

FOOD WEB SAMPLING WORK PLAN GREATER LOS ANGELES AND LONG BEACH HARBOR WATERS

Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

CCMRP	Coordinated Compliance Monitoring and Reporting Plan
DDT	dichlorodiphenyltrichloroethane
DGPS	differential global positioning system
EDD	electronic data deliverable
EQuIS	Environmental Quality Information System
GC/MS	gas chromatography/mass spectrometry
HRGC/HRMS	high-resolution gas chromatography/high-resolution mass spectrometry
MLLW	mean lower low water
mm	millimeter
OEHHA	Office of Environmental Health Hazard Assessment
PCB	polychlorinated biphenyl
Ports	Ports of Long Beach and Los Angeles
PQAPP	Programmatic Quality Assurance Project Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SQO	Sediment Quality Objective
SWAMP	Surface Water Ambient Monitoring Program
TDDT	total dichlorodiphenyltrichloroethane
TMDL	total maximum daily load
TPCB	total polychlorinated biphenyl
WGS	World Geodetic System 1984
WRAP	Water Resources Action Plan

1 INTRODUCTION

The *Final Basin Plan Amendment*, an amendment to the *Water Quality Control Plan – Los Angeles Region to Incorporate the Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters* (RWQCB 2011) includes fish tissue and sediment total polychlorinated biphenyl (TPCB) and total dichlorodiphenyltrichloroethane (TDDT) numeric targets. A technically sound and logistically feasible management strategy for attaining these targets is needed due to the size and complexity of the Los Angeles/Long Beach Harbor, the widespread distribution of legacy pollutants within the region, and the potential ecological and financial costs associated with sediment remediation. To better understand how compliance with Harbor Toxics Total Maximum Daily Load (TMDL) targets may be achieved, the Ports of Long Beach and Los Angeles (Ports) are developing a bioaccumulation model as part of a Sediment Quality Objective (SQO) indirect effects Tier III assessment of the Los Angeles/Long Beach Harbor. The objectives of the bioaccumulation model are to develop a scientifically defensible link between fish contaminant concentrations and contaminant sources and provide the Ports with a tool to identify effective remediation options.

The Water Resources Action Plan (WRAP) Model will be used to understand the chemical fate and sediment transport mechanisms affecting polychlorinated biphenyl (PCBs) and dichlorodiphenyltrichloroethane (DDTs) in the Los Angeles/Long Beach Harbor and will be linked to the bioaccumulation model. In support of modeling efforts, analyses to support the development of conceptual site models for contaminant fate and bioaccumulation were performed and data gaps were identified, including surface sediment chemistry, food web tissue chemistry, and food web structure. Data collection to fill identified spatial gaps in surface sediment TPCB and TDDT concentrations within the Los Angeles/Long Beach Harbor are needed to minimize uncertainty for the WRAP Model calibration. Filling identified spatial and temporal gaps in TPCB and TDDT concentrations in biota tissue chemistry is needed to calibrate the bioaccumulation model for target fish species and their representative prey organisms. Additional information on the food web structure, or the trophic structure and dietary sources of representative species and their prey items, in the Los Angeles/Long Beach Harbor is also needed to inform the bioaccumulation model.

The conceptual site model for bioaccumulation (Anchor QEA 2014a) identified representative species of the harbor food web. Specifically, the bioaccumulation model will include a bottom-feeding predator (white croaker [*Genyonemus lineatus*]), a sport fish (California halibut [*Paralichthys californicus*]) whose diet is based on the pelagic portion of the food web, and a prey fish (shiner surfperch [*Cymatogaster aggregata*]). Invertebrates also have been chosen to represent deposit and water column feeders. Mussels will be used to represent water-column feeding organisms; polychaetes (i.e., worms) will be used to represent deposit feeders. Additional groups of organisms may also be included as part of future model development. Using this representative food web will allow for the simultaneous exposure of biota to water column and sediment sources of PCBs and DDTs.

This work plan has been designed to fill food web tissue chemistry data gaps specifically targeting fish and mussel TPCB and TDDT concentrations. Bioaccumulation in polychaetes is technically part of the food web program designed to address data gaps in the harbor food web; however, they are included in a separate work plan to co-locate sediment and polychaetes for purposes of direct comparison. Food web structure and diet also will be informed through aging and by conducting stable isotope analyses on collected fish.

The sampling approach discussed below was presented to the Harbor Technical Working Group on February 12, 2014, with updates provided on April 15, and was found to be acceptable (HTWG 2014a, 2014b).

1.1 Objectives

The purpose of this study is to fill key chemistry data gaps associated with biota in the harbor food web that are necessary for the parameterization and calibration of the WRAP and bioaccumulation models. Upon their development and calibration, the linked models will provide the Ports with a tool that can be used to assess the effectiveness of various sediment management alternatives at reducing TPCB and TDDT concentrations in target fish species.

1.2 Programmatic Quality Assurance Project Plan

A Programmatic Quality Assurance Project Plan (PQAPP; Appendix A) was developed to ensure high-quality data collection as part of compliance monitoring and special studies required by and in support of the Harbor Toxics TMDL. The PQAPP includes the following key elements that focus on analytical methods and data generated during a project:

- **Program Management.** This section identifies specific roles and responsibilities of data collectors and data managers and describes the sequence for processing, reducing, and storing field analytical data in an Environmental Quality Information System (EQuIS) database by the managing consultant.
- **Field Sampling Data Quality Objectives.** This section includes detailed information on field collection requirements, including sample processing, sample handling, sample identification codes, sample custody and shipping, field quality control (QC) sample requirements with associated performance criteria, field records, and field electronic data deliverable (EDD) requirements.
- **Laboratory Data Quality Objectives.** This section includes detailed information on analytical methods, analyte lists and reporting limits, laboratory QC sample requirements with associated performance criteria and corrective actions, laboratory record requirements, and laboratory EDD requirements.
- **Data Review, Verification, and Validation.** This section outlines procedures used to ensure that project data quality objectives are met.

The PQAPP was designed to be programmatic in nature and does not target any one study as it plans for both compliance monitoring and a variety of other Harbor Toxics TMDL-related sampling and analysis activities over the next 5 years. While the PQAPP complies with California Surface Water Ambient Monitoring Program (SWAMP) protocols and is SWAMP compatible, it is not written in the format of a SWAMP Quality Assurance Project Plan (QAPP). In addition, it does not include all elements of SWAMP QAPP guidance (SWRCB 2008). This format was not possible because not all special studies have been designed or contractors determined. Instead, the PQAPP states that elements SWAMP QAPP guidance relating to project-specific field collection requirements will be included in Sampling and Analysis Plans (SAPs) developed to support Harbor Toxics TMDL-related studies. The programmatic approach outlined in the PQAPP provides a uniform data

collection and management program for all Harbor Toxics TMDL-related studies that provides high-quality data and efficiencies by standardizing sample collection, nomenclature, analysis, data review/validation, processing, storage, management, and seamless data export to the Regional Monitoring Coalition and State of California databases, regardless of study type or contractors performing the work.

This work plan has been designed accordingly and incorporates relevant PQAPP elements and supplemental information specific to the compliance monitoring program in order to develop a single, all-inclusive, monitoring plan compatible with SWAMP QAPP requirements (SWRCB 2008).

1.3 Document Organization

The remainder of the document is organized as follows:

- **Section 2: Overview of Field Program.** This section presents the field sampling program for fishes and mussels.
- **Section 3: Laboratory Analytical Methods.** This section presents key analytes, methods, associated detection limits, and minimum requirements.
- **Section 4: Quality Assurance and Quality Control.** This section presents quality assurance (QA) and QC procedures associated with field sampling methods and chemical analyses.
- **Section 5: Data Analysis and Reporting.** This section presents data processing objectives and report requirements.
- **Section 6: References.** This section presents relevant citations or reference material.

2 OVERVIEW OF FIELD PROGRAM

The food web sampling program will consist of collecting the following representative fish species: white croaker, California halibut, and shiner Surfperch. Mussels, the representative water-column invertebrate species, will also be collected. While polychaetes are also part of the representative harbor food web, these species will be collected as part of the surface sediment sampling program (Anchor QEA 2014b). Station locations, with target coordinates and prescribed laboratory analyses, are summarized in Table 1. Details of the field program are presented in this section.

2.1 Target Species

2.1.1 Fish

Fish species targeted in this program are comprised of the three species targeted for compliance monitoring: white croaker, California halibut, and shiner surfperch.

White croaker and California halibut were selected as target species because individuals are abundant within the harbor and frequently caught and consumed by anglers in the area. In addition, both species contain elevated TPCB and TDDT concentrations. For white croaker, contaminant concentrations exceed fish consumption advisory tissue levels, and as a result, the Office of Environmental Health Hazard Assessment (OEHHA) recommends that white croaker caught from Ventura to San Mateo Point will not be eaten (OEHHA 2009). For California halibut, OEHHA recommends reduced servings due to TPCB and TDDT concentrations.

Shiner surfperch was selected because it is a representative prey species consumed by white croaker and California halibut, which are abundant within the harbor and are listed in OEHHA (2009) for reduced consumption in the region due to elevated TPCB and TDDT concentrations.

2.1.2 Mussels

Mussels will be collected as part of this program to represent filter-feeding organisms that derive most of their food from the water column. *Mytilus galloprovincialis* will be targeted

because they are abundant in Los Angeles/Long Beach Harbor (SAIC 2010) and are consumed by the representative predator species.

2.2 Station Locations

2.2.1 Fish

Fish sampling stations were selected from areas where data gaps in biota spatial and temporal trends were identified; sampling locations also were selected to represent a wide range of sediment TPCB and DDT concentrations based on existing data (Anchor QEA 2014a). Each fish species will be collected from four stations that were chosen to supplement the TMDL Compliance Monitoring Program for fish tissue chemical analysis. White croaker sampling is currently planned for summer 2014; sampling locations are depicted in Figure 1. In this program, California halibut and shiner surfperch will be collected from stations located in Consolidated Slip, Fish Harbor, Los Angeles Outer Harbor, and Inner Cabrillo Beach. White croaker will be collected from stations located in Fish Harbor, Los Angeles Inner Harbor (Seaplane Lagoon), Los Angeles Outer Harbor, and Inner Cabrillo Beach. The coordinates for target sampling locations are shown in Table 1. All locations shown in Figure 1 have been found to be acceptable by the Harbor Technical Working Group (HTWG 2014a).

The coordinates for fish sampling should be used to guide fish collection efforts; however, fish collection does not need to occur at the exact geographic coordinates provided in Table 1. Instead, guidelines have been established that allow for some flexibility in selecting the most appropriate fish collection area within each waterbody targeted for fish collection to improve the chances for success of the fish monitoring program. These guidelines are as follows:

- Fish collection should be targeted as close to the target sampling locations as practicable, while accounting for limitations in the sampling vessel due to size and draft as well as equipment type (e.g., trawl and seine) necessary for fish collection.
- Every effort should be taken to ensure that any particular trawl track (or alternative fish sampling technique) occurs near the proposed target sampling areas; however, a numerous factors (e.g., safe navigation around vessels and structures, wind, currents, and presence or absence of targeted fish species) may require the collection of fish in other sampling locations.

- If extensive efforts have been made and insufficient fish have been caught at the target sampling locations, all available resources, such as fish finders or echosounders, should be used to find an alternative sampling location that is as close to the original sampling location as practicable and is still within the waterbody specified (Figure 1).

Reasons for relocation will be noted in the field log, and fish collection efforts will be attempted at the secondary location.

2.2.2 Mussels

Mussel sampling stations were selected to be in proximity to locations with existing TPCB and TDDT data to fill temporal data gaps and proposed fish sampling locations. Target station locations are presented in Figure 1 and include four subareas within the harbor (Los Angeles Outer Harbor, Los Angeles Inner Harbor, Consolidated Slip, and Long Beach Inner Harbor). The coordinates for target sampling locations are shown in Table 1. Actual locations are flexible and dependent upon where mussel colonies are found during the field collection effort.

2.3 Sample Identification

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identification code
- Date and time of sample collection
- Preservative type (if applicable)
- Analysis to be performed

The sample nomenclature will include the identifiers listed below. A catalogue of identification codes is provided in Table 4 of the PQAPP (Appendix A).

- Waterbody or site (i.e., TMDL waterbody or other site in which sample was collected within each port jurisdiction)

- Media or sampling method code
- Organism code
- Organism or composite number
- Station number
- Date of collection

An example, the sample identification code for the second white croaker collected (fish fillet skin off) from Station 8 within Fish Harbor on July 31, 2014, is as follows:

FH-FF-WC-02-08-20140731

2.4 Sample Platform Requirements

A subcontractor will provide the sampling vessel and all equipment necessary for safe operation during sampling. The vessel shall conform to U.S. Coast Guard safety standards. The vessel will be equipped with the proper equipment for the safe deployment and retrieval of sampling gear, such as an A-frame and/or davit with an associated electrical or hydraulic winch system. An A-frame will be used for the deployment of fish sampling (e.g., trawl) gear. In addition, the vessel will have sufficient deck space for sample processing and water pumps available to aid in sample processing and cleaning of the deck and equipment between stations.

2.5 Navigation Requirements

On-vessel navigation and positioning will be accomplished using a differential global positioning system (DGPS). The navigation system will be used to guide the vessel to predetermined sampling locations, with an accuracy of plus or minus 10 feet. The coordinates of the actual sampling locations will be reported in latitude and longitude in decimal degrees (to five decimal places). Positions will be relative to the World Geodetic System 1984 (WGS84).

2.6 Recommended Collection Methods

Detailed collection methods are provided in the Coordinated Compliance Monitoring and Reporting Plan (CCMRP; Anchor QEA 2014c) and summarized below. Necessary permits

(e.g., scientific collection and incidental take) will be secured prior to collection. In addition, permit holders must notify the local California Department of Fish and Wildlife office prior to collection and submit a report of the animals taken under the permits within 30 days of the expiration date of the permits.

2.6.1 Fish

When possible, fish will be collected using a semi-balloon, 7.6-meter headrope otter trawl following the methods in the *Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Field Operations Manual* (BCEC 2008). If other methods need to be employed in the case an otter trawl is not feasible (e.g., lampara net, beach seine, fish trap, or hook and line), SWAMP methods will be used (CDFG 2001). The start and end time of each sampling event will be noted.

Once the catch is onboard the vessel, the targeted species will be identified and separated for subsequent processing. At each station, 10 individuals of each fish species will be collected for further processing. Pictures will be taken of all unidentifiable species or known species with irregularities. There is currently no legal size limit for white croaker. An ocean fish contaminant survey was performed from 2002 to 2004 (NOAA 2007), and collection of white croaker for the Harbor Toxics TMDL study will be consistent with this survey, which recommended a minimum length of 160 millimeters (mm; total length). Collection of California halibut of legal size limit is preferred. The current regulations specify at least 22 inches (or 559 mm total length) for California halibut (CDFG 2012); however, legal size halibut may not be abundant in the harbor in which case, the collection of juvenile halibut would be acceptable. Collection of adult shiner surfperch (i.e., second year age-class with a target length of 88 mm [Odenweller 1975]) is preferred. Additional individuals of the three target species and non-target species will be returned to the ocean as soon as possible to minimize loss. It will be noted that field personnel may encounter catch that are potentially harmful while sorting for targeted species. Safe handling procedures are detailed in the CCMRP (Anchor QEA 2014c).

Each targeted fish kept will be tagged with a unique identification code (see Section 3.3) and then measured for total length, fork length, and weight and examined for gross pathology in

accordance with guidance established in the *Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Field Operations Manual* (BCEC 2008).

Fish tissue submitted for analysis of chemical and physical parameters is shown in Tables 1 and 2. Processing and preservation will be performed in accordance with the methods described in the *Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Field Operations Manual* and *Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Bioaccumulation Workplan* (BCEC 2008, 2009). Briefly, fish will be processed in the field according to the following steps:

1. Place fish in a cooler with ice, leaving the whole body intact and keeping individuals from each sampling event in unique coolers labeled by date and location (e.g., three sampling locations on 1 day will have three coolers).
2. Remove six to 10 scales (as described in Section 2.7) from behind the origin of the left pectoral fin below the lateral line and place samples in a scale envelope labeled according to the sample.
3. Blot fish dry and pack each fish in aluminum foil (shiny side out).
4. Place each packed fish in a labeled, food grade, resalable plastic bag and store on ice.
5. Ship overnight to the analytical laboratory on wet or blue ice. If samples are held more than 24 hours, pack on dry ice.
6. Maintain chain-of-custody forms.

Organism dissection and tissue compositing will be conducted by the analytical laboratory. In addition to standard processing for skin-off fillets, the laboratory will follow the procedures described in Section 2.7. Offal will be submitted to a separate laboratory for otolith extraction and analysis.

2.6.2 Mussels

The recommended mussel collection methods are as consistent as possible with those used by the ongoing State Mussel Watch Program (SWRCB 2011). Due to their known abundance in the harbor the *M. galloprovincialis* will be targeted for collection (SAIC 2010); however, other species from the *Mytilus* genus may be collected and combined to form composites of

sufficient volume if *M. galloprovincialis* are not present. Other *Mytilus* species that may reside in the program area include *M. californianus* and possibly *M. trossulus* and *M. edulis*.

Mussels will be hand-collected from piers at low tide from a sampling vessel or via divers. If collection is conducted from a sampling vessel, it is recommended that sampling be conducted during the lowest tide of the month to maximize the mussels available for collection. If necessary, byssal threads may be cut to facilitate animal collection. Field personnel will wear Nitrile or latex gloves while collecting and handling organisms.

Sixty to 160 mussels (depending on size) will be collected at available locations (e.g., riprap and piers) within a 400-meter radius of each target station and a composite sampling location. The optimal size is 5 to 8 centimeters; however, if only smaller mussels (less than 1 centimeter) are available within the 400-meter radius of a station, then smaller mussels are acceptable but more organisms (up to 160) may be required to achieve sufficient mass for chemical analysis (see Section 3). Five composites will be collected and analyzed for each station. Each mussel will be measured (total shell length) and measurements recorded on field logs. The GPS coordinates of the midpoint of each location or station that a composite mussel sample represents will be recorded. In addition, if possible, the height of collection will be recorded as the height above the water level (documented to mean lower low water [MLLW]) from which mussels were collected. The species will be identified in the field log and temperature, salinity, and any other relevant observations will also be recorded at each site. Mussel shells will be rinsed free of debris with water at the site, wrapped in aluminum foil (shiny side out) and placed in labeled, plastic bags. Bags of mussels will be placed in a cooler with ice and shipped to the analytical laboratory within 2 days of collection.

2.7 Sample Processing

For white croaker, California halibut, and shiner surfperch, scales will be removed in the field in accordance with well-established methods (Chilton and Stocker 1987; Prentice and Dean 1991; Hoxmeier et al. 2001), prior to sending them to the analytical laboratory for processing. Specifically, the fish will be rinsed with site water, and the mucus and loose scales rubbed off. Then, using forceps, six to 10 scales on each side of the fish will be taken from the area behind the pectoral fin and below the lateral line. If a scale is not attached, it

will be discarded and not saved for analysis. The scales to be saved will be rinsed free of dirt and mucus using site water and placed in a scale envelope to dry. Scales will not be stacked within the envelope, and envelopes will be placed in a well-ventilated container and sent to the analytical laboratory. California halibut and white croaker scales will be archived, as a backup for otolith analyses. Shiner surfperch scales will be analyzed for age and growth rate because otoliths will not be removed from this species. Additional details on scale removal for age and growth rate analysis are provided in the Standard Operating Procedure in Appendix B.

