b]	No. of MS/MSD	No. of Rinsate Blanks[c]	Certified Reference Material	Total No. of Samples to Lab
Tissue	PCB congeners	Low	T2	80	8	0/0	2	8	98
Tissue	PCB Aroclors	Low	T8, T17, T18	80	4	4/4	2	0	94
Tissue	PCDDs/PCDFs	Low	T3	80	8	0/0	2	8	98
Tissue	Butyltin compounds	Low	T21, T22	80	4	4/4	2	0	94
Tissue	PAHs	Low	T4	80	4	0/0	2	4	90
Tissue	Alkylated PAHs	Low	T17, T18, T26, T27, T29	80	4	4/4	2	0	94
Tissue	SVOCs	Low	T17, T18, T19, T20	80	4	4/4	2	0	94
Tissue	Metals[d]	Low	T9, T10, T11, T12	80	4	4/0	2	4	94
Tissue	Inorganic arsenic	Low	T13	80	8	8/8	2	4	110
Tissue	Methylmercury	Low	T16	80	8	8/8	2	4	110
Tissue	Total mercury	Low	T14, T15	80	8	8/8	2	4	110
Tissue	Organochlorine pesticides	Low	T5, T6, T7	80	4	0/0	2	4	90
Tissue	Lipids	Low	T23	80	4	0/0	0	4	88
Tissue	Percent moisture	Low	T24	80	4	0/0	0	0	84

Note: Trip blanks will not be collected because they are not applicable to tissue samples.

[a] Refer to Worksheet No. 23 of this QAPP addendum for SOP titles.

[b] After homogenization, sample masses will be reviewed, and samples will be selected for USEPA splits and matrix-specific QC samples (MD, MS, and MSD). Matrix-specific QC samples will be analyzed at a rate of approximately 1 sample per 20 (unless the analytical method requires more) as sample mass permits. In order to have enough mass for QC samples, sample mass must be at least 3 times the post-homogenization minimum target mass of 105 g.

[c] Matrix-specific QC will not be required for homogenization rinsate samples. Rinsate samples will be collected at a rate of 1 per 40 samples.

[d] Metals will be analyzed using either USEPA SW-846 6020 or 6010. An MS for calcium, magnesium, sodium, and potassium will not be performed because analytical interferences are created when the major cations are present at concentrations required for the MS.

QAPP Worksheet No. 20. Field Quality Control Sample Summary Table

MD – matrix duplicates
MS – matrix spike
MSD – matrix spike duplicates
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
QC – quality control
SOP – standard operating procedure
SVOC – semivolatile organic compound
USEPA – US Environmental Protection Agency