The remaining sample processing steps will occur at the analytical laboratory. The laboratory will prepare skin-off fillets, excluding ribs and stomach tissue, and the offal (fish tissue remaining after removal of skin-off fillet) will be saved for additional chemistry or otolith analysis. Specifically, for California halibut and white croaker, up to nine offals per station (assuming 10 fish caught per station), will be sent to a laboratory for extraction and analysis of the sagittal otoliths to determine approximate age and growth rate of each fish. One California halibut and white croaker offal per station will be homogenized by the laboratory and analyzed for the analytes listed in Tables 1 and 2.

For shiner surfperch, up to nine fish per station will be submitted to the laboratory (after removal of the scales) and the whole body will be homogenized prior to chemical analysis. The fillet and offal from one fish per station will be analyzed for the analytes listed in Tables 1 and 2.

Mussels will be shucked at the analytical laboratory, and only the soft tissue will be analyzed for the parameters listed in Tables 1 and 2.

2.8 Analysis Approach

All composited and/or homogenized fish and mussel tissue samples will be analyzed for percent lipids, total solids, PCBs, DDT compounds, and stable isotopes of carbon and nitrogen, as listed in Tables 1 and 2. Results are to be reported uncorrected for lipids or total solids.

2.9 Waste Disposal

All disposable sampling materials and personal protective equipment used in sample collection and processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies will be removed from the site by sampling personnel and placed in a normal refuse container for disposal as solid waste.

After target fish have been collected, the remaining catch will be returned to the sea. Dead specimens will be discarded offshore, outside the breakwater.

3 LABORATORY ANALYTICAL METHODS

Tissue samples will be analyzed for PCBs by high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS), lipids, low-resolution DDTs, stable isotopes of carbon and nitrogen, and total solids. A subset of tissue samples will also be analyzed for PCBs using low-resolution gas chromatography/high-resolution mass spectrometry (GC/MS), as indicated in Table 1. If insufficient sample mass is collected, the priority for analyses will be PCBs, lipids, DDTs, stable isotopes, and then total solids. However, the Ports will be consulted prior to analysis if there is limited mass. Tissue analytes, analytical methods, and target reporting limits are listed in Table 2. Physical and chemical analyses will be conducted at accredited facilities. Samples for stable isotope analysis may require additional preparation steps prior to submission for analysis. Offal samples planned for otolith analysis will be frozen and submitted by the analytical laboratory to the otolith laboratory within a few days of collection. All samples will be maintained according to the appropriate holding times and temperatures for each analysis as listed in Table 3. The laboratory will prepare detailed reports in accordance with Section 4.4 of the PQAPP (Appendix A). See Section 4 of the PQAPP for more information regarding analytical methods.

4 QUALITY ASSURANCE/QUALITY CONTROL

Field and laboratory QA/QC requirements are described in detail in Sections 3 and 4 of the PQAPP (Appendix A). Field (homogenization) duplicates are to be collected at a frequency of 5 percent, or one per 20 samples processed. Laboratory QA/QC definitions and frequencies are summarized in Tables 4 and 5, respectively. Data quality objectives were derived from SWAMP guidance (SWRCB 2008) and are summarized in Table 6.

5 DATA ANALYSIS AND REPORTING

At a minimum, the Sampling and Analysis Report (SAR) will detail the sample collection and analytical methods used to generate project data, any deviations from the SAP, a summary of the data validation evaluation, and a summary of fish and mussel tissue chemistry results. Results from the study will be presented in a manner to facilitate peer and agency review and acceptance.

To facilitate data validation and management for the Ports' TMDL program, field and analytical EDDs will be provided to the Ports as specified in Sections 3.3.2.3 and 4.5 of the PQAPP (Appendix A). Briefly, field data collection, including observations, field measurements, and sample generation, will be compiled into a field EDD generated from the custom field application or field collection logs and provided to the Ports in an electronic format. A template for the field EDD will be provided to the contractor upon request. Final, validated analytical EDDs will be provided to the Ports in a pre-specified custom EQUIS EDD format. The Ports' contractor may request analytical laboratory EDDs in any format as long as final data sent to the Ports' data manager is provided in the custom EQUIS EDD format described in the PQAPP. At the time of submittal of the final, validated analytical and field EDDs, the laboratory reports (in PDF format) associated with analytical data should also be provided to the Ports' data manager.

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TABLES

Table 1
Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Station ID	Sample ID ^a	Proposed Coordinates ^{b,c}		Target Species	Tissue for Age and Growth	Tissue(s) for Chemical Analysis ^d	Primary Analytes	Additional Analytes	Notes
			Latitude	Longitude						
Food Web Sampling Tissue Collection Program										
Los Angeles Outer Harbor (inside breakwater)	01	OA-ST-MS-COMP1-01-YYYYMMDD	33.70885	-118.27505	Mussel		Soft tissue	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		5 composite samples of 60 to 160 mussels in each composite will be analyzed
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-01-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	Field team will collect scales from shiner surfperch and submit to laboratory for age and growth analysis
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-01-06-YYYYMMDD	33.71377	-118.23915			Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-02-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-03-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-04-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-05-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-06-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-07-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-08-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-09-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-SS-10-06-YYYYMMDD	33.71377	-118.23915	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-01-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-01-06-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-02-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from California halibut and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-03-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-04-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-05-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-06-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-07-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-08-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-09-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-CH-10-06-YYYYMMDD	33.71377	-118.23915	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-01-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-01-06-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Entire offal submitted for chemical analysis on this fish; no otolith analysis
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-02-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from white croaker and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis
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Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-05-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-06-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
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Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Station ID	Sample ID ^a	Proposed Coordinates ^{b,c}		Target Species	Tissue for Age and Growth	Tissue(s) for Chemical Analysis ^d	Primary Analytes	Additional Analytes	Notes	
			Latitude	Longitude							
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-08-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from white croaker and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis	
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-09-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Outer Harbor (inside breakwater)	06	OA-XX-WC-10-06-YYYYMMDD	33.71377	-118.23915	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	02	IA-ST-MS-COMP1-02-YYYYMMDD	33.75357	-118.26755	Mussel		Soft tissue	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		5 composite samples of 60 to 160 mussels in each composite will be analyzed	
Los Angeles Inner Harbor	07	IA-XX-WC-01-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)		
Los Angeles Inner Harbor	07	IA-XX-WC-01-07-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Entire offal submitted for chemical analysis on this fish	
Los Angeles Inner Harbor	07	IA-XX-WC-02-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from white croaker and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis	
Los Angeles Inner Harbor	07	IA-XX-WC-03-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-04-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-05-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-06-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-07-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-08-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-09-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Inner Harbor	07	IA-XX-WC-10-07-YYYYMMDD	33.74062	-118.24907	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Harbor - Consolidated Slip	03	CS-ST-MS-COMP1-03-YYYYMMDD	33.77578	-118.24398	Mussel		Soft tissue	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			5 composite samples of 60 to 160 mussels in each composite will be analyzed
Los Angeles Harbor - Consolidated Slip	03	CS-XX-SS-01-03-YYYYMMDD	33.77578	-118.24398	Shiner Surfperch	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-SS-01-03-YYYYMMDD	33.77578	-118.24398			Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
Los Angeles Harbor - Consolidated Slip	03	CS-XX-SS-01-03-YYYYMMDD	33.77578	-118.24398	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from shiner surfperch and submit to laboratory for age and growth analysis	
Los Angeles Harbor - Consolidated Slip	03	CS-XX-SS-02-03-YYYYMMDD	33.77578	-118.24398	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
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Los Angeles Harbor - Consolidated Slip	03	CS-XX-SS-08-03-YYYYMMDD	33.77578	-118.24398	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes			
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Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-01-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-01-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Scales	Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Entire offal submitted for chemical analysis on this fish; no otolith analysis	

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Waterbody or Area	Station ID	Sample ID ^a	Proposed Coordinates ^{b,c}		Target Species	Tissue for Age and Growth	Tissue(s) for Chemical Analysis ^d	Primary Analytes	Additional Analytes	Notes
			Latitude	Longitude						
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-02-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from California halibut and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-03-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-04-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-05-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-06-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-07-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-08-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-09-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Los Angeles Harbor - Consolidated Slip	03	CS-XX-CH-10-03-YYYYMMDD	33.77578	-118.24398	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	04	IB-ST-MS-COMP1-04-YYYYMMDD	33.75222	-118.23603	Mussel		Soft Tissue	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		5 composite samples of 60 to 160 mussels in each composite will be analyzed
Long Beach Inner Harbor	05	IB-XX-SS-01-05-YYYYMMDD	33.75040	-118.23358	Shiner Surfperch	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	Field team will collect scales from shiner surfperch and submit to laboratory for age and growth analysis
Long Beach Inner Harbor	05	IB-XX-SS-01-05-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-SS-02-05-YYYYMMDD	33.75040	-118.23358	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-SS-03-05-YYYYMMDD	33.75040	-118.23358	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-SS-04-05-YYYYMMDD	33.75040	-118.23358	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
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Long Beach Inner Harbor	05	IB-XX-WC-03-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-04-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-05-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-06-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-07-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-08-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-09-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Long Beach Inner Harbor	05	IB-XX-WC-10-05-YYYYMMDD	33.75040	-118.23358	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Fish Harbor	08	FH-XX-SS-01-08-YYYYMMDD	33.73413	-118.26663	Shiner Surfperch	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	
Fish Harbor	08	FH-XX-SS-01-08-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Fish Harbor	08	FH-XX-SS-02-08-YYYYMMDD	33.73413	-118.26663	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Fish Harbor	08	FH-XX-SS-03-08-YYYYMMDD	33.73413	-118.26663	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Fish Harbor	08	FH-XX-SS-04-08-YYYYMMDD	33.73413	-118.26663	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
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Fish Harbor	08	FH-XX-SS-06-08-YYYYMMDD	33.73413	-118.26663	Shiner Surfperch	Scales	Whole body	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
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Fish Harbor	08	FH-XX-CH-01-08-YYYYMMDD	33.73413	-118.26663	California Halibut	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	Entire offal submitted for chemical analysis on this fish; no otolith analysis
Fish Harbor	08	FH-XX-CH-01-08-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
Fish Harbor	08	FH-XX-CH-02-08-YYYYMMDD	33.73413	-118.26663	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from California halibut and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis
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Fish Harbor	08	FH-XX-CH-10-08-YYYYMMDD	33.73413	-118.26663	California Halibut	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		

Table 1
Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Station ID	Sample ID ^a	Proposed Coordinates ^{b,c}		Target Species	Tissue for Age and Growth	Tissue(s) for Chemical Analysis ^d	Primary Analytes	Additional Analytes	Notes
			Latitude	Longitude						
Fish Harbor	08	FH-XX-WC-01-08-YYYYMMDD	33.73413	-118.26663	White Croaker	Scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes	PCBs (low resolution)	
Fish Harbor	08	FH-XX-WC-01-08-YYYYMMDD					Offal	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Entire offal submitted for chemical analysis on this fish; no otolith analysis
Fish Harbor	08	FH-XX-WC-02-08-YYYYMMDD	33.73413	-118.26663	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		Field team will collect scales from white croaker and submit to lab for archive; Analytical laboratory will freeze offal after removing Skin-off fillets and send immediately to the analytical lab for otolith extraction and analysis
Fish Harbor	08	FH-XX-WC-03-08-YYYYMMDD	33.73413	-118.26663	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		
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Fish Harbor	08	FH-XX-WC-10-08-YYYYMMDD	33.73413	-118.26663	White Croaker	Sagittal otoliths, scales	Skin-off fillets	PCBs (high resolution), DDX, lipid, total solids, C/N stable isotopes		

Notes:

C/N = carbon/nitrogen

DDX = dichlorodiphenyltrichloroethane derivatives

PCBs = polychlorinated biphenyls

a The "XX" in the sample ID should be replaced with the letters representing each tissue analyzed: FF = skin-off fillet, OF = offal, WO = whole organism, OL = otolith, SC = scale.

b Coordinates are listed as target locations; actual locations may vary depending on conditions and substrate.

c Coordinates are shown in decimal degrees, World Geodetic System 1984 (WGS84)

d Skin-off fillets prepared by the laboratory should exclude ribs and stomach tissue.

Table 2
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^{b,c}	Target Reporting Limit ^d
Conventionals (%)		
Lipids	NOAA 1993a / Gravimetric	0.5
Total solids (% wet weight)	SM 2540G / USEPA 160.3	0.1
Organochlorine Pesticides (ng/g or µg/kg wet weight) - Low Resolution Analytical Methods		
2,4'-DDD	USEPA 8081A / 8270C / 8270D TQ	4.0
2,4'-DDE	USEPA 8081A / 8270C / 8270D TQ	4.0
2,4'-DDT	USEPA 8081A / 8270C / 8270D TQ	6.0
4,4'-DDD	USEPA 8081A / 8270C / 8270D TQ	4.0
4,4'-DDE	USEPA 8081A / 8270C / 8270D TQ	4.0
4,4'-DDT	USEPA 8081A / 8270C / 8270D TQ	10.0
4,4'-DDMU	USEPA 8081A / 8270C / 8270D TQ	10.0
Stable Isotopes		
¹³ C/ ¹² C and ¹⁵ N/ ¹⁴ N	EA-IRMS	N/A
PCB Congeners (ng/g or µg/kg)^e - High Resolution Analytical Methods		
All 209 PCB congeners	USEPA 1668	0.001
PCB Congeners (ng/g or µg/kg)^e - Low Resolution Analytical Methods		
All 209 PCB congeners	USEPA 8270C / 8270D	0.4

Notes:

µg/g = micrograms per gram

CFR = Code of Federal Regulations

EA-IRMS = Elemental Analysis - Isotope Ratio Mass Spectrometry

EDL = estimated detection limit

MDL = method detection limit

N/A = not applicable

ng/g = nanograms per gram

PCB = polychlorinated biphenyl

QA/QC = quality assurance/quality control

QAPP = Quality Assurance Project Plan

USEPA = U.S. Environmental Protection Agency

a Data will be reported uncorrected for lipids or moisture content.

b Laboratory reporting limits are revised periodically and may change over the duration of this project. Reporting limits should be verified by each laboratory when writing Sampling and Analysis Plans.

c Laboratories may use different versions of recommended methods (i.e., USEPA 8270C) as long as the quality assurance/quality control (QA/QC) elements identified in this QAPP are met.

d Matrix interference, total solid concentrations, and/or dilutions due to non-target analytes may increase actual reporting limits. The MDL should be at least three times lower than the reporting limit (40 CFR Part 136) but will vary per instrument by MDL study.

e PCB co-elutions will vary by instrument and column, and may increase reporting limits for some congeners.

Table 3
Sample Containers, Holding Times, and Preservation Methods

Parameter	Sample Size		Container Size and Type	Holding Time	Preservative
	Ideal	Minimum			
Tissues					
Lipids	200 g	10 g	Foil or 8-oz glass	1 year	Freeze -20°C
Total Solids	50 g	10 g		1 year	Freeze -20°C
DDX	200 g	15 g		14 days to extraction	Cool ≤6°C
				1 year to extraction; samples must be extracted within 14 days of thawing	Freeze -20°C
				40 days after extraction	Cool ≤6°C
PCB Congeners ^a	200 g	15 g		None ^b	Cool ≤6°C
			Freeze -20°C		
Stable isotopes	2 g	2 g	Contact laboratory for container type	None established	Cool ≤6°C
Otolith (from offal)	2 from each fish		Foil	3 days ^c	Freeze (-20°C) and ship immediately to otolith laboratory to avoid shrinkage
Scales	4 to 5 scales from each side of fish		Fish scale envelope		Allow scale envelopes to dry and store in a well-ventilated container

Notes:

Some criteria may differ from SWAMP guidance; however, criteria are consistent with analytical methods.

Recommendations are intended as guidance only. The selection of sample container and amount of sample required may vary per contracted laboratory sampling requirements.

°C = degrees Celsius

DDX = dichlorodiphenyltrichloroethane derivatives

g = gram

mL = milliliter

oz = ounce

PCB = polychlorinated biphenyl

SWAMP = California Surface Water Ambient Monitoring Program

a The minimum mass should be doubled if both high resolution and low resolution GC/MS methods are to be used; this applies to a subset of fish tissue samples.

b PCB hold time was removed in SW-846, Chapter 4, Revision 4, February 2007 for aqueous and solid samples stored cool ≤6°C.

c Targeted hold time for otolith extraction is 3 days from collection in order to avoid shrinkage.

Table 4
Laboratory Quality Assurance/Quality Control Definitions

Laboratory Quality Control	Definition
Calibration	A comparison of a measurement standard, instrument, or item with one having higher accuracy to detect, quantify, and record any inaccuracy or variation; the process by which an instrument setting is adjusted based on response to a standard to eliminate the inaccuracy.
Certified/Standard Reference Material	A substance whose property values are certified by a procedure that establishes its traceability and uncertainty at a stated level of confidence.
Continuing Calibration Verification	A periodic standard used to assess instrument drift between calibrations.
Internal Standard	Pure analyte(s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes that are components of the same sample or solution. The internal standard must be an analyte that is not a sample component.
Laboratory Duplicate	Two or more representative portions taken from one homogeneous sample by the analyst and analyzed in the same testing facility.
Laboratory Control Sample	A specimen of known composition prepared using contaminant-free reagent water, or an inert solid, which is spiked with the analyte of interest at the midpoint of the calibration curve or at the level of concern, and then analyzed using the same preparation, reagents, and analytical methods employed for regular specimens and at the intervals set in the Quality Assurance Project Plan.
Matrix Spike	A test specimen prepared by adding a known concentration of the target analyte to a specified amount of a specific homogenized specimen where an estimate of the target concentration is available and subjected to the entire analytical protocol.
Matrix Spike Duplicate	A sample prepared simultaneously as a split with the matrix spike sample with each specimen being spiked with identical, known concentrations of targeted analyte.
Method Blank	A blank prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.
Sample Batch	Twenty or fewer field samples prepared and analyzed with a common set of quality assurance samples.
Surrogate	A pure substance with properties that mimics the analyte of interest (organics only) and which is unlikely to be found in environmental samples. It is added into a sample before sample preparation.

Table 5
Frequencies for Laboratory Quality Assurance/Quality Control Samples

Analysis Type	Initial Calibration^{a,b}	Continuing Calibration Verification	LCS or SRM^c	Duplicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Internal Standard
Total solids	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Lipids	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Stable isotope	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
PCB Congeners by low resolution method	As needed	Every 12 hours	1 per 20 samples or 1 per batch	1 per 20 samples ^d	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample
PCB Congeners by high resolution method	As needed	Every 12 hours	1 per 20 samples	1 per 20 samples ^d	N/A ^e	N/A ^e	1 per 20 samples	N/A ^e	Every sample
DDX by low resolution method	As needed	Per 10 analytical runs	1 per 20 samples or 1 per batch	1 per 20 samples ^d	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample

Notes:

Primary column is considered the column that contains the highest value with the least interference. Values should have RPDs less than 40 percent or they are P flagged.

ICALS = 20 percent or less and CCALS = 15 percent or less.

DDX = dichlorodiphenyltrichloroethane derivatives

LCS = Laboratory control sample

N/A = not applicable

SRM = standard reference material

PCB = polychlorinated biphenyl

a For physical tests, calibration and certification of drying ovens and weighing scales are conducted annually.

b Calibrations should be conducted per analytical methods or instrument manufacturers specifications.

c When a Standard Reference Material is not available, an LCS will be analyzed.

d A laboratory duplicate or homogenization duplicate is to be analyzed by the lab in place of a field duplicate.

e Isotope dilution quantitation technique accounts for matrix interferences thus MS/MSD are not required.

Table 6
Laboratory and Reporting Data Quality Objectives

Parameter	Precision^a	Accuracy^b	Completeness^c
Tissues			
Lipids	± 25% RPD	N/A	90%
Total solids	± 25% RPD	N/A	90%
Stable isotope	± 25% RPD	N/A	90%
DDX ^d	± 25% RPD	50-150% R	90%
PCB Congeners ^d	± 25% RPD	50-150% R	90%

Notes:

CRM = certified reference material

DDX = dichlorodiphenyltrichloroethane derivatives

PCB = polychlorinated biphenyl

R = recovery

RPD = relative percent difference

a Not applicable if native concentration of either sample is less than five times the reporting limit. In these situations, the difference between the sample result and duplicate result must be within ± 2 times the reporting limit.

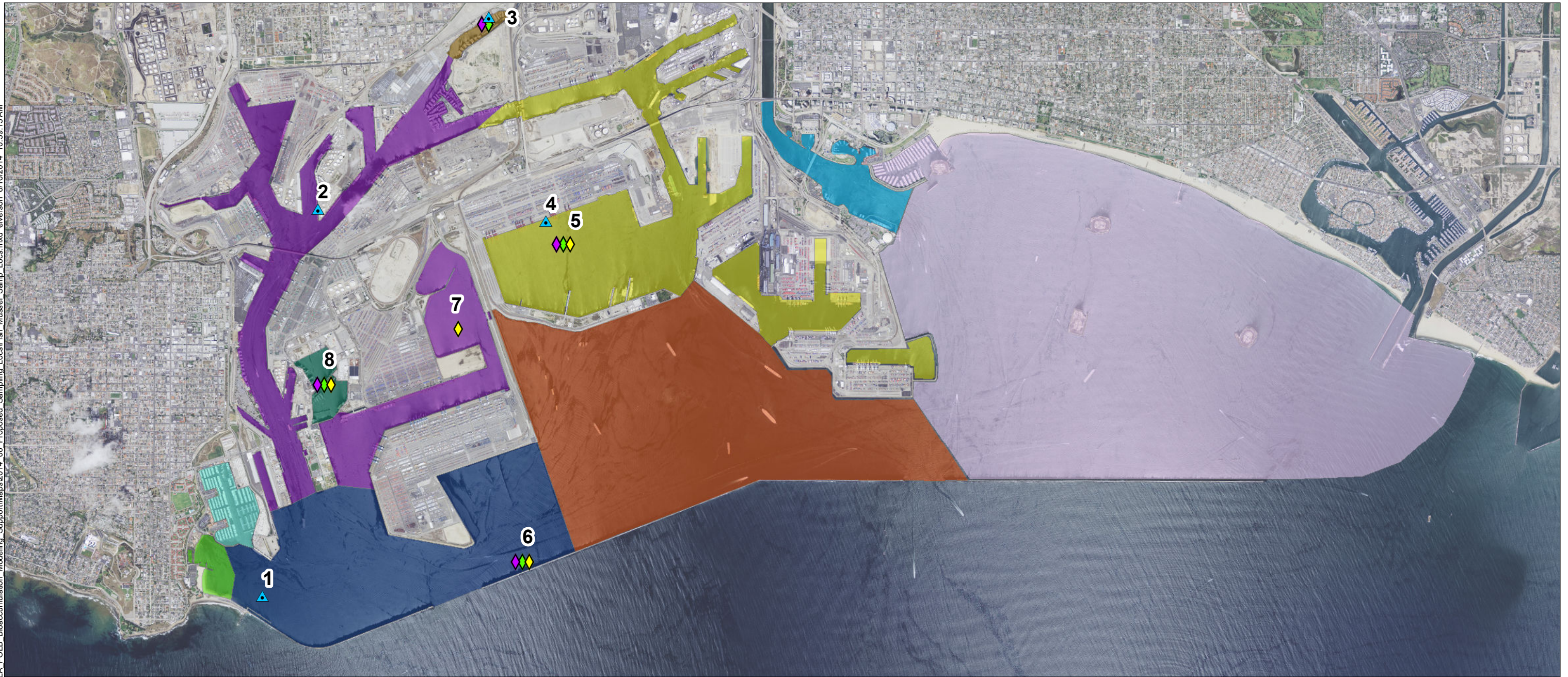
b Laboratory control sample, CRMs, and matrix spike/matrix spike duplicate percent recovery.

c Percent of each class of analytes that are not rejected after data validation conducted in accordance with the Technical Support Manual (Bay et al. 2009).

d The accuracy goal is 70 to 130% R if certified reference material is used.

FIGURE

\\nrcas\gis\jobs\120711-01_Port of Los Angeles\POLA_PO LB_Bioaccumulation_Modeling_Support\Maps\2014_06_Proposed_Sampling_Locs\Fish_Mussel_Samp_Locs.mxd everson 6/16/2014 10:59:15 AM



TMDL Waterbodies

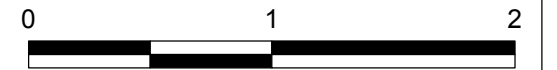
- East San Pedro Bay
- Fish Harbor
- Long Beach Inner Harbor
- Long Beach Outer Harbor (inside breakwater)
- Los Angeles Harbor - Cabrillo Marina

- Los Angeles Harbor - Consolidated Slip
- Los Angeles Harbor - Inner Cabrillo Beach Area
- Los Angeles Inner Harbor
- Los Angeles Outer Harbor (inside breakwater)
- Los Angeles River Estuary (Queensway Bay)

- Mussel Sampling Location
- California Halibut Sampling Location
- Shiner surfperch Sampling Location
- White Croaker Sampling Location



Miles



DRAFT



Figure 1
Fish and Mussel Sampling Locations
Food Web Sampling Workplan
Greater Los Angeles and Long Beach Harbor Waters

APPENDIX A
PROGRAMMATIC QUALITY ASSURANCE
PROJECT PLAN

DRAFT PROGRAMMATIC QUALITY ASSURANCE PROJECT PLAN SUPPORTING COMPLIANCE MONITORING AND SPECIAL STUDIES RELATED TO THE HARBOR TOXICS TOTAL MAXIMUM DAILY LOAD

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DOCUMENT TITLE

Draft Programmatic Quality Assurance Project Plan Supporting Compliance Monitoring and Special Studies Related to the Harbor Toxics Total Maximum Daily Load

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LIST OF ACRONYMS AND ABBREVIATIONS

ADR	Automated Data Review
CLP	Contract Laboratory Program
COC	chain-of-custody
DQO	data quality objective
eCOC	electronic chain-of-custody
EDD	Electronic Data Deliverable
EDL	estimated detection limit
Harbor Toxics TMDL	<i>Final Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Load</i>
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
LOD	limit of detection
MDL	method detection limit
MRL	method reporting limit
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
POLA	Port of Los Angeles
POLB	Port of Long Beach
Ports	Ports of Long Beach and Los Angeles
PQAPP	Programmatic Quality Assurance Project Plan
PTFE	polytetrafluoroethylene
QA	quality assurance
QC	quality control
SAP	Sampling and Analysis Plan
SQO	Sediment Quality Objective
SOP	standard operating procedure
SWAMP	Surface Water Ambient Monitoring Program
TMDL	total maximum daily load
USEPA	U.S. Environmental Protection Agency

1 INTRODUCTION

This section includes an overview of the *Final Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Load* (Harbor Toxics TMDL; RWQCB and USEPA 2011), a brief description of studies required to support its implementation, and the rationale and intent of a Programmatic Quality Assurance Project Plan (PQAPP) for ensuring data quality as part of upcoming TMDL compliance monitoring studies and other special studies.

1.1 Background

The Harbor Toxics TMDL has been established to protect marine life and minimize human health risks from the consumption of fish in the Los Angeles and Long Beach Harbor and adjacent waterbodies. The Harbor Toxics TMDL includes annual contaminant limits in surface sediment, stormwater effluent, and fish tissues in these waterbodies. These limits are defined as target loads or concentrations for compliance by 2032 within the Harbor Toxics TMDL. The City of Los Angeles (including the Port of Los Angeles [POLA]) and the City of Long Beach (including the Port of Long Beach [POLB]) are identified in the Harbor Toxics TMDL as two of the responsible parties. Consequently, the Ports of Long Beach and Los Angeles (Ports) are responsible, together with other stakeholders, for complying with the Harbor Toxics TMDL and ultimately identifying and reducing sediment and fish tissue concentrations in harbor waters to levels that do not cause further social or environmental harm.

To assist with the long-term goal of compliance, the Harbor Toxics TMDL includes a phased Implementation Plan that specifies implementation actions required to meet the goals of the total maximum daily load (TMDL). Implementation will be iterative, and information acquired during each phase of implementation will be used to inform later phases. The Harbor Toxics TMDL requires that the first phase of implementation include the development and initiation of the required compliance monitoring program. Monitoring must be initiated in May 2014 at specific locations and frequencies for water column chemistry (annually), sediment chemistry (every 2 years), Sediment Quality Objectives (SQO) evaluation (every 5 years), and fish tissue chemistry (every 2 years). Specific locations and analytes to be monitored are provided in Section 7.6.2 of the Harbor Toxics TMDL and

will be detailed in the Coordinated Compliance Monitoring and Reporting Plan. The Harbor Toxics TMDL also states that “All samples will be collected in accordance with California Surface Water Ambient Monitoring Program (SWAMP) protocols.”

In addition to compliance monitoring as part of Phase I implementation, the Ports’ plan to perform special studies to support TMDL compliance and site-specific management strategies and their implementation, which are required as part of Phases II and III of implementation activities. Planned special studies have been designed to determine causes of elevated fish tissue concentrations (e.g., site-specific harbor sediments, ongoing sources, and off-site regional sources) and the necessary reductions of these sources that will effectively reduce fish tissue concentrations. To identify these causes, the Ports’ plan includes using scientific- and data-based models of the conditions in the harbor and the food web. Specifically, hydrodynamic, sediment transport, chemical fate, and bioaccumulation models will be integrated and used to evaluate the effectiveness of specific remedial actions and the impact of out-of-harbor sources (e.g., Palos Verdes Shelf). Calibration and validation of these models will require the collection of physical, chemical, and biological data to fill current data gaps.

1.2 Rationale and Intent of the Programmatic Quality Assurance Project Plan

A PQAPP is necessary to support all sampling and analysis activities planned as part of either the required compliance monitoring or the special studies needed to support model development. Specifically, the intent of this PQAPP is to:

- Provide a user-friendly QAPP that will provide consistency and will result in cost savings through the use of a standardized, pre-defined data collection and reporting process, which can be easily followed by contractors performing monitoring or other special studies for the Ports.
- Provide necessary procedures to ensure that data collection and analysis is standardized, efficient, and of high quality, regardless of study type or the contractors/subcontractors involved in data collection, testing, or analysis.
- Ensure that all field and laboratory data are defensible and meet specified data quality objectives (DQOs), which are based on the (Surface Water Ambient Monitoring Program (SWAMP) protocols (SWRCB 2008), U.S. Environmental Protection Agency

(USEPA) SW-846 (2004), and USEPA National Functional Guidelines data validation criteria (1999, 2004b, 2005, 2008), and other applicable analytical method guidance.

- Outline data management steps that will allow for quality-ensured, integrated, and efficient data management, including importing collected data to an EQuIS database, processing, and exporting to the Ports and agency databases.

Given the extent and variety of sampling and analysis activities planned for the next 5 years, it is essential that this PQAPP be programmatic in nature and not target one study. Each study is anticipated to have its own Sampling and Analysis Plan (SAP) specifying study-specific details that have not yet been defined. This programmatic approach will allow for an overall data collection program that provides high quality data and is highly efficient due to standardization of sample collection, nomenclature, analysis, data review/validation, processing, storage, management, and seamless data export to Ports and State databases, regardless of study type or contractors performing the work. Consequently, while this PQAPP complies with SWAMP protocols and is SWAMP compatible, it is not written in the format of a SWAMP QAPP with elements specified as A1 through D3. This format is not possible, because sampling and analysis details (i.e., equipment and instrument types) will vary by study type and contractor, which have not been identified at this time. Those elements not covered in this document will be covered in the Coordinated Compliance Monitoring and Reporting Plan and in every SAP associated with a special study. Table 1 summarizes the recommended SWAMP QAPP elements and indicates whether each element is included in this PQAPP or will be included in the corresponding Compliance Monitoring and Reporting Plan or special study SAPs.

1.3 Updates

The intent of this PQAPP is to ensure data quality as part of all sampling and analysis activities associated with compliance monitoring or special studies mentioned above.

Updates to this document may be required to address any unanticipated special studies with methods currently not described herein, improvements in analytical methods or detection limits over time, or changes associated with monitoring requirements that may occur as part of the TMDL reopener process.

2 PROGRAM MANAGEMENT

This section identifies specific roles and responsibilities of team members and describes the process through which field and analytical data will be processed, reduced, and stored in an EQulS database. A project organization chart is presented as Figure 1.

2.1 Roles and Responsibilities

Specific roles and responsibilities of project managers, data managers, and laboratory project managers are shown on Figure 1. The contact information for key members of the TMDL Study Team are provided in Table 2.

2.1.1 Project Managers

The Ports' project managers will be responsible for project administration and will serve as the lead contacts for TMDL compliance monitoring and TMDL-related special studies. The Ports' project managers will also serve as the point of contact between the Ports and the consulting team and will manage all project activities.

The TMDL Study project manager will be responsible for:

- Managing the overall TMDL program
- Ensuring the project and the Ports' objectives are met throughout project activities
- Coordinating internal communications with the Ports, the Ports' contractors, the data manager, and the quality assurance (QA) manager
- Overseeing all project deliverables
- Performing administrative tasks needed to ensure timely and successful completion of TMDL program special studies
- Resolution of project concerns or conflicts related to technical matters

For each compliance monitoring event or special study, the Ports will select a contractor to be the monitoring/special study project manager. This project manager will be identified in the SAP prepared prior to conducting the study. The monitoring/special study project manager will be responsible for:

- Providing oversight, overall special study project management, and progress reports

- Communicating with the TMDL study project manager and the Ports
- Organizing field staff
- Coordinating with subcontract laboratories
- Scheduling sampling days
- Installing and maintaining field sampling equipment, sample handling and transport, data transmittal in accordance with this PQAPP, and study reporting

2.1.2 Field Coordinator

For each compliance monitoring event or special study, a field coordinator will be identified in the SAP prepared by the contractor awarded the work. The field coordinator for each sampling program will be responsible for day-to-day technical and QA and quality control (QC) oversight. The field coordinator will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will submit environmental samples to selected laboratories for chemical and physical analyses. The field coordinator will also be responsible for submitting the finalized field data to the QA manager in a pre-determined format, as discussed in Section 2.2.

2.1.3 Laboratory Project Managers

The laboratory manager of any laboratory testing samples for the Ports will oversee all laboratory operations associated with the receipt of environmental samples, chemical and physical analyses, and laboratory report preparation for special studies. The laboratory manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during analysis.

Analytical testing laboratories will be responsible for the following:

- Delivering sample confirmation receipt notifications to the field coordinator and QA manager (by submittal to the TMDL Study project manager)
- Performing analytical methods described in this PQAPP
- Following documentation, custody, and sample logbook procedures
- Ensuring that personnel engaged in preparation and analysis tasks have appropriate, documented training
- Meeting all reporting and QA/QC requirements

- Delivering electronic data files as specified in this PQAPP
- Meeting turnaround times for deliverables

2.1.4 QA Manager

The QA manager will provide QA oversight for field sampling and laboratory programs associated with the TMDL study (i.e., either compliance monitoring or special studies). The QA manager will also ensure that samples are collected and documented appropriately, ensure field and analytical data quality, oversee data validation, and supervise overall project QA coordination.

2.1.5 Data Managers

The data manager will compile field observations and analytical data from laboratories into a database, review data for completeness and consistency, append the database with qualifiers assigned by the data validator, and ensure that data obtained is in a format suitable for inclusion in the appropriate databases and delivery to the Ports and agencies.

The data validator will be responsible for verifying and validating all analytical data and submitting assigned data qualifiers to the database manager.

2.2 Overview of Data Management Process

Figure 2 provides an overview of the data flow process. After each field event, field data will be imported into the EQuIS database. These field data will undergo QC checks such as sample identifier review, transcription error review, and completeness verification.

Independent of field data, laboratory data will be submitted to the QA manager in specified PDF and electronic data deliverable (EDD) formats. These data will undergo verification and validation using a combination of manual validation and Automated Data Review (ADR) software and then will be uploaded into the EQuIS database with the applied final validation qualifiers. These two datasets will be linked in the database to retain corresponding field data for each sample. Data will be exported from EQuIS in custom formats to meet POLB, POLA, and agency database requirements.

3 FIELD SAMPLING DATA QUALITY OBJECTIVES

This section includes detailed information on field collection requirements, including sample processing, handling, and identification; sample custody and shipping requirements; and field QC protocols.

3.1 Sample Processing, Handling, and Identification

Field personnel will identify and label samples in a consistent manner to ensure that field samples are traceable and that labels provide all information necessary for the laboratory to conduct required analyses properly. Samples will be placed in appropriate containers and preserved for shipment to the laboratory.

3.1.1 Sample Processing

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with various media collected for chemical analysis must be made of glass, stainless steel, high-density polyethylene (HDPE), or polytetrafluoroethylene (PTFE) and will be cleaned prior to each day's use and between sampling or compositing events. The decontamination procedure is as follows:

1. Pre-wash rinse with tap or site water.
2. Wash with solution of warm tap water or site water and Alconox soap.
3. Rinse with tap or site water.
4. Rinse thoroughly with organic-free water.
5. Cover (no contact) all decontaminated items with aluminum foil.
6. Store in a clean, closed container for next use.

3.1.2 Sample Containers

Sample containers and preservatives will be provided by the laboratory. The laboratory will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided. Specific container requirements are included in Table 3.

3.1.3 Sample Identification and Labels

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identifier
- Date and time of sample collection
- Preservative type (if applicable)
- Analysis to be performed

The sample nomenclature should include the identifiers listed below. A catalogue of identification codes is provided in Table 4. Identifiers shown below should be used when applicable; however, sample identification requirements for special studies are not yet defined and consequently, minor modifications to the recommended identification codes will be acceptable in these cases.

- Waterbody or site as shown in Table 4 (i.e., TMDL waterbody or other site in which sample was collected within each port jurisdiction)
- Media or sampling method code
- Organism common name, if applicable
- Station number
- Depth interval (in metric units), if applicable
- Date of collection
- Indication of field duplicate (i.e., add 1000 to station number)

For equipment rinsate blank or field blank samples, “EB” or “FB” will be used, respectively, in place of the waterbody or site and station number. The date of sample collection will be added to end in YYYYMMDD format.

An example sample identifier for a sediment core at 0 to 15 centimeters, Station 54 from Outer Harbor – Los Angeles on July 31, 2013:

OA-SC-54-0-15-20130731

An example sample identifier for an equipment blank of the decontaminated sample processing equipment after sample collection of the above sample would be:

EB-20130731

An example sample identifier for a sediment core at 0 to 15 centimeters, Station 54 from Outer Harbor – Los Angeles on July 31, 2013, that is a field duplicate:

OA-SC-1054-0-15-20130731

An example sample identifier for a white croaker fish fillet skin off, station number 23 from Inner Harbor – Long Beach on July 31, 2013:

IH-FF-WC-23-20130731

3.2 Sample Custody and Shipping Requirements

Samples are considered to be in one's custody if they are: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) so that the sample cannot be reached without breaking the seal(s).