QAPP Worksheet No. 23. Analytical SOP References Table

Reference No.	Primary Method Reference	Title, Revision Date, and/or No.	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?	Attached to this QAPP Addendum?[a]
T1	na	SOP ID 2166 (OP-003), Tissue Preparation and Homogenization, Issue No. 3, Revision 3, 7/25/12	na	na	glass or polyethylene cutting board; Black & Decker® food processor with small titanium blade; Osterizer® blender with large stainless steel blades; ceramic, stainless steel, or titanium knives; Omni-GLH grinding unit with stainless steel or titanium saw tooth probes; Janke & Kunkel IKA tissuemizer	Alpha Analytical	No[b]	Yes
T2	USEPA 1668C	AP-CM-7, High Resolution Mass Spectrometry, Method 1668 for Solid/Air/Aqueous/ Tissue Matrices, Revision 10-2, 8/22/12	Definitive	PCBs	Micromass Autospec Ultima high-resolution mass spectrometers	SGS – Analytical Perspectives	No	Yes
T3	USEPA 1613B	AP-CM-5, Polychlorinated dibenzo dioxin/furans, USEPA Methods 8290, 1613, 23, 0023A, & TO-9A, Revision 12-7, 10/16/09	Definitive	PCDDs/ PCDFs	Micromass Autospec Ultima high-resolution mass spectrometers	SGS – Analytical Perspectives	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T4	CARB 429 Mod.	BRL SOP-00423/5, PAH Compounds by HRGC/HRMS in Food Products, Sediments, and Water, 8/5/10	Definitive	PAHs	VG Autospec HRMS or Autospec Ultima Hewlett Packard 5890 Series II gas chromatograph or HP 6890 gas chromatograph autosampler	Maxxam Analytics	No	Yes
T5	na	BRL SOP-00003, Cleanup of Sample Extract Using Gel Permeation Chromatography, 4/13/09	Definitive	Pesticides	Gel permeation chromatograph autoprep and Model 1002B or J2Scientific AccuPrep MPS GPC system	Maxxam Analytics	No	No
T6	na	BRL SOP-00010, Extraction Organochlorine Pesticides from Liquids and Solids, 4/13/09	Definitive	Pesticides	Cal-Glass LG-6900 Soxhlet (or equivalent), Cal-Glass LG-6901-122 thimble, and 500-mL round-bottom flask	Maxxam Analytics	No	No
T7	USEPA 1699 Mod.(NYSDEC HRMS-2)	BRL SOP-00415/4, OC Pesticides by HRMS in Liquid, Solid, and Tissue 8/5/10	Definitive	Pesticides	HP HRGC, Model: 6890A, 6890, 6890D, 6890N, 5690 Series II, or 6890A Plus; with an HRMS Micromass Autospec Ultima or VG AutoSpec "S"	Maxxam Analytics	No	Yes
T8	USEPA SW-846 8082A	SOP ID 2160 (O-012), Determination of Polychlorinated Biphenyls (PCBs) as Aroclors or Congeners By Gas Chromatography/Electron Capture Detection (GC-ECD), Revision 3, 7/25/12	Definitive	PCB – Aroclors	HP 5890 Series II Gas Chromatograph, HP 6890 Puls or similar, HP 6890 series autosampler with controller or equivalent	Alpha Analytical	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T9	na	MET-TDIG, Standard Operating Procedure for Sample Preparation of Biological Tissue for Metals Analysis by GFAA, ICP-OES, and ICP-MS, Revision 3, 2/13/12	Definitive	Total metals	Teflon® Closed Vessel Microwave or conventional oven	ALS – CAS, Kelso	No	Yes
T10	USEPA SW-846 6020	MET-6020, Standard Operating Procedure for Determination of Metals and Trace Elements by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS); EPA Method 6020, Revision 14, 4/10/10	Definitive	Total metals	Thermo ICP/mass spectrometry (VG PQ-S or ExCell or X-Series model)	ALS – CAS, Kelso	No	Yes
T11	USEPA SW-846 6010	MET-ICP, Standard Operating Procedure for Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP), Revision 23, 10/28/11	Definitive	Total metals	Thermo Jarrell ash atomic emission spectrometer (ICAP-61 or IRIS model)	ALS – CAS, Kelso	No	Yes
T12	USEPA SW-846 7742	MET-7742, Standard Operating Procedure for Selenium by Borohydride Reduction Atomic Absorption, Revision 3, 2/19/10	Definitive	Total metals	Varian SpectrAA-20 atomic absorption spectrometer	ALS – CAS, Kelso	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T13	USEPA 1632	SOP No.BR-0021, BRL Procedure for the Analysis of Water, Sediment, and Tissue by EPA Method 1632, Revision A (1/01): Chemical Speciation of Arsenic in Water and Tissue by Hydride Generation Quartz Furnace Atomic Absorption Spectrometry, Revision 004a, 1/20/10	Definitive	Inorganic arsenic	Perkin Elmer 703 atomic absorption spectrometer	Brooks Rand Labs	Yes, modified to exclude method blank correction	Yes
T14	na	SOP No.BR-002, BRL Procedure for EPA Method 1631, Appendix to (1/01): Total Mercury in Tissue, Sludge, Sediment, and Soil by Acid Digestion and BrCl Oxidation by Cold Vapor Atomic Fluorescence Spectrophotometry (CVAFS), Revision 010d, 5/31/11	Definitive	Total mercury	BRL Model III cold vapor atomic fluorescence spectrophotometer	Brooks Rand Labs	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T15	USEPA 1631	SOP No.BR-0006, BRL Procedure for EPA Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, Revision 004e, 05/24/10	Definitive	Total mercury	BRL Model III cold vapor atomic fluorescence spectrophotometer	Brooks Rand Labs	No	Yes
T16	USEPA 1630	SOP No.BR-0011, Determination of Methyl Mercury by Aqueous Phase Ethylation, Trap Pre-Collection, Isothermal GC Separation, and CVAFS Detection: BRL Procedure for EPA Method 1630 (Waters) and EPA Method 1630, Modified (Solids), Revision 013d, 6/6/11	Definitive	Methylmercury	BRL Model III cold vapor atomic fluorescence spectrophotometer	Brooks Rand Labs	No	Yes
T17	USEPA 3570	SOP ID 2172 (OP-016), Microscale Solvent Extraction (MSE), Revision 2, 3/2/12	Definitive	SVOCs, PCB Aroclors	Custom tumbler, Kuderna-Danish 10-mL concentrator tubes, 500-mL evaporation flasks, 3-ball macro Snyder columns, Organomations N-EVAP, or Zymark TurboVap	Alpha Analytical	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T18	na	SOP ID 2167 (OP-006), Gel Permeation Chromatography Method 3640A, Revision 2, 3/2/12	Definitive	SVOCs, Alkylated PAHs	Waters HPLC 600E controller and pump, 486 tunable absorbance detector, auto system, Envirogel GPC guard and cleanup columns, and Phenomonex guard and cleanup columns	Alpha Analytical	No	Yes
T19	na	SOP ID 2170 (OP-014), Silica Gel Cleanup Procedure (Automated and Manual), Revision 2, 3/2/12	Definitive	SVOCs	Waters HPLC 600E system controller, 717 autosampler, and 486 tunable absorbance detector; Waters uPorasil Prep-pak and guard-pak cartridges or Modcol column	Alpha Analytical	No	Yes
T20	USEPA SW-846 8270D	SOP ID 2155 (No.O-006), Method 8270, Semivolatile Organic Compounds by GC/MS, Revision 4, 8/10/12	Definitive	SVOCs	Agilent 6890 GC with Agilent 5973 detector	Alpha Analytical	No	Yes
T21	na	SOP No.SOC-OSWT, Extraction of Organotins in Sediment, Water, and Tissue Matrices, Revision 6, 11/25/09	Definitive	Butyltins	Nitrogen evaporator, centrifuge, Kuderna-Danish apparatus, vacuum pump and manifold, water bath, vortex and tumbler for VOA vials	ALS – CAS, Kelso	No	Yes
T22	Krone et al (1989)	SOP No.SOC-BUTYL, Butyltins, Revision 10, 1/20/12	Definitive	Butyltins	HP 6890 gas chromatograph with a flame photometric detector	ALS – CAS, Kelso	No	Yes
T23	Bligh-Dyer	SOP No. SOC-LIPID, Percent Lipids in Tissue, Revision 2, 9/20/10	Definitive	Lipids	Analytical balance capable of weighing to the nearest 0.0001 g	ALS – CAS, Kelso	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T24	SM2540G Mod	SOP ID 2175 (W-001), Percent Solids Determination, Revision 2, 3/2/12	Definitive	Percent moisture	Analytical balance capable of weighing to the nearest 0.0001 g and a top-loading balance capable of weighing to the nearest 0.01 g	Alpha Analytical	No	Yes
T25	na	SOP ID 1754(No. G-003), Balance Calibration and Maintenance, Revision 2, 3/2/12	Definitive	Percent moisture	Analytical balance capable of weighing to the nearest 0.0001 g and a top-loading balance capable of weighing to the nearest 0.01 g	Alpha Analytical	No	Yes
T26	USEPA SW-846 8270D	SOP ID 2247 (O-008). Analysis of Parent and Alkylated Polynuclear Aromatic Hydrocarbons, Selected Heterocyclic Compounds, Steranes, Triterpanes, and Triaromatic Steroids by GC/MS – SIM, Revision 4, 8/10/12	Definitive	Alkylated PAHs	GC Model Agilent/HP6890 or equivalent, Mass spectrometer Agilent/HP5973 or equivalent	Alpha Analytical	No	Yes
T27	na	SOP ID 2247 (OP-009). Alumina Column Cleanup of Organic Extracts, Revision 4,8 /10/12	Definitive	Alkylated PAHs	Glass preparation column, muffle furnace, top-loading balance capable of weighing to the nearest 0.01 g	Alpha Analytical	No	Yes