Chain-of-custody (COC) procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample will be represented on a COC form the day it is collected. All manual data entries will be made using an indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines and spaces on the COC form will be lined out, dated, and initialed by the individual maintaining custody. Electronic COC (eCOC) forms generated from a custom field application will be emailed directly to the laboratory and QA managers.

A COC form will accompany each container of samples to the analytical laboratory. Each person in custody of samples will sign the COC form and ensure the samples are not left

unattended unless properly secured. Copies of all COC forms will be retained in the project files.

All samples will be shipped or hand delivered to the analytical laboratory no later than the day after collection. Samples collected on Friday may be held until the following Monday for shipment provided that this delay does not jeopardize any holding time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container containing samples for analysis will be shipped via overnight delivery to the laboratory. In the event that Saturday delivery is required, the field coordinator will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers. Following each shipment, the field coordinator will call the laboratory and verify that the shipment from the day before has been received and is in good condition.
- Coolant ice will be sealed in separate double plastic bags and placed in the shipping containers.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock-absorbent material (e.g., bubble wrap) to prevent breakage.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- Shipping waybill number will be documented on all COC forms accompanying samples.
- A sealed envelope containing COC forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- A minimum of two signed and dated custody seals will be placed on adjacent sides of each cooler prior to shipping.
- Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and will be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the person(s) transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the custody seals will be broken, and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition.

3.3 Field Quality Assurance and Quality Control

Field QA/QC sampling and analysis procedures that will be conducted as part of Compliance Monitoring or special studies conducted by contractors for the Ports and steps will be taken to ensure all field records are retained and submitted accurately as part of the data flow process described above (see Section 2.2 and Figure 2).

3.3.1 Field Quality Assurance and Quality Control Sampling and Analysis

Field QA/QC samples will be collected along with environmental samples. Field QA/QC samples will be useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA/QC samples will follow SWAMP guidance and may include field (homogenization) duplicates, rinsate (equipment) blanks, and/or field blanks (SWRCB 2008). Field duplicates will be collected at a frequency of 5 percent of total project sample count. Rinsate blanks or field blanks will be collected as needed (e.g., when low level contamination is suspected). Field QA/QC sample frequencies and performance criteria are presented in Table 5.

Additional sample volume will be collected to ensure that the laboratory has sufficient sample volume to run the program-required analytical QA/QC samples for analysis, as specified in Section 4.2.

3.3.2 Field Records

All collected field samples will be documented using a custom field application or field collection logs that will be manually converted to a field EDD prior to data submittal. Additionally, the field coordinator or designee will keep a daily record of significant events, observations, and measurements on a daily log. Entries for each day will begin on a new page. The person recording information must enter the date and time and initial each entry.

In general, sufficient information will be recorded during sampling to reconstruct the event can without relying on the memory of the field personnel.

The daily log will contain the following information, at a minimum:

- Project name
- Field personnel on site
- Site visitors
- Weather conditions
- Field observations
- Maps and/or drawings
- Date and time sample collected
- Sampling method and description of activities
- Identification or serial numbers of instruments or equipment used
- Deviations from the PQAPP or SAP
- Conferences associated with field sampling activities

After each field event, field data will be imported into the EQuIS database either by direct import using a custom field application export or manual submittal of a field EDD containing information from field collection logs (Figure 2). Field data collection and management options are described below along with field EDD requirements.

3.3.2.1 Field Data Option 1: Custom Field Application

Electronic field EDDs can be generated from a custom field application that provides electronic data entry forms for field information and generates field collection logs, sample labels, and eCOCs. A custom field application improves data quality by minimizing handwritten errors through the use of required data entry elements and controlled, unique identifiers for locations, samples, and analytical test requests. In addition, it promotes efficiency in the field and provides eCOCs for laboratory sample check-in and for loading field information to the TMDL Study Team's data management system, further reducing transcription errors. When a custom field application is used in place of field collection logs, all information and generated forms are backed up to removable storage devices and should be emailed to the QA manager at the end of each field day, for data security. The same

elements required for the field logs described in Sections 3.3.2.2 would be captured in the custom field application. To use this application, the field coordinator should coordinate with the QA manager.

3.3.2.2 *Field Data Option 2: Field Collection Logs*

All field sample collection information will be recorded on field collection logs maintained by the field coordinator, or designee, for each activity. Key information should be recorded for each sample, such as sample station, station coordinates, sample identifier, and sample matrix. The information recorded during sample collection should fulfill requirements of the field EDD described in Section 3.3.2.3.

Notes will be taken in indelible, waterproof blue or black ink. Errors will be corrected by crossing out with a single line, dating, and initialing. Each field collection log will be marked with the project name, number, and date. The field logs will be scanned at the end of each field day and emailed to the monitoring/special study project manager.

3.3.2.3 *Field Electronic Data Deliverable Requirements*

Field data collection, including observations, field measurements, and sample generation, will be facilitated by submittal of a field EDD generated from the custom field application or field collection logs. Field data must be submitted to the managing consultant. It is imperative that the field sample data match field forms and COC forms. The field EDD template (Excel workbook format) will be provided by the QA manager upon request. Required, conditional, and optional fields will be identified in the field EDD template along with defined valid values. Required fields must be filled out prior to submittal of field data. Conditional fields are required for specific matrices, collection methods, or if a field QC sample is collected. Optional fields may be populated at the field coordinator's discretion. Columns may be left blank but should not be deleted. Any questions with regarding completion of the field EDD should be directed to the QA manager.

4 LABORATORY DATA QUALITY OBJECTIVES

It is critical to ensure that data collected are of acceptable quality so that the project objectives for each special study or monitoring program sampling are achievable. Guidance for DQOs is derived from the SWAMP guidance (SWRCB 2008). The quality of laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity. Applicable quantitative goals for laboratory precision, accuracy, and completeness are described in Section 4.3. The definitions for the data quality indicators are as follows:

- Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analysis.
- Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value.
- Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the sampling program, analyte lists presented in Section 4.1 have been identified to provide a comprehensive assessment of sediment, water, and tissue quality at the Ports.
- Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats and use of common traceable calibration and reference materials.
- Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected.
- Sensitivity is related to the instrument calibration low level standard, method detection limits (MDLs), and/or estimated detection limits (EDLs). For each special study, analytical methods will be selected to achieve reporting limits that comply with, or are close to, target detection limits.

4.1 Analyte Lists, Analytical Methods, and Reporting Limits

Analyte lists and target reporting limits for sediment, water, and tissues are identified in Tables 6, 7, and 8, respectively. Analytical methods and target detection limits were selected to comply with SWAMP guidance (SWRCB 2008). The analyte list for sediments includes

recommended chemical analytes needed to calculate the chemistry exposure line of evidence for application of the California sediment quality assessment framework (SWRCB 2009). For some analyte groups (e.g., polychlorinated biphenyls [PCBs]), several methodologies have been included to allow for flexibility of method selection based on the DQOs for compliance monitoring and special studies.

For high-resolution isotope dilution methods, the EDL sample concentration, or the estimated maximum possible concentration, should be calculated and reported for each target compound. For all other methods, the laboratory should report detected compounds to the MDL, if applicable. The laboratory should also provide the instrument verified limit of detection (LOD) for each analyte in the laboratory report and EDD, whenever possible. Reported values between the MDL and method reporting limit (MRL) should be qualified with a “J.” Non-detects should be reported at the lowest calibration level (typically the MRL) or LOD, whichever is lower. In some cases, non-detects may be reported at the MDL.

4.2 Laboratory Quality Control Sample Requirements

Laboratory QA/QC definitions are identified in Table 9. Laboratory QC frequency requirements were derived from SWAMP guidance (SWRCB 2008) and are identified in Table 10.

4.3 Performance Criteria

Applicable quantitative goals for precision, accuracy, and completeness are derived from SWAMP guidance (SWRCB 2008) and provided in Table 11.

4.4 Laboratory Record Requirements

Analytical data records (bookmarked PDF and EDD formats) will be generated by the laboratory and submitted to the TMDL study project manager upon completion. If files are too large to be emailed, a notification email with download instructions can be sent to the TMDL Study Team at labdata@anchorqea.com. The data package level will depend on the sampling event. The field coordinator or QA manager will identify the required data package level on the COC.

The analytical laboratory will be required to report the following, where applicable:

- **Case Narrative.** This summary will discuss problems encountered during any aspect of analysis, if any. It should discuss, but is not be limited to, QC issues, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate. Analytical QC samples that exceed project performance criteria and/or laboratory performance criteria should also be discussed in the case narrative.
- **COC Records.** Legible copies of COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.
- **Sample Results.** The data package will summarize results for each sample analyzed. The summary will include the following information when applicable:
 - Field sample identifier and corresponding laboratory identification code
 - Sample matrix
 - Date and time of sample extraction
 - Date and time of analysis
 - Final concentration volumes and dilution factors
 - Instrument and analyst identification
 - MRLs and MDLs accounting for sample-specific factors (e.g., dilution and total solids)
 - Analytical results with reporting units identified
 - Data qualifiers and their definitions
 - Raw data including instrument printouts, chromatograms, and bench sheets (required for full data packages)
- **QA/QC Summaries.** Contract Laboratory Program (CLP)-like form summaries should be generated for all required laboratory QC components and samples (i.e., method blanks, instrument daily tunes, surrogate spikes, internal standards, and laboratory control samples). These summaries should include spike volumes, parent sample concentrations, percent recoveries, relative percent differences, area counts, and

laboratory control limits as applicable. For full data packages, associated raw data files should be included.

- **Instrument Calibration Data.** CLP-like form summaries of calibration data (i.e., initial calibration, initial calibration verification, and continuing calibration verification) should be included in all data packages. For full data packages, associated raw data files should be included.

All instrument data shall be fully restorable at the laboratory from electronic backup. The laboratory will be required to maintain all records relevant to project analyses for a minimum of 5 years.

4.5 Laboratory Electronic Deliverable Requirements

The Ports contractor may obtain laboratory EDDs in any format as long as the key fields and formats required by the Ports (Appendix A) are populated. Final, validated laboratory EDDs will be submitted to the Ports' data manager in a custom EQUIS format. Specifications and valid values associated with this format can be found in Appendix A. Updates to specifications and valid values will occur over time and will be distributed to the laboratory or Ports' contractor when they become available. Laboratory reports (in PDF format) associated with final electronic analytical data should also be submitted to the Ports' data manager.

5 ASSESSMENTS AND OVERSIGHT

The following sections describe the types of assessments that may be conducted for this project and how these assessments will be reported to project management.

5.1 Assessments and Response Actions

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. The field coordinator is responsible for assessing field activities and has the authority to issue a stop work order on sample collection. The TMDL study project manager or designee provides additional oversight on all field and laboratory activities and consequently may also issue a stop work order on sample collection if warranted. Laboratory audits are not anticipated to be conducted as part of this study; however, all laboratory audit reports will be made available to the project QA manager upon request. The laboratory is required to have written procedures addressing internal QA/QC (i.e., QA Plan), which will be reviewed by the project QA manager to ensure compliance with the project SAP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training. As part of the audit process, the laboratory will provide written details of any and all method modifications planned for consultant's review. Laboratory non-conformances will be documented and submitted to the QA manager for review. All non-conformances will be discussed in the final data report.

5.2 Corrective Actions

The following sections identify the responsibilities of key project team members and actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this document.

5.2.1 Field Activities

The field coordinator will be responsible for correcting equipment malfunctions during the field sampling effort. The QA manager will be responsible for resolving situations identified by the field coordinator that may result in noncompliance with the SAP. All corrective measures will be immediately documented in the field logbook.

5.2.2 Laboratory

The laboratory is required to comply with its standard operating procedures (SOPs). The laboratory manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this PQAPP. All laboratory personnel will be responsible for reporting problems that may compromise quality data.

The laboratory manager will be notified if any QC sample grossly exceeds the laboratory in-house control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. If the anomaly cannot be corrected, the laboratory manager will document the corrective action taken in a memorandum submitted to the QA manager within 5 days of the initial notification. A narrative describing the anomaly, steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package.

5.3 Reports to Management

QA reports to project management will include verbal status reports, written reports on field sampling activities and laboratory processes, data validation reports, and final project reports. These reports shall be the responsibility of the TMDL study project manager.

Progress reports will be prepared by the field coordinator and delivered to the TMDL study project manager following each sampling event. These progress reports will contain final versions (peer reviewed) of field logs, field notebooks, COCs, observations, etc.

6 DATA VALIDATION AND USABILITY

The following sections describe the processes that will be used to review project data quality.

6.1 Data Review, Validation, and Verification

During the validation process, analytical data will be electronically and/or manually evaluated for method and laboratory QC compliance and their validity and applicability for program purposes will be determined.

Based on findings of the validation process, data validation qualifiers may be assigned. Validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

6.2 Verification and Validation Methods

Data verification includes a review for completeness and accuracy by the field coordinator and laboratory manager; review by the data manager for outliers and omissions; and the use of performance criteria to identify laboratory QC sample outliers. Data verification can be conducted manually or using specialized automated software programs such as ADR. ADR is an efficient tool that can be used to generate outlier reports for all analytical results outside the performance criteria presented in this PQAPP. For this program, Stage 2A verification/validation will be conducted consisting of completeness checks (target analyte lists, etc.), holding time compliance, and laboratory QC sample performance evaluations (see the list in the next paragraph). Data validation will then be conducted by the data validator and will consist of accepting, rejecting, or applying qualifiers to data based on the verification findings, analytical method criteria, National Functional Guidelines data validation guidance (USEPA 1999, 2004, 2005, 2008), and professional judgment. A data validation report will be generated to document qualifications applied to data. All validated data will be entered into the Ports' data manager's EQuIS database, and a final data file will be exported. Verification of the database export against the PDF data report will be performed by the QA manager or designee. Any errors found in the data file export will be corrected in the database and reviewed for systemic reporting errors. Once all discrepancies are resolved, the database will be established.

All laboratory data will receive a Stage 2A validation (USEPA 2009). The recommended QC checks identified in a Stage 2A validation are as follows:

- Completeness
- Holding times
- Requested methods were performed
- MRLs and EDLs - project requirements were met
- Sample-related QC data were analyzed at the required frequencies
- QC performance criteria were met for the following:
 - Laboratory control samples
 - Matrix spike/matrix spike duplicate
 - Standard reference material
 - Surrogate recoveries
 - Method blanks
- Field QC samples

The QA manager will be responsible for the final review of all data validation reports.

6.3 Reconciliation with User Requirements

The QA manager will review data at the completion of each task to determine if DQOs have been met. If data do not meet the project's specifications, the QA manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action, if appropriate. It is expected that problem would be able to be corrected by retraining, revising techniques, or replacing supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA manager will recommend appropriate modifications. If matrix interference is suspected to have attributed to the exceedance, adequate laboratory documentation must be presented to demonstrate that instrument performance and/or laboratory technique did not bias the result. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per USEPA National Functional Guidelines (1999, 2004, 2005, 2008). In these instances, the usability of data will be determined by the extent of the exceedance. Rejected data will be assigned an "R" qualifier and will not be used for any purposes.

7 ADDITIONAL QUALITY ASSURANCE PROJECT PLAN ELEMENTS

The following section provides general guidance on special training and certifications; documentation and record keeping; and instrument/equipment maintenance and calibration protocols. More specific requirements for special training and certifications may be included in the Compliance Monitoring and Reporting Plan or special study SAPs; if provided, these documents would supersede the information provided below.

7.1 Special Training Requirements and Certifications

For sample preparation tasks, field crews will be trained in standardized sample collection requirements so that the samples collected and data generated from samples are consistent among field crews. The field coordinator must ensure that all field crew members are fully trained in the collection and processing of sediment, surface water, tissues, decontamination protocols, and sample transport and COC procedures.

Some special studies may require that all sampling personnel have 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and the 8-hour refresher course, as necessary, to meet the 29 Code of Federal Regulations 1910.120 Occupational Safety and Health Administration (OSHA) regulations. The Ports will determine if this training is necessary.

7.2 Documentation and Records

Document requirements for field records and laboratory reports are provided in Sections 3.3.2 and 4.5, respectively. Each project team member (field coordinator, QA manager, etc.) is responsible for documenting all necessary project information and should maintain files for individual tasks but must provide such files to the TMDL study project manager upon completion of each sampling event. A central project file will be maintained by the TMDL Study Team. Hard copy documents will be kept on file with the TMDL Study Team or at a document storage facility throughout the duration of the project. All electronic documents and work products will be stored in a project-specific directory on secured and a backed-up server. All electronic analytical data will be maintained in a central database with the TMDL Study Team. Data will be periodically exported to the POLB and POLA databases after the completion of each monitoring event or special study. Additionally as required, data will be

submitted to the California Environmental Data Exchange Network using templates provided on its website: http://water100.waterboards.ca.gov/ceden/ceden_submitdata.shtml#templates.

7.3 Instrument and Equipment Testing, Inspection, and Maintenance Requirements

This section describes procedures for testing, inspection, and maintenance of field and laboratory equipment.

7.3.1 *Field Instruments and Equipment*

The field coordinator or designee will maintain inventories of field instruments and equipment and will be responsible for the preparation, documentation, and implementation of preventative maintenance. The frequency and types of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment. The frequency of maintenance is dependent on the type and stability of the equipment, the methods used, the intended use of the equipment, and recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in specific manufacturer's instruction manuals.

The field coordinator or designee will also be responsible for navigation and will confirm proper operation of the navigation equipment daily. This verification may consist of internal diagnostics or visiting a location with known coordinates to confirm the coordinates indicated by the navigation system. Samplers will be inspected daily for any mechanical problems, and problems will be noted in the field logbook and corrected prior to continuing sampling operations.

7.3.2 *Laboratory Instruments and Equipment*

Selected laboratories will maintain an inventory of instruments and equipment, and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

Selected laboratories will have a preventative maintenance program, as detailed in their QA Plans, organized to maintain proper instrument and equipment performance and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics, the availability of spare parts, and the frequency at which maintenance is required. Any equipment that has been overloaded, mishandled, shown to give suspect results, determined to be defective will be taken out of service, or tagged with the discrepancy note, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to ensure that it is in proper operational condition. The QA manager will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The QA manager will also be notified immediately regarding any delays due to instrument malfunctions that could impact holding times. Selected laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. All maintenance records will be checked according to the schedule on an annual basis and recorded by the responsible individual. A laboratory QA/QC manager or designee shall be responsible for verifying compliance.

7.4 Instrument and Equipment Calibration

Proper calibration of equipment and instrumentation is an integral part of providing quality data. Instrumentation and equipment used to generate data must be calibrated at a frequency that ensures sufficient and consistent accuracy and reproducibility.

7.4.1 Field Instrument and Equipment Calibration

Field equipment will be calibrated prior to the sampling event according to manufacturer's recommendations using manufacturer's standards. A calibration check will be performed at the beginning of each day. The equipment, calibration, and maintenance information will be documented in the instrument calibration log. The frequency of calibration is dependent on the type and stability of the equipment, the methods used the intended use of the equipment, and the recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in specific manufacturer's instruction manuals. Equipment that fails calibration will be recalibrated prior to use.