QAPP Worksheet No. 23. Analytical SOP References Table

T28	na	Project-Specific Information on Processing Fish Tissue Samples	na	na	Glass or polyethylene cutting board; Black & Decker® food processor with small titanium blade; Osterizer® blender with large stainless steel blades; ceramic, stainless steel, or titanium knives; Omni-GLH grinding unit with stainless steel or titanium saw tooth probes; Janke & Kunkel IKA tissuemizer	Alpha Analytical	No[c]	Yes
T29	na	SOP ID 2264 (OP-018) Tissue extraction, Revision 2, 3/22/12	Definitive	Alkylated PAHs	Centrifuge, top-loading balance capable of weighing to the nearest 0.01 g, concentration apparatus	Alpha Analytical	No	Yes

[a] The SOP is attached to this QAPP addendum if it was updated by the laboratory after the Fish/Decapod QAPP (Windward 2009) was finalized; otherwise, the SOP is provided in Attachment T of the Fish/Decapod QAPP.

[b] The SOP incorporates changes requested by the Louis Berger Group Inc. as a result of its March 10, 2010, crab processing audit of Alpha Analytical, and is consistent with the SOP (Alpha Analytical's Tissue Preparation and Homogenization SOP, OP-003, Revision 3, 4/29/10) attached to Protocol Modification Form No. 11 to the Fish/Decapod QAPP (Windward 2009) provided in Appendix B of the *2009 Fish and Blue Crab Tissue chemistry Data for the Lower Passaic River Study Area* (Windward [in prep]). Alpha Analytical revised its SOP numbering system in 2012, and this SOP was updated in July 2012 with a new SOP reference number.

[c] This was originally presented as the Addendum to Attachment O (also Attachment T1) in the Fish/Decapod QAPP (Windward 2009); it has been modified for this QAPP addendum. The SOP incorporates changes (to the extent they are applicable to fish tissue) requested by the Louis Berger Group Inc. as a result of its March 10, 2010, crab processing audit of Alpha Analytical, as detailed in Protocol Modification Form No. 10 to Fish/Decapod QAPP (Windward 2009) in Appendix B of the *2009 Fish and Blue Crab Tissue Chemistry Data for the Lower Passaic River Study Area* (Windward [in prep]).

BRL – Ballistic Research Laboratory
CAS – Columbia Analytical Services, Inc.
HP – Hewlett Packard
HRGC – high-resolution gas chromatography
HRMS – high-resolution mass spectrometry
ICP – inductively coupled plasma
na – not applicable
OC – organic carbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
SGS – *Société Générale de Surveillance*
SOP – standard operating procedure
SVOC – semivolatile organic compound
QAPP – quality assurance project plan
USEPA – US Environmental Protection Agency

QAPP Worksheet No. 23. Analytical SOP References Table

QAPP Worksheet No. 24. Analytical Instrument Calibration Table

Instrument/ Chemical	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference[a]
GC/MS – SVOCs	Refer to Alpha Analytical SOP ID 2155 (O-006).	ICAL after instrument set up, after major instrument changes, and when CCC are not met	ICAL: ≤ 20% RSD for all target analytes or linear/quadratic curve r ≥ 0.990 ICV: ± 30% recovery of the true values. Sporadic marginal failures accepted. CCV: ≤ 40% difference or drift; SPCC minimum average RF.	Inspect system; correct problem; rerun calibration and affected samples.	Elizabeth Porta or Andy Cram (or alternate analyst), Alpha Analytical	T20

Note: Worksheet 24 of this QAPP addendum presents only calibration procedures that have been updated since the Fish/Decapod QAPP (Windward 2009) was finalized; all other calibration procedures are presented in Worksheet 24 of the Fish/Decapod QAPP (Windward 2009).

[a] From Analytical SOP References table (Worksheet No. 23 of this QAPP addendum).

CA – corrective action
CCC – continuing calibration criteria
CCV – continuing calibration verification
GC/MS – gas chromatograph/mass spectrometer
ICAL – initial calibration
ICV – initial calibration verification
ID – identification
RF – response factor
RSD – relative standard deviation
SIM – selective ion monitoring
SPCC – system performance check compounds
SVOC – semivolatile organic compound

QAPP Worksheet No. 35. Sampling and Analysis Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Analytical data deliverables	Verify that the required deliverables were provided by the laboratory as specified in the contractual documents.	Jennifer Parker, Windward/ Polly Newbold, ddms
IIa	Field SOPs, field records	Verify conformance to approved sampling and field measurement procedures, ensure that activities met performance criteria, and verify that deviations from procedures or criteria were documented.	Thai Do, Windward
IIa	Field records, database output	Verify transcription of field data from field forms to database.	Thai Do, Windward/Kim Goffman, Windward
IIa	Custody records, analytical data reports	Review traceability from sample collection through reporting.	Jennifer Parker, Windward/ Stella Cuenco, Laboratory Data Consultants, Inc.
IIa	Analytical data reports	Verify reported analytes conform to contractual specifications.	Jennifer Parker, Windward/ Polly Newbold, ddms
IIa	Laboratory SOPs, analytical data reports	Verify conformance to approved preparation and analytical procedures, ensure that measurement performance criteria were met, and verify that deviations from procedures or criteria were documented.	Jennifer Parker, Windward/Stella Cuenco, Laboratory Data Consultants, Inc.
IIa	Methods, analytical data reports	Verify that samples were prepared/analyzed within method-specific holding times.	Jennifer Parker, Windward/ Stella Cuenco, Laboratory Data Consultants, Inc.
IIa	Laboratory EDDs	Verify that EDD conforms to USEPA Region 2 MEDD format.	Ellen Collins, Alpha Analytical/ Kimberly Mace, SGS - Analytical Perspectives/Tiffany Stilwater, Brooks Rand Labs/ Ivana Vukovic, Maxxam Analytics/ Lynda Huckestein, ALS - Columbia Analytical Services, Inc.
IIa	Laboratory EDDs, analytical data reports, database output	Verify loading of EDDs into database against hard-copy analytical reports.	Polly Newbold, ddms
IIa	Analytical data reports	Verify that the qualifiers applied by the laboratory are defined in the analytical report and are in conformance to the contractual requirements.	Jennifer Parker, Windward/Polly Newbold, ddms

QAPP Worksheet No. 35. Sampling and Analysis Validation (Steps IIa and IIb) Process Table

IIa	Laboratory SOPs, analytical data reports	Verify that measurement criteria were met for all analyses and, if not, that appropriate corrective action and notification were taken and made.	Jennifer Parker, Windward/Polly Newbold, ddms
IIa	Analytical data reports	Verify that project QLs conformed to the contractual specifications and that deviations were justified.	Jennifer Parker, Windward/Polly Newbold, ddms
IIa	Analytical data reports, validation guidance	Validate 100% of the analytical data reports according to the method-specific Region 2 validation SOPs (if available). Qualifiers will be applied based on the criteria in the Region 2 validation SOPs or QAPP. Verify manual transcriptions from the raw data. Verify calculations from the raw data.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIa	Data validation reports, database output	Verify that entry of qualifiers was correct and complete.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	Analytical data reports	Verify reported analytes conform to target analytes in QAPP.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, analytical data reports	Verify that samples were prepared/analyzed within the holding times specified in the QAPP.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, analytical data reports	Verify that samples were prepared/analyzed according to the procedures specified in the QAPP.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, analytical data reports	Verify that the measurement criteria specified in the QAPP were met for all analyses, and, if not, that appropriate corrective action and notification were taken.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, analytical data reports	Verify that project QLs conformed to the QAPP and that deviations were justified.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	Analytical data reports, validation guidance	Validate 100% of the analytical data reports according to the measurement performance criteria in the QAPP. Qualifiers will be applied based on the criteria in the QAPP and method-specific Region 2 validation SOPs.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, analytical data reports, validation guidance	Verify that the qualifiers applied during validation were in conformance with the QAPP and specified validation guidance.	Stella Cuenco, Laboratory Data Consultants, Inc.
IIb	QAPP, data validation	Verify that data validation was performed in accordance with QAPP specifications and that all required peer reviews were conducted. If validation actions deviated from the QAPP specifications and/or	Jennifer Parker, Windward/