7.4.2 Laboratory Instrument and Equipment Calibration

As part of their QC program, selected laboratories will perform two types of calibrations. A periodic calibration is performed at prescribed intervals for relevant instruments and laboratory equipment (i.e., balances, drying ovens, refrigerators, and thermometers), and operational calibrations are performed daily, at a specified frequency, or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the laboratory's QA Plan. Calibrations are discussed in the laboratory's SOPs for analyses.

The laboratory QA/QC manager will be responsible for ensuring that the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program shall be the responsibility of the respective laboratory manager. Recognized procedures (USEPA, ASTM, or manufacturer's instructions) shall be used when available.

Physical standards (i.e., weights or certified thermometers) shall be traceable to nationally recognized standards such as the National Institute of Standards and Technology. Chemical reference standards shall be NIST standard reference materials or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions shall be accessible, either in the laboratory's SOPs or QA Plan for each instrument or analytical method in use. An instrument that fails calibration will be recalibrated prior to use. All calibrations shall be preserved on electronic media.

8 REFERENCES

- RWQCB and USEPA (Los Angeles Regional Water Quality Control Board and U.S. Environmental Protection Agency), 2011. *Final Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Loads*. June 2011.
- SWRCB (State Water Resources Control Board), 2008. *Surface Water Ambient Monitoring Program Quality Assurance Program Plan*. Final Technical Report Version 1. September 2008.
- SWRCB (State Water Resource Control Board), 2009. *Water Quality Control Plan for Enclosed Bays and Estuaries*. August 25, 2009.
- USEPA (U.S. Environmental Protection Agency), 1999. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. USEPA, Office of Emergency Response. USEPA 540/R-99/008. October 1999.
- USEPA, 2004a. SW-846 On-line, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Revision 6. Available online at: <http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm>.
- USEPA, 2004b. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. USEPA540-R-04-004. October 2004.
- USEPA, 2005. *National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins and Chlorinated Dibenzofurans Data Review*. OSWER 9240.1-51, USEPA-540-R-05-001. September 2005.
- USEPA, 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. USEPA, Office of Emergency Response. USEPA 540/R-08-01. June 2008.
- USEPA, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. USEPA, Office of Solid Waste and Emergency Response. OSWER No. 9200.1-85. January 2009.

TABLES

Table 1
SWAMP, USEPA, and QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
A	PROJECT MANAGEMENT		
A1.	Title and Approval Sheet (s)		
A1.1	Contains project title	X	X
A1.2	Indicates revision number, if applicable	X	X
A1.3	Indicates organization's name	X	
A1.4	Includes signature of organization's project manager	X	
A1.5	Includes signature block for organization's project manager	X	
A1.6	Includes signature block for organization's QA officer	X	
A1.7	Includes signature block for Port program managers	X	
A1.8	Includes signature block for RWQCB QA officer	N/A	N/A
A2.	Table of Contents		
A2.1	Lists QAPP information sections	X	X
A2.2	Includes document control information	X	X
A2.3	Provides lists of tables and figures	X	X
A2.4	Provides contents of each appendix	X	X
A2.5	Lists all attached standard operating procedures (with names, not just numbers)	N/P	
A3.	Distribution List		
A3.1	Includes all individuals who are to receive a copy of the QAPP, and identifies their organization	X	X
A4.	Project/Task Organization		
A4.1	Identifies key individuals involved in all major aspects of the project, including contractors	X	
A4.2	Discusses their responsibilities	X	
A4.3	Confirms that the project QA officer position is independent of data generation	X	
A4.4	Identifies individual responsible for maintaining the official, approved QAPP	X	
A4.5	Includes organizational chart that shows lines of authority and reporting responsibilities	X	
A4.6	Clearly identifies who is part of the project team and who is related to the project in an advisory role (but is not responsible for delivery of any product)	X	
A5.	Problem Definition/Background		
A5.1	States decisions to be made, actions to be taken, or outcomes expected from the information to be obtained	X	
A5.2	Clearly explains the reason (site background or historical context) for initiating this project	X	
A5.3	Identifies regulatory information, applicable criteria, or action limits necessary to the project		X
A6.	Project/Task Description		
A6.1	Summarizes work to be performed (e.g., measurements to be made, data files to be obtained)	X	X
A6.2	Provides a work schedule, indicating critical project points (e.g., start and completion dates for activities such as sampling, analysis, data reviews, assessments)		X
A6.3	Details geographical locations to be studied, including maps where possible		X
A6.4	Describes resource and time constraints, if applicable		X
A7.	Quality Objectives and Criteria		X
A7.1	Identifies measurement quality objectives that meet or exceed those mandated by SWAMP	X	
A7.2	Identifies project action limits for all parameters of interest	X	X
A7.3	Identifies acceptance criteria for all previously collected information	X	
A7.4	Discusses precision	X	X
A7.5	Addresses bias	X	X
A7.6	Discusses representativeness and how it will be assessed and controlled	X	X
A7.7	Identifies the need for completeness	X	X
A8.	Special Training/Certifications		X
A8.1	Identifies any specialized training or certifications required of project personnel	X	X
A8.2	Discusses how this training will be provided		X
A8.3	Identifies individual(s) responsible for ensuring sufficient training and certification	X	X

Table 1
SWAMP, USEPA, and QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
A8.4	Identifies where training and certification information is documented		X
A9.	Documentation and Records		
A9.1	Identifies report format and summarizes all data report package information	X	
A9.2	Lists all other project documents, records, and electronic files that will be produced	X	
A9.3	Identifies where project information should be kept and for how long	X	
A9.4	Discusses backup plans for records stored electronically	X	
A9.5	States how the individuals identified in Element A3 will receive the most current copy of the approved QAPP, and identifies the individual(s) responsible for this	X	
B	DATA GENERATION AND ACQUISITION		
B01.	Sampling Process Design (Sampling Design and Logistics)		
B01.1	Provides the design information, or a reference to a specific document that contains it, with sufficient detail to assess data against project objectives		X
B01.2	Describes and justifies design strategy, indicating the size of the area and time period to be represented by a sample		X
B01.3	Details the type and total number of samples, matrices, and runs expected and needed		X
B01.4	Indicates where samples should be taken and how sites will be identified		X
B01.5	Discusses what to do if sampling sites become inaccessible		X
B01.6	Identifies project activity schedules (e.g., sampling events, shipping times)		X
B01.7	Specifies what information is critical and what is for informational purposes only		X
B01.8	Identifies sources of natural variability and how this variability should be reconciled with project information		X
B01.9	Identifies potential sources of bias or misrepresentation and how their contribution can be minimized		X
B02.	Sampling (sample collection) Methods		
B02.1	Identifies all sampling standard operating procedures by number, date, and regulatory citation, indicating sampling options or modifications to be taken. Non-SWAMP standard operating procedures should be attached		X
B02.2	If bioassessment sampling, implements the standard operating procedure <i>Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California</i>		X
B02.3	Indicates how each kind of matrix and each sample type should be collected		X
B02.4	Indicates how samples are to be homogenized, composited, split, or filtered		X
B02.5	Indicates what sample containers and sample volumes should be used		X
B02.6	Identifies whether samples should be preserved, and indicates methods that should be followed	X	X
B02.7	Describes how sampling equipment and samplers should be cleaned and decontaminated, including the disposal of byproducts	X	X
B02.8	Identifies any equipment and support facilities needed		X
B02.9	Addresses actions to be taken when problems occur, identifying individual(s) responsible for corrective action and how this should be documented	X	X
B03.	Sample Handling and Custody		
B03.1	For each parameter, states maximum holding times allowed from sample collection to preparation and analysis	X	X
B03.2	Identifies how samples should be physically handled, transported, received, and stored in the laboratory or office (including temperature upon receipt)	X	X
B03.3	Indicates how sample handling and custody information should be documented, identifying individual(s) responsible	X	X
B03.4	Identifies chain-of-custody procedures and includes form to track custody	X	X
B04.	Analytical Methods and Field Measurements		
B04.01	Identifies all standard operating procedures that should be followed by number, date, and regulatory citation, indicating options or modifications; standard operating procedures should be attached or referenced	N/P	X
B04.02	Lists all the instruments and kits that will be used in the field and describes their measurement principle (e.g., nephelometric or transparency) and major attributes (e.g., automatic temperature compensation, range and resolution)		X

Table 1
SWAMP, USEPA, and QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
B04.03	If in situ monitoring, indicates how instruments should be deployed and operated to avoid fouling and ensure maintenance of proper data		X
B04.04	If continuous monitoring, indicates how instruments should store and maintain raw data		X
B04.05	Identifies all laboratory standard operating procedures that should be followed by number, date, and regulatory citation, indicating options or modifications to be taken (e.g., such as sub-sampling and extraction procedures)	N/P	X
B04.06	Identifies equipment or instrumentation needed for laboratory analyses	X	
B04.07	Specifies any specific method performance criteria	X	X
B04.08	Provides target analytical reporting limits or method detection limits	X	X
B04.09	Identifies procedures to follow when failures occur, identifying individual(s) responsible for corrective action and associated documentation	X	X
B04.10	Identifies sample disposal procedures		X
B04.11	Specifies laboratory turnaround times needed		X
B04.12	Provides documentation for the use of non-standard methods		X
B05.	Quality Control		
B05.1	For each parameter, identifies quality control activities (e.g., blanks, spikes, duplicates) that meet those mandated by SWAMP	X	X
B05.2	Details what should be done when control limits are exceeded and how corrective actions will be assessed and documented	X	X
B05.3	Identifies procedures and formulas for calculating quality control results (e.g., precision, bias)	X	
B06.	Instrument/Equipment Testing, Inspection, and Maintenance		
B06.1	Identifies field and laboratory equipment needing periodic maintenance and the associated schedule	X	X
B06.2	Identifies testing criteria; this information is instrument-specific and may be included in the standard operating procedure for each instrument	X	X
B06.3	Notes availability and location of spare parts	X	X
B06.4	Indicates procedures in place for inspecting equipment before usage (this information is instrument-specific and may be already included in the standard operating procedure for each Instrument)	X	X
B06.5	Identifies individual(s) responsible for testing, inspection, and maintenance	X	X
B06.6	Indicates how deficiencies should be resolved, and how corrective actions should be assessed and documented	X	X
B07.	Instrument/Equipment Calibration and Frequency		
B07.1	Identifies equipment, tools, and instruments that should be calibrated, and the frequency for this calibration		X
B07.2	Describes how calibrations should be performed and documented, indicating test criteria and standards or certified equipment (this information is instrument-specific and may be already included in the standard operating procedure for each Instrument)		X
B07.3	Identifies how deficiencies should be resolved and documented		X
B08.	Inspection/Acceptance for supplies and Consumables		
B08.1	Identifies critical field and laboratory supplies and consumables; noting supply source, acceptance criteria, and procedures for tracking, storing, and retrieving these materials		X
B08.2	Identifies the individual(s) responsible for this task		X
B09	Non-direct Measurements		
B09.1	Identifies data sources (e.g., computer databases, literature files, models) that should be assessed and used		X
B09.2	Describes the intended use of this information and the rationale for their selection		X
B09.3	Indicates the acceptance criteria for these data sources or models		X
B09.4	Identifies key resources and support facilities needed		X
B09.5	Describes how limits to validity and operating conditions should be determined (e.g., internal checks, beta testing)		X
B10.	Data Management		

Table 1
SWAMP, USEPA, and QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
B10.01	Describes the data management scheme from field to final use and storage	X	
B10.02	Verifies that all continuous monitoring raw data will be kept in the original sonde file (and stored on a PC); Endpoints (e.g., averages) can be calculated after downloading and trimming records		X
B10.03	Describes the filing and document control system, or cites documentation such as standard operating procedures	X	
B10.04	Identifies data handling equipment and procedures that should be used to process, compile, analyze, and transmit data reliably and accurately	X	
B10.05	Describes how field and laboratory data will be formatted and entered into SWAMP's Information Management System	X	
B10.06	Identifies individual(s) responsible for each step and task	X	
B10.09	Describes procedures to demonstrate the acceptability of hardware and software configurations	X	
B10.10	Attaches checklists and forms that should be used (or refers to standard operating procedures)	X	
C	ASSESSMENT AND OVERSIGHT		
C1.	Assessments and Response Actions		
C1.1	Lists the number, frequency, and type of assessment activities that should be conducted, including approximate dates	X	X
C1.2	Identifies individual(s) responsible for conducting assessments; including their authority to issue stop work orders	X	X
C1.3	Describes how and to whom assessment information should be reported	X	X
C1.4	Identifies how corrective actions should be addressed and by whom, and how they should be verified and documented	X	X
C2.	Reports to Management		
C2.1	Identifies what project quality assurance reports are needed and how frequently		X
C2.2	Identifies who should write and receive these reports		X
D	DATA VALIDATION AND USABILITY		
D1.	Data Review, Verification, and Validation		
D1.1	Describes SWAMP criteria that should be used for accepting, rejecting, or qualifying project data (or refers to Element 7)	X	
D2	Verification and Validation Methods		
D2.1	Describes processes for data verification and validation, including standard operating procedures and data validation software	X	
D2.2	Identifies who is responsible for verifying and validating different components of project information (e.g., chain-of-custody forms, receipt logs, calibration information)	X	
D2.3	Describes the issue resolution process, and individual(s) responsible for conveying results to data users	X	
D2.4	Attaches checklists, forms, and calculations (including electronic formulae if using spreadsheets)	X	
D3.	Reconciliation with User Requirements		
D3.1	Describes procedures used to evaluate the uncertainty of the validated data (or refers to previous elements)	X	
D3.2	Describes how limitations on data use should be reported to the data users	X	
D3.3	Identifies how the data will be used in the context of the various SWAMP components, including the SWAMP Information Management System	X	

**Table 2
Contact Information**

Name	Title/Position	Organization	Phone Number	Email	Mailing Address
Kathryn Curtis Andrew Jirik	POLA Project Managers	Port of Los Angeles Environmental Management Division	(310) 732-3681	kcurtis@portla.org ajirik@portla.org	425 S. Palos Verdes Street San Pedro, California 90731
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Laurel Menoche	Data Manager	Anchor QEA	(206) 903-3372	lmenoche@anchorqea.com	720 Olive Way, Suite 1900 Seattle, Washington 98101
Joy Dunay	QA Manager	Anchor QEA	(206) 903-3320	jdunay@anchorqea.com	720 Olive Way, Suite 1900 Seattle, Washington 98101
Cindy Fields	Data Validator	Anchor QEA	206-903-3394	cfields@anchorqea.com	720 Olive Way, Suite 1900 Seattle, Washington 98101

Table 3
Sample Containers, Holding Times, and Preservation Methods

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Sediments				
Bulk density	50 g	4-oz glass	None established	Ambient
Ammonia	10 g	4-oz glass	7 days to extraction; 48 hours cooled, 28 days frozen	Cool ≤ 6°C, pH <2 with 2 mL 9N H ₂ SO ₄
Sulfide	20 g	4-oz glass	7 days	Cool ≤4°C
Specific gravity	100 g	16-oz glass	None established	Ambient
Total solids	10 g	8-oz glass (can be combined with other parameters)	14 days	Cool ≤6°C
			1 year	Freeze -20°C
Grain size	300 g	16-oz plastic	6 months	Cool ≤6°C
DOC in porewater	1- 2 L sediment ^a	2 X 1-L amber glass	48 hours for extraction, filtration and preservation; 28 days to analysis	HCl or H ₂ SO ₄ to pH<2 after filtration; Cool ≤6°C and dark
TOC	10 g	4-oz glass	28 days	Cool ≤6°C
			1 year, if frozen within 28 days of collection	Freeze -20°C
Total metals and mercury	100 g	4-oz glass	6 months	Cool ≤6°C
			1 year; samples must be extracted within 14 days of thawing	Freeze -20°C ^c
PAHs/ Organochlorine pesticides	500 g	8-oz glass	14 days to extraction	Cool ≤6°C
			1 year to extraction; samples must be extracted within 14 days of thawing	Freeze -20°C
			40 days after extraction	Cool ≤6°C
PCBs	500 g	8-oz glass	None ^a	Cool ≤6°C
				Freeze -20°C
Tissues				
Lipids	200 g	Split taken from sample for chemistry analyses	1 year	Freeze -20°C
Organochlorine pesticides	200 g	Foil or 8-oz glass	14 days to extraction	Cool ≤6°C
			1 year to extraction; samples must be extracted within 14 days of thawing	Freeze -20°C
			40 days after extraction	Cool ≤6°C
PCBs	200 g	Foil or 8-oz glass	None ^b	Cool ≤6°C
				Freeze -20°C

Table 3
Sample Containers, Holding Times, and Preservation Methods

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Waters				
Particle size determination	1 L	1-L HDPE	7 days	Cool ≤6°C
Total suspended solids	1 L	1-L HDPE	7 days	Cool ≤6°C
Total dissolved solids	1 L	1-L HDPE	7 days	Cool ≤6°C
TOC	150 mL	250 mL amber glass	28 days	Cool ≤6°C and dark; HCl or H2SO4 to pH<2
	40 mL	40 mL VOA vials		
DOC	200 mL	3 x 250mL glass	48 hours to filtration; 28 days to analysis	Cool ≤6°C and dark; HCl or H2SO4 to pH<2 after filtration
POC	2 - 5 L ^d	10L	48 hours to filtration; 28 days to analysis	Cool ≤6°C
Total Metals and hardness	100 mL	250 mL HDPE	48 hours until preservation	Cool ≤6°C
			6 months to analysis	Ambient; HNO3 to pH<2
Dissolved metals	100 mL	250 mL HDPE	Field filter; 48 hours until preservation	Cool ≤6°C
			6 months to analysis	Ambient; HNO ₃ to pH<2 after filtration
Organochlorine pesticides	1 to 2 L	2 X 1-L amber glass	14 days to extraction	Cool ≤6°C; pH 5-9
			40 days after extraction	Cool ≤6°C
PCBs	1 to 2 L	2 X 1-L amber glass	None ^b	Cool ≤6°C

Notes:

Some criteria may differ from SWAMP guidance; however, criteria are consistent with analytical methods. Recommendations are intended as guidance only. The selection of sample container and amount of sample required may vary per contracted laboratory sampling requirements.

°C = degrees Celsius

DOC = dissolved organic carbon

g = gram

HDPE = high-density polyethylene

L = liter

mL = milliliter

oz = ounce

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

POC = particulate organic carbon

SWAMP = California Surface Water Ambient Monitoring Program

TOC = total organic carbon

USEPA = U.S. Environmental Protection Agency

VOA = volatile organic analysis

a Volume of sediment collected must be sufficient to produce a minimum of 40 mL of porewater.

b PCB hold time was removed in SW-846, Chapter 4, Revision 4, February 2007 for aqueous and solid samples stored cool ≤6°C.

c Mercury will be analyzed prior to freezing.

d POC solids are analyzed for TOC by USEPA 9060. The volume of water collected must be sufficient to produce a minimum of 10 g of suspended sediment. Water may be field filtered.

Table 4
Sample Nomenclature Codes

Waterbody or Other Area Codes												
Actual	Outer Harbor - LA	Outer Harbor - LB	Inner Harbor - LA	Inner Harbor - LB	Consolidated Slip	Fish Harbor	Cabrillo Marina	Inner Cabrillo Beach	Eastern San Pedro Bay	Dominguez Channel	Cabrillo Pier	Angels Gate
Code	OA	OB	IA	IB	CS	FH	CM	CB	SP	DC	CP	AG

Media Codes												
Actual	Receiving Water	Porewater	Stormwater	Surface Sediment	Sediment Core	Whole Organism	Fish Fillet skin off (muscle)	Soft Tissue	Offal	Otolith	Field Blank	Equipment Rinsate Blank
Code	RW	PW	STW	SS	SC	WO	FF	ST	OF	OL	FB	EB

Organism									
<i>Scientific Name</i>	<i>Genyonemus lineatus</i>	<i>Cymatogaster aggregata</i>	<i>Atherinops affinis</i>	<i>Seriphus politus</i>	<i>Paralichthys californicus</i>	<i>Scomber japonicus</i>	<i>Paralabrax clathratus</i>	<i>Mytilus spp.</i>	<i>Polychaeta</i>
Common Name	White Croaker	Shiner Surfperch	Topsmelt	Queenfish	California Halibut	Chub Mackerel	Kelp Bass	Mussels	Polychaete worms
Code	WC	SS	TS	QF	CH	CM	KB	MS	PW

Organism or Composite Number	
Individual fish	1 or COMP1
Code	01 or C1

Station Number	
Station	01
Code	01

Date of Collection	
Date	1-Jul-14
Code	20140701

Depth	
Actual	0-15 cm
Code	0-15

Table 5
Frequencies and Performance Criteria for Field Quality Assurance/Quality Control Samples

Analysis Type	Field Duplicate	Field Duplicate Performance Criteria^{a,b}	Field and Rinse Blank^c	Field and Rinse Performance Criteria^d
Total solids and conventionals	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	NA	NA
Lipids	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	NA	NA
Grain size	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	NA	NA
Particle size determination for suspended solids	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	NA	NA
Total suspended and dissolved solids	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	NA	NA
Total and dissolved organic carbon	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL
Particulate organic carbon	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL
Total metals	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL
Polycyclic aromatic hydrocarbons	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL
Organochlorine pesticides	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL
PCB Congeners	5% of total project sample count	≤25%RPD if both result(s) are >5x RL. Difference ≤2x RL if result(s) are ≤5x RL.	Not a method requirement. Task specific	<RL

Notes:

NA = not applicable

PCB = polychlorinated biphenyl

RL = reporting limit

RPD = relative percent difference

SWAMP = California Surface Water Ambient Monitoring Program

a Field duplicate RPD exceedances alone would not result in data qualification. Further evaluation into the sample collection procedures should be conducted.

b This criteria is a slight deviation from SWAMP due to the ultra low detection levels utilized for these studies.

c If low level contamination could potentially bias results, field blanks and/or rinse (equipment) blanks should be collected.

d The determination to qualify results based on field and/or rinse blank concentrations will be made by the QA Manager as part of the overall data usability assessment.

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
Conventional Parameters		
Ammonia (mg/kg)	SM 4500-NH ₃ B/C/D (M)	0.20
Sulfide (mg/kg)	USEPA 376.2	0.50
Bulk density	ASTM D7263	--
Specific gravity	ASTM D854	--
Total solids (% wet weight)	SM 2540B/G / USEPA 160.3	0.1
Grain size (% retained)	ASTM D442 / SM 2560	1.0
Total organic carbon (%)	SM 5310B / USEPA 9060A	0.01% OC
Sediment porewater dissolved organic carbon (mg/L)	USEPA 9060M	0.5
Metals (µg/g or mg/kg)		
Cadmium	USEPA 6010B/6020	0.01
Chromium	USEPA 6010B/6020	0.1
Copper	USEPA 6010B/6020	0.01
Lead	USEPA 6010B/6020	0.01
Mercury	USEPA 6010B/6020/7471A/245.7/1631	0.03
Zinc	USEPA 6010B/6020	0.10
Polycyclic Aromatic Hydrocarbons (ng/g or µg/kg)		
Acenaphthene	USEPA 8270C / 8270D - SIM	20
Anthracene	USEPA 8270C / 8270D - SIM	20
Biphenyl	USEPA 8270C / 8270D - SIM	20
Naphthalene	USEPA 8270C / 8270D - SIM	20
2,6-Dimethylnaphthalene	USEPA 8270C / 8270D - SIM	20
Fluorene	USEPA 8270C / 8270D - SIM	20
1-Methylnaphthalene	USEPA 8270C / 8270D - SIM	20
2-Methylnaphthalene	USEPA 8270C / 8270D - SIM	20
1-Methylphenanthrene	USEPA 8270C / 8270D - SIM	20
Phenanthrene	USEPA 8270C / 8270D - SIM	20
Benz[a]anthracene	USEPA 8270C / 8270D - SIM	20
Benzo[a]pyrene	USEPA 8270C / 8270D - SIM	20
Benzo(e)pyrene	USEPA 8270C / 8270D - SIM	20
Chrysene	USEPA 8270C / 8270D - SIM	20
Dibenz[a,h]anthracene	USEPA 8270C / 8270D - SIM	20
Fluoranthene	USEPA 8270C / 8270D - SIM	20
Perylene	USEPA 8270C / 8270D - SIM	20
Pyrene	USEPA 8270C / 8270D - SIM	20
Organochlorine Pesticides (ng/g or µg/kg) - Low Resolution Analytical Methods		
Total Chlordane ^e	USEPA 8081A / 8270C	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A / 8270C	0.5
gamma-Chlordane (trans-chlordane)	USEPA 8081A / 8270C	0.5
Oxychlordane	USEPA 8081A / 8270C	0.5
cis-Nonachlor	USEPA 8081A / 8270C	0.5
trans-Nonachlor	USEPA 8081A / 8270C	0.5
Dieldrin ^f	USEPA 8081A / 8270C	0.02
Toxaphene ^f	USEPA 8081A / 8270C	0.10
2,4'-DDD	USEPA 8081A / 8270C	1.0
2,4'-DDE	USEPA 8081A / 8270C	1.0
2,4'-DDT	USEPA 8081A / 8270C	1.0
4,4'-DDD	USEPA 8081A / 8270C	1.0
4,4'-DDE	USEPA 8081A / 8270C	1.0
4,4'-DDT	USEPA 8081A / 8270C	1.0
DDMU	USEPA 8081A / 8270C	1.0

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
Organochlorine Pesticides (ng/g or µg/kg) - High Resolution Analytical Methods		
Total Chlordane ^e	USEPA 1699	--
alpha-Chlordane (cis-chlordane)	USEPA 1699	0.5
gamma-Chlordane (trans-chlordane)	USEPA 1699	0.5
Oxychlordane	USEPA 1699	0.5
cis-Nonachlor	USEPA 1699	0.5
trans-Nonachlor	USEPA 1699	0.5
Dieldrin	USEPA 1699	0.02
Toxaphene ^f	USEPA 1699	0.10
2,4'-DDD	USEPA 1699	1.0
2,4'-DDE	USEPA 1699	1.0
2,4'-DDT	USEPA 1699	1.0
4,4'-DDD	USEPA 1699	1.0
4,4'-DDE	USEPA 1699	1.0
4,4'-DDT	USEPA 1699	1.0
4,4'-DDMU	USEPA 1699	1.0
PCB Aroclors (ng/g or µg/kg)		
Aroclor-1016	USEPA 8082 / 8270C	10.0
Aroclor-1221	USEPA 8082 / 8270C	10.0
Aroclor-1232	USEPA 8082 / 8270C	10.0
Aroclor-1242	USEPA 8082 / 8270C	10.0
Aroclor-1248	USEPA 8082 / 8270C	10.0
Aroclor-1254	USEPA 8082 / 8270C	10.0
Aroclor-1260	USEPA 8082 / 8270C	10.0
Aroclor-1262	USEPA 8082 / 8270C	10.0
Aroclor-1268	USEPA 8082 / 8270C	10.0
PCB Congeners (ng/g or µg/kg)^g - Low Resolution Analytical Methods		
CL1-PCB-3	USEPA 8270C / 8270D-SIM	0.2
CL2-PCB-5	USEPA 8270C / 8270D-SIM	0.2
CL2-PCB-8	USEPA 8270C / 8270D-SIM	0.2
CL2-PCB-15	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-18	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-27	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-28	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-29	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-31	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-33	USEPA 8270C / 8270D-SIM	0.2
CL3-PCB-37	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-44	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-49	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-52	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-56	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-60	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-66	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-70	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-74	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-77	USEPA 8270C / 8270D-SIM	0.2
CL4-PCB-81	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-87	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-95	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-97	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-99	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-101	USEPA 8270C / 8270D-SIM	0.2

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
CL5-PCB-105	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-110	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-114	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-118	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-119	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-123	USEPA 8270C / 8270D-SIM	0.2
CL5-PCB-126	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-128	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-137	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-138	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-141	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-149	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-151	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-153	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-156	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-157	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-158	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-167	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-168	USEPA 8270C / 8270D-SIM	0.2
CL6-PCB-169	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-170	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-174	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-177	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-180	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-183	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-187	USEPA 8270C / 8270D-SIM	0.2
CL7-PCB-189	USEPA 8270C / 8270D-SIM	0.2
CL8-PCB-194	USEPA 8270C / 8270D-SIM	0.2
CL8-PCB-195	USEPA 8270C / 8270D-SIM	0.2
CL8-PCB-200	USEPA 8270C / 8270D-SIM	0.2
CL8-PCB-201	USEPA 8270C / 8270D-SIM	0.2
CL8-PCB-203	USEPA 8270C / 8270D-SIM	0.2
CL9-PCB-206	USEPA 8270C / 8270D-SIM	0.2
CL10-PCB-209	USEPA 8270C / 8270D-SIM	0.2
PCB Congeners (ng/g or µg/kg)^f - High Resolution Analytical Methods		
CL1-PCB-1	USEPA 1668	0.0025
CL1-PCB-2	USEPA 1668	0.0025
CL1-PCB-3	USEPA 1668	0.0025
CL2-PCB-4	USEPA 1668	0.0025
CL2-PCB-5	USEPA 1668	0.0025
CL2-PCB-6	USEPA 1668	0.0025
CL2-PCB-7	USEPA 1668	0.0025
CL2-PCB-8	USEPA 1668	0.0025
CL2-PCB-9	USEPA 1668	0.0025
CL2-PCB-10	USEPA 1668	0.0025
CL2-PCB-11	USEPA 1668	0.0025
CL2-PCB-12	USEPA 1668	0.0025
CL2-PCB-13	USEPA 1668	0.0025
CL2-PCB-14	USEPA 1668	0.0025
CL2-PCB-15	USEPA 1668	0.0025
CL3-PCB-16	USEPA 1668	0.0025
CL3-PCB-17	USEPA 1668	0.0025
CL3-PCB-18	USEPA 1668	0.0025
CL3-PCB-19	USEPA 1668	0.0025

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
CL3-PCB-20	USEPA 1668	0.0025
CL3-PCB-21	USEPA 1668	0.0025
CL3-PCB-22	USEPA 1668	0.0025
CL3-PCB-23	USEPA 1668	0.0025
CL3-PCB-24	USEPA 1668	0.0025
CL3-PCB-25	USEPA 1668	0.0025
CL3-PCB-26	USEPA 1668	0.0025
CL3-PCB-27	USEPA 1668	0.0025
CL3-PCB-28	USEPA 1668	0.0025
CL3-PCB-29	USEPA 1668	0.0025
CL3-PCB-30	USEPA 1668	0.0025
CL3-PCB-31	USEPA 1668	0.0025
CL3-PCB-32	USEPA 1668	0.0025
CL3-PCB-33	USEPA 1668	0.0025
CL3-PCB-34	USEPA 1668	0.0025
CL3-PCB-35	USEPA 1668	0.0025
CL3-PCB-36	USEPA 1668	0.0025
CL3-PCB-37	USEPA 1668	0.0025
CL3-PCB-38	USEPA 1668	0.0025
CL3-PCB-39	USEPA 1668	0.0025
CL4-PCB-40	USEPA 1668	0.0025
CL4-PCB-41	USEPA 1668	0.0025
CL4-PCB-42	USEPA 1668	0.0025
CL4-PCB-43	USEPA 1668	0.0025
CL4-PCB-44	USEPA 1668	0.0025
CL4-PCB-45	USEPA 1668	0.0025
CL4-PCB-46	USEPA 1668	0.0025
CL4-PCB-47	USEPA 1668	0.0025
CL4-PCB-48	USEPA 1668	0.0025
CL4-PCB-49	USEPA 1668	0.0025
CL4-PCB-50	USEPA 1668	0.0025
CL4-PCB-51	USEPA 1668	0.0025
CL4-PCB-52	USEPA 1668	0.0025
CL4-PCB-53	USEPA 1668	0.0025
CL4-PCB-54	USEPA 1668	0.0025
CL4-PCB-55	USEPA 1668	0.0025
CL4-PCB-56	USEPA 1668	0.0025
CL4-PCB-57	USEPA 1668	0.0025
CL4-PCB-58	USEPA 1668	0.0025
CL4-PCB-59	USEPA 1668	0.0025
CL4-PCB-60	USEPA 1668	0.0025
CL4-PCB-61	USEPA 1668	0.0025
CL4-PCB-62	USEPA 1668	0.0025
CL4-PCB-63	USEPA 1668	0.0025
CL4-PCB-64	USEPA 1668	0.0025
CL4-PCB-65	USEPA 1668	0.0025
CL4-PCB-66	USEPA 1668	0.0025
CL4-PCB-67	USEPA 1668	0.0025
CL4-PCB-68	USEPA 1668	0.0025
CL4-PCB-69	USEPA 1668	0.0025
CL4-PCB-70	USEPA 1668	0.0025
CL4-PCB-71	USEPA 1668	0.0025
CL4-PCB-72	USEPA 1668	0.0025
CL4-PCB-73	USEPA 1668	0.0025
CL4-PCB-74	USEPA 1668	0.0025

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
CL4-PCB-75	USEPA 1668	0.0025
CL4-PCB-76	USEPA 1668	0.0025
CL4-PCB-77	USEPA 1668	0.0025
CL4-PCB-78	USEPA 1668	0.0025
CL4-PCB-79	USEPA 1668	0.0025
CL4-PCB-80	USEPA 1668	0.0025
CL4-PCB-81	USEPA 1668	0.0025
CL5-PCB-82	USEPA 1668	0.0025
CL5-PCB-83	USEPA 1668	0.0025
CL5-PCB-84	USEPA 1668	0.0025
CL5-PCB-85	USEPA 1668	0.0025
CL5-PCB-86	USEPA 1668	0.0025
CL5-PCB-87	USEPA 1668	0.0025
CL5-PCB-88	USEPA 1668	0.0025
CL5-PCB-89	USEPA 1668	0.0025
CL5-PCB-90	USEPA 1668	0.0025
CL5-PCB-91	USEPA 1668	0.0025
CL5-PCB-92	USEPA 1668	0.0025
CL5-PCB-93	USEPA 1668	0.0025
CL5-PCB-94	USEPA 1668	0.0025
CL5-PCB-95	USEPA 1668	0.0025
CL5-PCB-96	USEPA 1668	0.0025
CL5-PCB-97	USEPA 1668	0.0025
CL5-PCB-98	USEPA 1668	0.0025
CL5-PCB-99	USEPA 1668	0.0025
CL5-PCB-100	USEPA 1668	0.0025
CL5-PCB-101	USEPA 1668	0.0025
CL5-PCB-102	USEPA 1668	0.0025
CL5-PCB-103	USEPA 1668	0.0025
CL5-PCB-104	USEPA 1668	0.0025
CL5-PCB-105	USEPA 1668	0.0025
CL5-PCB-106	USEPA 1668	0.0025
CL5-PCB-107	USEPA 1668	0.0025
CL5-PCB-108	USEPA 1668	0.0025
CL5-PCB-109	USEPA 1668	0.0025
CL5-PCB-110	USEPA 1668	0.0025
CL5-PCB-111	USEPA 1668	0.0025
CL5-PCB-112	USEPA 1668	0.0025
CL5-PCB-113	USEPA 1668	0.0025
CL5-PCB-114	USEPA 1668	0.0025
CL5-PCB-115	USEPA 1668	0.0025
CL5-PCB-116	USEPA 1668	0.0025
CL5-PCB-117	USEPA 1668	0.0025
CL5-PCB-118	USEPA 1668	0.0025
CL5-PCB-119	USEPA 1668	0.0025
CL5-PCB-120	USEPA 1668	0.0025
CL5-PCB-121	USEPA 1668	0.0025
CL5-PCB-122	USEPA 1668	0.0025
CL5-PCB-123	USEPA 1668	0.0025
CL5-PCB-124	USEPA 1668	0.0025
CL5-PCB-125	USEPA 1668	0.0025
CL5-PCB-126	USEPA 1668	0.0025
CL5-PCB-127	USEPA 1668	0.0025
CL6-PCB-128	USEPA 1668	0.0025
CL6-PCB-129	USEPA 1668	0.0025

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
CL6-PCB-130	USEPA 1668	0.0025
CL6-PCB-131	USEPA 1668	0.0025
CL6-PCB-132	USEPA 1668	0.0025
CL6-PCB-133	USEPA 1668	0.0025
CL6-PCB-134	USEPA 1668	0.0025
CL6-PCB-135	USEPA 1668	0.0025
CL6-PCB-136	USEPA 1668	0.0025
CL6-PCB-137	USEPA 1668	0.0025
CL6-PCB-138	USEPA 1668	0.0025
CL6-PCB-139	USEPA 1668	0.0025
CL6-PCB-140	USEPA 1668	0.0025
CL6-PCB-141	USEPA 1668	0.0025
CL6-PCB-142	USEPA 1668	0.0025
CL6-PCB-143	USEPA 1668	0.0025
CL6-PCB-144	USEPA 1668	0.0025
CL6-PCB-145	USEPA 1668	0.0025
CL6-PCB-146	USEPA 1668	0.0025
CL6-PCB-147	USEPA 1668	0.0025
CL6-PCB-148	USEPA 1668	0.0025
CL6-PCB-149	USEPA 1668	0.0025
CL6-PCB-150	USEPA 1668	0.0025
CL6-PCB-151	USEPA 1668	0.0025
CL6-PCB-152	USEPA 1668	0.0025
CL6-PCB-153	USEPA 1668	0.0025
CL6-PCB-154	USEPA 1668	0.0025
CL6-PCB-155	USEPA 1668	0.0025
CL6-PCB-156	USEPA 1668	0.0025
CL6-PCB-157	USEPA 1668	0.0025
CL6-PCB-158	USEPA 1668	0.0025
CL6-PCB-159	USEPA 1668	0.0025
CL6-PCB-160	USEPA 1668	0.0025
CL6-PCB-161	USEPA 1668	0.0025
CL6-PCB-162	USEPA 1668	0.0025
CL6-PCB-163	USEPA 1668	0.0025
CL6-PCB-164	USEPA 1668	0.0025
CL6-PCB-165	USEPA 1668	0.0025
CL6-PCB-166	USEPA 1668	0.0025
CL6-PCB-167	USEPA 1668	0.0025
CL6-PCB-168	USEPA 1668	0.0025
CL6-PCB-169	USEPA 1668	0.0025
CL7-PCB-170	USEPA 1668	0.0025
CL7-PCB-171	USEPA 1668	0.0025
CL7-PCB-172	USEPA 1668	0.0025
CL7-PCB-173	USEPA 1668	0.0025
CL7-PCB-174	USEPA 1668	0.0025
CL7-PCB-175	USEPA 1668	0.0025
CL7-PCB-176	USEPA 1668	0.0025
CL7-PCB-177	USEPA 1668	0.0025
CL7-PCB-178	USEPA 1668	0.0025
CL7-PCB-179	USEPA 1668	0.0025
CL7-PCB-180	USEPA 1668	0.0025
CL7-PCB-181	USEPA 1668	0.0025
CL7-PCB-182	USEPA 1668	0.0025
CL7-PCB-183	USEPA 1668	0.0025
CL7-PCB-184	USEPA 1668	0.0025

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter ^{a,b}	Analytical Method ^c	Target Reporting Limit ^d
CL7-PCB-185	USEPA 1668	0.0025
CL7-PCB-186	USEPA 1668	0.0025
CL7-PCB-187	USEPA 1668	0.0025
CL7-PCB-188	USEPA 1668	0.0025
CL7-PCB-189	USEPA 1668	0.0025
CL7-PCB-190	USEPA 1668	0.0025
CL7-PCB-191	USEPA 1668	0.0025
CL7-PCB-192	USEPA 1668	0.0025
CL7-PCB-193	USEPA 1668	0.0025
CL8-PCB-194	USEPA 1668	0.0025
CL8-PCB-195	USEPA 1668	0.0025
CL8-PCB-196	USEPA 1668	0.0025
CL8-PCB-197	USEPA 1668	0.0025
CL8-PCB-198	USEPA 1668	0.0025
CL8-PCB-199	USEPA 1668	0.0025
CL8-PCB-200	USEPA 1668	0.0025
CL8-PCB-201	USEPA 1668	0.0025
CL8-PCB-202	USEPA 1668	0.0025
CL8-PCB-203	USEPA 1668	0.0025
CL8-PCB-204	USEPA 1668	0.0025
CL8-PCB-205	USEPA 1668	0.0025
CL9-PCB-206	USEPA 1668	0.0025
CL9-PCB-207	USEPA 1668	0.0025
CL9-PCB-208	USEPA 1668	0.0025
CL10-PCB-209	USEPA 1668	0.0025

Notes:

Laboratory reporting limits are revised periodically and may change over the duration of this project. Reporting limits should be verified by each laboratory when writing Sampling and Analysis Plans.