QAPP Worksheet No. 35. Sampling and Analysis Validation (Steps IIa and IIb) Process Table

	reports	regional validation guidance based on professional judgment, verify that rationale was documented.	Polly Newbold, ddms

ddms – de maximis Data Management Solutions, Inc.
EDD – electronic data deliverable
MEDD – multimedia electronic data deliverable
QAPP – quality assurance project plan
QL – quantitation limit
SOP – standard operating procedure
USEPA – US Environmental Protection Agency
Windward – Windward Environmental LLC

QAPP Worksheet No. 36. Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[a]	Data Validator (title and organizational affiliation)
IIa	Tissue	PCBs – congeners[b]	Low	Region 2 validation SOP HW-46	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	PCBs – congeners[b]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	PCBs – Aroclors[c]	Low	Region 2 validation SOP HW-45	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	PCBs – Aroclors[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	PCDDs/PCDFs[d]	Low	Region 2 validation SOP HW-25	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	PCDDs/PCDFs[d]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24,	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	OC pesticides[e]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	OC pesticides[e]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	PAHs[e]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	PAHs[e]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Alkylated PAHs[c]	Low	Fish/Decapod QAPP Worksheets Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.

QAPP Worksheet No. 36. Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

IIb	Tissue	Alkylated PAHs[c]	Low	Fish/Decapod QAPP Worksheets Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Metals[c]	Low	Region 2 validation SOP HW-2	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Metals[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Inorganic arsenic[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Inorganic arsenic[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Total mercury[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Total mercury[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Methylmercury[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Methylmercury[c]	Low	QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	SVOCs[c]	Low	Region 2 validation SOP HW-22	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	SVOCs[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Butyltins[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Butyltins[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.

QAPP Worksheet No. 36. Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

IIa	Tissue	Lipids[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Lipids[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIa	Tissue	Percent moisture[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.
IIb	Tissue	Percent moisture[c]	Low	Fish/Decapod QAPP Worksheet Nos. 12, 15, 19, and 24	Stella Cuenco, Senior Chemist, Laboratory Data Consultants, Inc.

[a] Validation follows the most recent *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA 2008b), *Contract Laboratory Program National Functional Guidelines for Chlorinated Dibenzo-*p*-dioxins and Chlorinated dibenzofurans Data Review* (EPA 2011), *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA 2010), and Region 2 modifications to the extent they are applicable. Validation includes professional judgment where appropriate and necessary.

[b] All data packages will be submitted for full validation (USEPA Level 4) of all 209 PCB congeners and homologues.

[c] One SDG or 20% of the data (whichever is greater) will be submitted for full validation, and the remaining SDGs will be submitted for reduced validation (USEPA Stage 2B). Validation for each analytical group will be limited to the target analytes in Worksheet No. 15 of the Fish/Decapod QAPP(Windward 2009) for that group.

[d] All data packages will be submitted for full validation (USEPA Level 4); validation will be limited to the 2,3,7,8-substituted congeners and homologues.

[e] All data packages will be submitted for full validation (USEPA Level 4). Validation for each analytical group will be limited to the target analytes in Worksheet No. 15 of the Fish/Decapod QAPP for that group.

OC – organic carbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
QAPP – quality assurance project plan
SOP – standard operating procedure
SVOC – semivolatile organic compound
SDG – sample delivery group
USEPA – US Environmental Protection Agency

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Attachment T: Laboratory SOPs

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