µg/g = microgram per gram

EDL = estimated detection limit

MDL = method detection limit

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

N/A = not applicable

ng/g = nanogram per gram

OC = organic carbon

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

RL = reporting limit

SQO = sediment quality objectives

SWAMP = California Surface Water Ambient Monitoring Program

TBD = to be determined

TMDL = Total Maximum Daily Load

USEPA = U.S. Environmental Protection Agency

wt = weight

a Specific analytes used for each study conducted for the Ports may vary by waterbody, according to the listings.

b Units in dry weight unless otherwise noted. Specific analytes used for each study conducted for the Ports may vary by waterbody, according to the listings.

c Laboratories may use different versions of recommended methods (i.e. USEPA 8270C) as long as the QA/QC elements identified in this QAPP are met.

d Matrix interference, total solid concentrations and/or dilutions due to non-target analytes may increase actual reporting limits. The method detection limit (MDL) should be at least three times lower than the reporting limit (40 CFR part 136) but will vary per instrument by MDL study.

e Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

f TMDL sediment target for this compound is currently below achievable laboratory reporting limits. Results should be reported to the EDL/MDL.

g PCB co-elutions will vary by instrument and column, and may increase reporting limits for some congeners.

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
Conventionals		
Total dissolved solids (mg/L)	USEPA 160.1 / SM 2540 C	2.0
Total suspended solids (mg/L)	USEPA 160.2 / SM 2540 D	0.5
Hardness (mg CaCO ₃ / L) ^d	SM2340B	1
Total and dissolved organic carbon (mg/L)	9060M / SM 5310 D	0.6
Particulate organic carbon (mg/L)	9060 Modified/Lloyd Kahn with filtrate/USEPA 440	0.1
Particle size determination (%)	Laser diffraction (ASTM D4464M) or SSC (ASTM 3977)	0.1
Water Total and Dissolved Metals (µg/L)		
Cadmium	USEPA 6010A/6020/200.8/1640	0.01
Chromium	USEPA 6010A/6020/200.8/1640	0.1
Copper	USEPA 6010A/6020/200.8/1640	0.01
Lead	USEPA 6010A/6020/200.8/1640	0.01
Mercury	USEPA 7470A/245.7/1631	0.0002
Zinc	USEPA 6010A/6020/200.8/1640	0.10
Organochlorine Pesticides (ng/L) - Low Resolution Analytical Methods		
Total Chlordane^e	USEPA 8081A / 625	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A / 625	0.50
gamma-Chlordane (trans-chlordane)	USEPA 8081A / 625	0.50
Oxychlordane	USEPA 8081A / 625	0.50
cis-Nonachlor	USEPA 8081A / 625	0.50
trans-Nonachlor	USEPA 8081A / 625	0.50
Dieldrin	USEPA 8081A / 625	0.10
Toxaphene	USEPA 8081A / 625	2.0
2,4'-DDD	USEPA 8081A / 625	0.50
2,4'-DDE	USEPA 8081A / 625	0.50
2,4'-DDT	USEPA 8081A / 625	0.50
4,4'-DDD	USEPA 8081A / 625	0.50
4,4'-DDE	USEPA 8081A / 625	0.50
4,4'-DDT	USEPA 8081A / 625	0.50
4,4'-DDMU	USEPA 8081A / 625	0.50
Organochlorine Pesticides (ng/L) - High Resolution Analytical Method		
Total Chlordane^e	USEPA 1699	--
alpha-Chlordane (cis-chlordane)	USEPA 1699	0.50
gamma-Chlordane (trans-chlordane)	USEPA 1699	0.50
Oxychlordane	USEPA 1699	0.50
cis-Nonachlor	USEPA 1699	0.50
trans-Nonachlor	USEPA 1699	0.50
Dieldrin	USEPA 1699	0.10
Toxaphene	USEPA 1699	2.0
2,4'-DDD	USEPA 1699	0.50
2,4'-DDE	USEPA 1699	0.50

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
2,4'-DDT	USEPA 1699	0.50
4,4'-DDD	USEPA 1699	0.50
4,4'-DDE	USEPA 1699	0.50
4,4'-DDT	USEPA 1699	0.50
4,4'-DDMU	USEPA 1699	0.50
PCB Aroclors (ng/L) - Low Resolution Analytical Method		
Aroclor-1016	USEPA 8082 / 625	500
Aroclor-1221	USEPA 8082 / 625	500
Aroclor-1232	USEPA 8082 / 625	500
Aroclor-1242	USEPA 8082 / 625	500
Aroclor-1248	USEPA 8082 / 625	500
Aroclor-1254	USEPA 8082 / 625	500
Aroclor-1260	USEPA 8082 / 625	500
Aroclor-1262	USEPA 8082 / 625	500
Aroclor-1268	USEPA 8082 / 625	500
PCB Congeners (ng/L)^f - Low Resolution Analytical Methods		
CL1-PCB-3	USEPA 8270C (SIM or TQ) / 625	0.1
CL2-PCB-5	USEPA 8270C (SIM or TQ) / 625	0.1
CL2-PCB-8	USEPA 8270C (SIM or TQ) / 625	0.1
CL2-PCB-15	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-18	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-27	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-28	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-29	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-31	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-33	USEPA 8270C (SIM or TQ) / 625	0.1
CL3-PCB-37	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-44	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-49	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-52	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-56	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-60	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-66	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-70	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-74	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-77	USEPA 8270C (SIM or TQ) / 625	0.1
CL4-PCB-81	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-87	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-95	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-97	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-99	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-101	USEPA 8270C (SIM or TQ) / 625	0.1

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL5-PCB-105	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-110	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-114	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-118	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-119	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-123	USEPA 8270C (SIM or TQ) / 625	0.1
CL5-PCB-126	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-128	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-137	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-138	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-141	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-149	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-151	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-153	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-156	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-157	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-158	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-167	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-168	USEPA 8270C (SIM or TQ) / 625	0.1
CL6-PCB-169	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-170	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-174	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-177	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-180	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-183	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-187	USEPA 8270C (SIM or TQ) / 625	0.1
CL7-PCB-189	USEPA 8270C (SIM or TQ) / 625	0.1
CL8-PCB-194	USEPA 8270C (SIM or TQ) / 625	0.1
CL8-PCB-195	USEPA 8270C (SIM or TQ) / 625	0.1
CL8-PCB-200	USEPA 8270C (SIM or TQ) / 625	0.1
CL8-PCB-201	USEPA 8270C (SIM or TQ) / 625	0.1
CL8-PCB-203	USEPA 8270C (SIM or TQ) / 625	0.1
CL9-PCB-206	USEPA 8270C (SIM or TQ) / 625	0.1
CL10-PCB-209	USEPA 8270C (SIM or TQ) / 625	0.1
PCB Congeners (ng/L) ^{f,g} - High Resolution Analytical Method		
CL1-PCB-1	USEPA 1668B	0.005
CL1-PCB-2	USEPA 1668B	0.005
CL1-PCB-3	USEPA 1668B	0.005
CL2-PCB-4	USEPA 1668B	0.005
CL2-PCB-5	USEPA 1668B	0.005
CL2-PCB-6	USEPA 1668B	0.005
CL2-PCB-7	USEPA 1668B	0.005
CL2-PCB-8	USEPA 1668B	0.005

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL2-PCB-9	USEPA 1668B	0.005
CL2-PCB-10	USEPA 1668B	0.005
CL2-PCB-11	USEPA 1668B	0.005
CL2-PCB-12	USEPA 1668B	0.005
CL2-PCB-13	USEPA 1668B	0.005
CL2-PCB-14	USEPA 1668B	0.005
CL2-PCB-15	USEPA 1668B	0.005
CL3-PCB-16	USEPA 1668B	0.005
CL3-PCB-17	USEPA 1668B	0.005
CL3-PCB-18	USEPA 1668B	0.005
CL3-PCB-19	USEPA 1668B	0.005
CL3-PCB-20	USEPA 1668B	0.005
CL3-PCB-21	USEPA 1668B	0.005
CL3-PCB-22	USEPA 1668B	0.005
CL3-PCB-23	USEPA 1668B	0.005
CL3-PCB-24	USEPA 1668B	0.005
CL3-PCB-25	USEPA 1668B	0.005
CL3-PCB-26	USEPA 1668B	0.005
CL3-PCB-27	USEPA 1668B	0.005
CL3-PCB-28	USEPA 1668B	0.005
CL3-PCB-29	USEPA 1668B	0.005
CL3-PCB-30	USEPA 1668B	0.005
CL3-PCB-31	USEPA 1668B	0.005
CL3-PCB-32	USEPA 1668B	0.005
CL3-PCB-33	USEPA 1668B	0.005
CL3-PCB-34	USEPA 1668B	0.005
CL3-PCB-35	USEPA 1668B	0.005
CL3-PCB-36	USEPA 1668B	0.005
CL3-PCB-37	USEPA 1668B	0.005
CL3-PCB-38	USEPA 1668B	0.005
CL3-PCB-39	USEPA 1668B	0.005
CL4-PCB-40	USEPA 1668B	0.005
CL4-PCB-41	USEPA 1668B	0.005
CL4-PCB-42	USEPA 1668B	0.005
CL4-PCB-43	USEPA 1668B	0.005
CL4-PCB-44	USEPA 1668B	0.005
CL4-PCB-45	USEPA 1668B	0.005
CL4-PCB-46	USEPA 1668B	0.005
CL4-PCB-47	USEPA 1668B	0.005
CL4-PCB-48	USEPA 1668B	0.005
CL4-PCB-49	USEPA 1668B	0.005
CL4-PCB-50	USEPA 1668B	0.005
CL4-PCB-51	USEPA 1668B	0.005

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL4-PCB-52	USEPA 1668B	0.005
CL4-PCB-53	USEPA 1668B	0.005
CL4-PCB-54	USEPA 1668B	0.005
CL4-PCB-55	USEPA 1668B	0.005
CL4-PCB-56	USEPA 1668B	0.005
CL4-PCB-57	USEPA 1668B	0.005
CL4-PCB-58	USEPA 1668B	0.005
CL4-PCB-59	USEPA 1668B	0.005
CL4-PCB-60	USEPA 1668B	0.005
CL4-PCB-61	USEPA 1668B	0.005
CL4-PCB-62	USEPA 1668B	0.005
CL4-PCB-63	USEPA 1668B	0.005
CL4-PCB-64	USEPA 1668B	0.005
CL4-PCB-65	USEPA 1668B	0.005
CL4-PCB-66	USEPA 1668B	0.005
CL4-PCB-67	USEPA 1668B	0.005
CL4-PCB-68	USEPA 1668B	0.005
CL4-PCB-69	USEPA 1668B	0.005
CL4-PCB-70	USEPA 1668B	0.005
CL4-PCB-71	USEPA 1668B	0.005
CL4-PCB-72	USEPA 1668B	0.005
CL4-PCB-73	USEPA 1668B	0.005
CL4-PCB-74	USEPA 1668B	0.005
CL4-PCB-75	USEPA 1668B	0.005
CL4-PCB-76	USEPA 1668B	0.005
CL4-PCB-77	USEPA 1668B	0.005
CL4-PCB-78	USEPA 1668B	0.005
CL4-PCB-79	USEPA 1668B	0.005
CL4-PCB-80	USEPA 1668B	0.005
CL4-PCB-81	USEPA 1668B	0.005
CL5-PCB-82	USEPA 1668B	0.005
CL5-PCB-83	USEPA 1668B	0.005
CL5-PCB-84	USEPA 1668B	0.005
CL5-PCB-85	USEPA 1668B	0.005
CL5-PCB-86	USEPA 1668B	0.005
CL5-PCB-87	USEPA 1668B	0.005
CL5-PCB-88	USEPA 1668B	0.005
CL5-PCB-89	USEPA 1668B	0.005
CL5-PCB-90	USEPA 1668B	0.005
CL5-PCB-91	USEPA 1668B	0.005
CL5-PCB-92	USEPA 1668B	0.005
CL5-PCB-93	USEPA 1668B	0.005
CL5-PCB-94	USEPA 1668B	0.005
CL5-PCB-95	USEPA 1668B	0.005

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL5-PCB-96	USEPA 1668B	0.005
CL5-PCB-97	USEPA 1668B	0.005
CL5-PCB-98	USEPA 1668B	0.005
CL5-PCB-99	USEPA 1668B	0.005
CL5-PCB-100	USEPA 1668B	0.005
CL5-PCB-101	USEPA 1668B	0.005
CL5-PCB-102	USEPA 1668B	0.005
CL5-PCB-103	USEPA 1668B	0.005
CL5-PCB-104	USEPA 1668B	0.005
CL5-PCB-105	USEPA 1668B	0.005
CL5-PCB-106	USEPA 1668B	0.005
CL5-PCB-107	USEPA 1668B	0.005
CL5-PCB-108	USEPA 1668B	0.005
CL5-PCB-109	USEPA 1668B	0.005
CL5-PCB-110	USEPA 1668B	0.005
CL5-PCB-111	USEPA 1668B	0.005
CL5-PCB-112	USEPA 1668B	0.005
CL5-PCB-113	USEPA 1668B	0.005
CL5-PCB-114	USEPA 1668B	0.005
CL5-PCB-115	USEPA 1668B	0.005
CL5-PCB-116	USEPA 1668B	0.005
CL5-PCB-117	USEPA 1668B	0.005
CL5-PCB-118	USEPA 1668B	0.005
CL5-PCB-119	USEPA 1668B	0.005
CL5-PCB-120	USEPA 1668B	0.005
CL5-PCB-121	USEPA 1668B	0.005
CL5-PCB-122	USEPA 1668B	0.005
CL5-PCB-123	USEPA 1668B	0.005
CL5-PCB-124	USEPA 1668B	0.005
CL5-PCB-125	USEPA 1668B	0.005
CL5-PCB-126	USEPA 1668B	0.005
CL5-PCB-127	USEPA 1668B	0.005
CL6-PCB-128	USEPA 1668B	0.005
CL6-PCB-129	USEPA 1668B	0.005
CL6-PCB-130	USEPA 1668B	0.005
CL6-PCB-131	USEPA 1668B	0.005
CL6-PCB-132	USEPA 1668B	0.005
CL6-PCB-133	USEPA 1668B	0.005
CL6-PCB-134	USEPA 1668B	0.005
CL6-PCB-135	USEPA 1668B	0.005
CL6-PCB-136	USEPA 1668B	0.005
CL6-PCB-137	USEPA 1668B	0.005
CL6-PCB-138	USEPA 1668B	0.005
CL6-PCB-139	USEPA 1668B	0.005

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL6-PCB-140	USEPA 1668B	0.005
CL6-PCB-141	USEPA 1668B	0.005
CL6-PCB-142	USEPA 1668B	0.005
CL6-PCB-143	USEPA 1668B	0.005
CL6-PCB-144	USEPA 1668B	0.005
CL6-PCB-145	USEPA 1668B	0.005
CL6-PCB-146	USEPA 1668B	0.005
CL6-PCB-147	USEPA 1668B	0.005
CL6-PCB-148	USEPA 1668B	0.005
CL6-PCB-149	USEPA 1668B	0.005
CL6-PCB-150	USEPA 1668B	0.005
CL6-PCB-151	USEPA 1668B	0.005
CL6-PCB-152	USEPA 1668B	0.005
CL6-PCB-153	USEPA 1668B	0.005
CL6-PCB-154	USEPA 1668B	0.005
CL6-PCB-155	USEPA 1668B	0.005
CL6-PCB-156	USEPA 1668B	0.005
CL6-PCB-157	USEPA 1668B	0.005
CL6-PCB-158	USEPA 1668B	0.005
CL6-PCB-159	USEPA 1668B	0.005
CL6-PCB-160	USEPA 1668B	0.005
CL6-PCB-161	USEPA 1668B	0.005
CL6-PCB-162	USEPA 1668B	0.005
CL6-PCB-163	USEPA 1668B	0.005
CL6-PCB-164	USEPA 1668B	0.005
CL6-PCB-165	USEPA 1668B	0.005
CL6-PCB-166	USEPA 1668B	0.005
CL6-PCB-167	USEPA 1668B	0.005
CL6-PCB-168	USEPA 1668B	0.005
CL6-PCB-169	USEPA 1668B	0.005
CL7-PCB-170	USEPA 1668B	0.005
CL7-PCB-171	USEPA 1668B	0.005
CL7-PCB-172	USEPA 1668B	0.005
CL7-PCB-173	USEPA 1668B	0.005
CL7-PCB-174	USEPA 1668B	0.005
CL7-PCB-175	USEPA 1668B	0.005
CL7-PCB-176	USEPA 1668B	0.005
CL7-PCB-177	USEPA 1668B	0.005
CL7-PCB-178	USEPA 1668B	0.005
CL7-PCB-179	USEPA 1668B	0.005
CL7-PCB-180	USEPA 1668B	0.005
CL7-PCB-181	USEPA 1668B	0.005
CL7-PCB-182	USEPA 1668B	0.005

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL7-PCB-183	USEPA 1668B	0.005
CL7-PCB-184	USEPA 1668B	0.005
CL7-PCB-185	USEPA 1668B	0.005
CL7-PCB-186	USEPA 1668B	0.005
CL7-PCB-187	USEPA 1668B	0.005
CL7-PCB-188	USEPA 1668B	0.005
CL7-PCB-189	USEPA 1668B	0.005
CL7-PCB-190	USEPA 1668B	0.005
CL7-PCB-191	USEPA 1668B	0.005
CL7-PCB-192	USEPA 1668B	0.005
CL7-PCB-193	USEPA 1668B	0.005
CL8-PCB-194	USEPA 1668B	0.005
CL8-PCB-195	USEPA 1668B	0.005
CL8-PCB-196	USEPA 1668B	0.005
CL8-PCB-197	USEPA 1668B	0.005
CL8-PCB-198	USEPA 1668B	0.005
CL8-PCB-199	USEPA 1668B	0.005
CL8-PCB-200	USEPA 1668B	0.005
CL8-PCB-201	USEPA 1668B	0.005
CL8-PCB-202	USEPA 1668B	0.005
CL8-PCB-203	USEPA 1668B	0.005
CL8-PCB-204	USEPA 1668B	0.005
CL8-PCB-205	USEPA 1668B	0.005
CL9-PCB-206	USEPA 1668B	0.005
CL9-PCB-207	USEPA 1668B	0.005
CL9-PCB-208	USEPA 1668B	0.005
CL10-PCB-209	USEPA 1668B	0.005

Notes:

High volume alternative sampling techniques may be used to achieve lower reporting limits for these analyses.

Laboratory reporting limits are revised periodically, and may change over the duration of this project.

Reporting limits should be verified by each lab when writing Sampling and Analysis Plans.

mg/L = milligram per liter

µg/L = microgram per liter

ng/L = nanogram per liter

pg/L = picogram per liter

EDL = estimated detection limit

MDL = method detection limit

RL = reporting limit

PCB = polychlorinated biphenyl

TBD = to be determined

wt = weight

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
Conventionals (%)		
Lipids	NOAA 1993a / Gravimetric	0.5
Organochlorine Pesticides (ng/g or µg/kg wet weight) - Low Resolution Analytical Methods		
Total Chlordane ^d	USEPA 8081A / 8270C / 8270D TQ	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A / 8270C / 8270D TQ	4.0
gamma-Chlordane (trans-chlordane)	USEPA 8081A / 8270C / 8270D TQ	4.0
Oxychlordane	USEPA 8081A / 8270C / 8270D TQ	2.0
cis-Nonachlor	USEPA 8081A / 8270C / 8270D TQ	4.0
trans-Nonachlor	USEPA 8081A / 8270C / 8270D TQ	2.0
Dieldrin ^f	USEPA 8081A / 8270C / 8270D TQ	0.46
Toxaphene ^f	USEPA 8081A / 8270C / 8270D TQ	6.1
2,4'-DDD	USEPA 8081A / 8270C / 8270D TQ	4.0
2,4'-DDE	USEPA 8081A / 8270C / 8270D TQ	4.0
2,4'-DDT	USEPA 8081A / 8270C / 8270D TQ	6.0
4,4'-DDD	USEPA 8081A / 8270C / 8270D TQ	4.0
4,4'-DDE	USEPA 8081A / 8270C / 8270D TQ	4.0
4,4'-DDT	USEPA 8081A / 8270C / 8270D TQ	10.0
4,4'-DDMU	USEPA 8081A / 8270C / 8270D TQ	10.0
Organochlorine Pesticides (ng/g or µg/kg wet weight) - High Resolution Analytical Method		
Total Chlordane ^d	USEPA 1699	--
alpha-Chlordane (cis-chlordane)	USEPA 1699	4.0
gamma-Chlordane (trans-chlordane)	USEPA 1699	4.0
Oxychlordane	USEPA 1699	2.0
cis-Nonachlor	USEPA 1699	4.0
trans-Nonachlor	USEPA 1699	2.0
Dieldrin ^f	USEPA 1699	0.46
Toxaphene	USEPA 1699	6.1
2,4'-DDD	USEPA 1699	4.0
2,4'-DDE	USEPA 1699	4.0
2,4'-DDT	USEPA 1699	6.0
4,4'-DDD	USEPA 1699	4.0
4,4'-DDE	USEPA 1699	4.0
4,4'-DDT	USEPA 1699	10.0
4,4'-DDMU	USEPA 1699	10.0
PCB Aroclors (ng/g or µg/kg)		
Aroclor-1016	USEPA 8082 / 8270C	2.0
Aroclor-1221	USEPA 8082 / 8270C	2.0
Aroclor-1232	USEPA 8082 / 8270C	2.0
Aroclor-1242	USEPA 8082 / 8270C	2.0
Aroclor-1248	USEPA 8082 / 8270C	2.0
Aroclor-1254	USEPA 8082 / 8270C	2.0
Aroclor-1260	USEPA 8082 / 8270C	2.0
Aroclor-1262	USEPA 8082 / 8270C	2.0
Aroclor-1268	USEPA 8082 / 8270C	2.0
PCB Congeners (ng/g or µg/kg wet weight) - Low Resolution Analytical Methods		
CL1-PCB-3	USEPA 8270C / 8270D	0.4
CL2-PCB-5	USEPA 8270C / 8270D	0.4

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL2-PCB-8	USEPA 8270C / 8270D	0.4
CL2-PCB-15	USEPA 8270C / 8270D	0.4
CL3-PCB-18	USEPA 8270C / 8270D	0.4
CL3-PCB-27	USEPA 8270C / 8270D	0.4
CL3-PCB-28	USEPA 8270C / 8270D	0.4
CL3-PCB-29	USEPA 8270C / 8270D	0.4
CL3-PCB-31	USEPA 8270C / 8270D	0.4
CL3-PCB-33	USEPA 8270C / 8270D	0.4
CL3-PCB-37	USEPA 8270C / 8270D	0.4
CL4-PCB-44	USEPA 8270C / 8270D	0.4
CL4-PCB-49	USEPA 8270C / 8270D	0.4
CL4-PCB-52	USEPA 8270C / 8270D	0.4
CL4-PCB-56	USEPA 8270C / 8270D	0.4
CL4-PCB-60	USEPA 8270C / 8270D	0.4
CL4-PCB-66	USEPA 8270C / 8270D	0.4
CL4-PCB-70	USEPA 8270C / 8270D	0.4
CL4-PCB-74	USEPA 8270C / 8270D	0.4
CL4-PCB-77	USEPA 8270C / 8270D	0.4
CL4-PCB-81	USEPA 8270C / 8270D	0.4
CL5-PCB-87	USEPA 8270C / 8270D	0.4
CL5-PCB-95	USEPA 8270C / 8270D	0.4
CL5-PCB-97	USEPA 8270C / 8270D	0.4
CL5-PCB-99	USEPA 8270C / 8270D	0.4
CL5-PCB-101	USEPA 8270C / 8270D	0.4
CL5-PCB-105	USEPA 8270C / 8270D	0.4
CL5-PCB-110	USEPA 8270C / 8270D	0.4
CL5-PCB-114	USEPA 8270C / 8270D	0.4
CL5-PCB-118	USEPA 8270C / 8270D	0.4
CL5-PCB-119	USEPA 8270C / 8270D	0.4
CL5-PCB-123	USEPA 8270C / 8270D	0.4
CL5-PCB-126	USEPA 8270C / 8270D	0.4
CL6-PCB-128	USEPA 8270C / 8270D	0.4
CL6-PCB-137	USEPA 8270C / 8270D	0.4
CL6-PCB-138	USEPA 8270C / 8270D	0.4
CL6-PCB-141	USEPA 8270C / 8270D	0.4
CL6-PCB-149	USEPA 8270C / 8270D	0.4
CL6-PCB-151	USEPA 8270C / 8270D	0.4
CL6-PCB-153	USEPA 8270C / 8270D	0.4
CL6-PCB-156	USEPA 8270C / 8270D	0.4
CL6-PCB-157	USEPA 8270C / 8270D	0.4
CL6-PCB-158	USEPA 8270C / 8270D	0.4
CL6-PCB-167	USEPA 8270C / 8270D	0.4
CL6-PCB-168	USEPA 8270C / 8270D	0.4
CL6-PCB-169	USEPA 8270C / 8270D	0.4
CL7-PCB-170	USEPA 8270C / 8270D	0.4
CL7-PCB-174	USEPA 8270C / 8270D	0.4
CL7-PCB-177	USEPA 8270C / 8270D	0.4

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL7-PCB-180	USEPA 8270C / 8270D	0.4
CL7-PCB-183	USEPA 8270C / 8270D	0.4
CL7-PCB-187	USEPA 8270C / 8270D	0.4
CL7-PCB-189	USEPA 8270C / 8270D	20.0
CL8-PCB-194	USEPA 8270C / 8270D	0.4
CL8-PCB-195	USEPA 8270C / 8270D	0.4
CL8-PCB-200	USEPA 8270C / 8270D	0.4
CL8-PCB-201	USEPA 8270C / 8270D	0.4
CL8-PCB-203	USEPA 8270C / 8270D	0.4
CL9-PCB-206	USEPA 8270C / 8270D	0.4
CL10-PCB-209	USEPA 8270C / 8270D	0.4
PCB Congeners (ng/g or µg/kg)^e - High Resolution Analytical Methods		
CL1-PCB-1	USEPA 1668	0.001
CL1-PCB-2	USEPA 1668	0.001
CL1-PCB-3	USEPA 1668	0.001
CL2-PCB-4	USEPA 1668	0.001
CL2-PCB-5	USEPA 1668	0.001
CL2-PCB-6	USEPA 1668	0.001
CL2-PCB-7	USEPA 1668	0.001
CL2-PCB-8	USEPA 1668	0.001
CL2-PCB-9	USEPA 1668	0.001
CL2-PCB-10	USEPA 1668	0.001
CL2-PCB-11	USEPA 1668	0.001
CL2-PCB-12	USEPA 1668	0.001
CL2-PCB-13	USEPA 1668	0.001
CL2-PCB-14	USEPA 1668	0.001
CL2-PCB-15	USEPA 1668	0.001
CL3-PCB-16	USEPA 1668	0.001
CL3-PCB-17	USEPA 1668	0.001
CL3-PCB-18	USEPA 1668	0.001
CL3-PCB-19	USEPA 1668	0.001
CL3-PCB-20	USEPA 1668	0.001
CL3-PCB-21	USEPA 1668	0.001
CL3-PCB-22	USEPA 1668	0.001
CL3-PCB-23	USEPA 1668	0.001
CL3-PCB-24	USEPA 1668	0.001
CL3-PCB-25	USEPA 1668	0.001
CL3-PCB-26	USEPA 1668	0.001
CL3-PCB-27	USEPA 1668	0.001
CL3-PCB-28	USEPA 1668	0.001
CL3-PCB-29	USEPA 1668	0.001
CL3-PCB-30	USEPA 1668	0.001
CL3-PCB-31	USEPA 1668	0.001
CL3-PCB-32	USEPA 1668	0.001
CL3-PCB-33	USEPA 1668	0.001
CL3-PCB-34	USEPA 1668	0.001
CL3-PCB-35	USEPA 1668	0.001
CL3-PCB-36	USEPA 1668	0.001
CL3-PCB-37	USEPA 1668	0.001
CL3-PCB-38	USEPA 1668	0.001

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter^a	Analytical Method^b	Target Reporting Limit^c
CL3-PCB-39	USEPA 1668	0.001
CL4-PCB-40	USEPA 1668	0.001
CL4-PCB-41	USEPA 1668	0.001
CL4-PCB-42	USEPA 1668	0.001
CL4-PCB-43	USEPA 1668	0.001
CL4-PCB-44	USEPA 1668	0.001
CL4-PCB-45	USEPA 1668	0.001
CL4-PCB-46	USEPA 1668	0.001
CL4-PCB-47	USEPA 1668	0.001
CL4-PCB-48	USEPA 1668	0.001
CL4-PCB-49	USEPA 1668	0.001
CL4-PCB-50	USEPA 1668	0.001
CL4-PCB-51	USEPA 1668	0.001
CL4-PCB-52	USEPA 1668	0.001
CL4-PCB-53	USEPA 1668	0.001
CL4-PCB-54	USEPA 1668	0.001
CL4-PCB-55	USEPA 1668	0.001
CL4-PCB-56	USEPA 1668	0.001
CL4-PCB-57	USEPA 1668	0.001
CL4-PCB-58	USEPA 1668	0.001
CL4-PCB-59	USEPA 1668	0.001
CL4-PCB-60	USEPA 1668	0.001
CL4-PCB-61	USEPA 1668	0.001
CL4-PCB-62	USEPA 1668	0.001
CL4-PCB-63	USEPA 1668	0.001
CL4-PCB-64	USEPA 1668	0.001
CL4-PCB-65	USEPA 1668	0.001
CL4-PCB-66	USEPA 1668	0.001
CL4-PCB-67	USEPA 1668	0.001
CL4-PCB-68	USEPA 1668	0.001
CL4-PCB-69	USEPA 1668	0.001
CL4-PCB-70	USEPA 1668	0.001
CL4-PCB-71	USEPA 1668	0.001
CL4-PCB-72	USEPA 1668	0.001
CL4-PCB-73	USEPA 1668	0.001
CL4-PCB-74	USEPA 1668	0.001
CL4-PCB-75	USEPA 1668	0.001
CL4-PCB-76	USEPA 1668	0.001
CL4-PCB-77	USEPA 1668	0.001
CL4-PCB-78	USEPA 1668	0.001
CL4-PCB-79	USEPA 1668	0.001
CL4-PCB-80	USEPA 1668	0.001
CL4-PCB-81	USEPA 1668	0.001
CL5-PCB-82	USEPA 1668	0.001
CL5-PCB-83	USEPA 1668	0.001
CL5-PCB-84	USEPA 1668	0.001
CL5-PCB-85	USEPA 1668	0.001
CL5-PCB-86	USEPA 1668	0.001
CL5-PCB-87	USEPA 1668	0.001
CL5-PCB-88	USEPA 1668	0.001

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL5-PCB-89	USEPA 1668	0.001
CL5-PCB-90	USEPA 1668	0.001
CL5-PCB-91	USEPA 1668	0.001
CL5-PCB-92	USEPA 1668	0.001
CL5-PCB-93	USEPA 1668	0.001
CL5-PCB-94	USEPA 1668	0.001
CL5-PCB-95	USEPA 1668	0.001
CL5-PCB-96	USEPA 1668	0.001
CL5-PCB-97	USEPA 1668	0.001
CL5-PCB-98	USEPA 1668	0.001
CL5-PCB-99	USEPA 1668	0.001
CL5-PCB-100	USEPA 1668	0.001
CL5-PCB-101	USEPA 1668	0.001
CL5-PCB-102	USEPA 1668	0.001
CL5-PCB-103	USEPA 1668	0.001
CL5-PCB-104	USEPA 1668	0.001
CL5-PCB-105	USEPA 1668	0.001
CL5-PCB-106	USEPA 1668	0.001
CL5-PCB-107	USEPA 1668	0.001
CL5-PCB-108	USEPA 1668	0.001
CL5-PCB-109	USEPA 1668	0.001
CL5-PCB-110	USEPA 1668	0.001
CL5-PCB-111	USEPA 1668	0.001
CL5-PCB-112	USEPA 1668	0.001
CL5-PCB-113	USEPA 1668	0.001
CL5-PCB-114	USEPA 1668	0.001
CL5-PCB-115	USEPA 1668	0.001
CL5-PCB-116	USEPA 1668	0.001
CL5-PCB-117	USEPA 1668	0.001
CL5-PCB-118	USEPA 1668	0.001
CL5-PCB-119	USEPA 1668	0.001
CL5-PCB-120	USEPA 1668	0.001
CL5-PCB-121	USEPA 1668	0.001
CL5-PCB-122	USEPA 1668	0.001
CL5-PCB-123	USEPA 1668	0.001
CL5-PCB-124	USEPA 1668	0.001
CL5-PCB-125	USEPA 1668	0.001
CL5-PCB-126	USEPA 1668	0.001
CL5-PCB-127	USEPA 1668	0.001
CL6-PCB-128	USEPA 1668	0.001
CL6-PCB-129	USEPA 1668	0.001
CL6-PCB-130	USEPA 1668	0.001
CL6-PCB-131	USEPA 1668	0.001
CL6-PCB-132	USEPA 1668	0.001
CL6-PCB-133	USEPA 1668	0.001
CL6-PCB-134	USEPA 1668	0.001
CL6-PCB-135	USEPA 1668	0.001
CL6-PCB-136	USEPA 1668	0.001
CL6-PCB-137	USEPA 1668	0.001

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter^a	Analytical Method^b	Target Reporting Limit^c
CL6-PCB-138	USEPA 1668	0.001
CL6-PCB-139	USEPA 1668	0.001
CL6-PCB-140	USEPA 1668	0.001
CL6-PCB-141	USEPA 1668	0.001
CL6-PCB-142	USEPA 1668	0.001
CL6-PCB-143	USEPA 1668	0.001
CL6-PCB-144	USEPA 1668	0.001
CL6-PCB-145	USEPA 1668	0.001
CL6-PCB-146	USEPA 1668	0.001
CL6-PCB-147	USEPA 1668	0.001
CL6-PCB-148	USEPA 1668	0.001
CL6-PCB-149	USEPA 1668	0.001
CL6-PCB-150	USEPA 1668	0.001
CL6-PCB-151	USEPA 1668	0.001
CL6-PCB-152	USEPA 1668	0.001
CL6-PCB-153	USEPA 1668	0.001
CL6-PCB-154	USEPA 1668	0.001
CL6-PCB-155	USEPA 1668	0.001
CL6-PCB-156	USEPA 1668	0.001
CL6-PCB-157	USEPA 1668	0.001
CL6-PCB-158	USEPA 1668	0.001
CL6-PCB-159	USEPA 1668	0.001
CL6-PCB-160	USEPA 1668	0.001
CL6-PCB-161	USEPA 1668	0.001
CL6-PCB-162	USEPA 1668	0.001
CL6-PCB-163	USEPA 1668	0.001
CL6-PCB-164	USEPA 1668	0.001
CL6-PCB-165	USEPA 1668	0.001
CL6-PCB-166	USEPA 1668	0.001
CL6-PCB-167	USEPA 1668	0.001
CL6-PCB-168	USEPA 1668	0.001
CL6-PCB-169	USEPA 1668	0.001
CL7-PCB-170	USEPA 1668	0.001
CL7-PCB-171	USEPA 1668	0.001
CL7-PCB-172	USEPA 1668	0.001
CL7-PCB-173	USEPA 1668	0.001
CL7-PCB-174	USEPA 1668	0.001
CL7-PCB-175	USEPA 1668	0.001
CL7-PCB-176	USEPA 1668	0.001
CL7-PCB-177	USEPA 1668	0.001
CL7-PCB-178	USEPA 1668	0.001
CL7-PCB-179	USEPA 1668	0.001
CL7-PCB-180	USEPA 1668	0.001
CL7-PCB-181	USEPA 1668	0.001
CL7-PCB-182	USEPA 1668	0.001
CL7-PCB-183	USEPA 1668	0.001
CL7-PCB-184	USEPA 1668	0.001
CL7-PCB-185	USEPA 1668	0.001
CL7-PCB-186	USEPA 1668	0.001

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter ^a	Analytical Method ^b	Target Reporting Limit ^c
CL7-PCB-187	USEPA 1668	0.001
CL7-PCB-188	USEPA 1668	0.001
CL7-PCB-189	USEPA 1668	0.001
CL7-PCB-190	USEPA 1668	0.001
CL7-PCB-191	USEPA 1668	0.001
CL7-PCB-192	USEPA 1668	0.001
CL7-PCB-193	USEPA 1668	0.001
CL8-PCB-194	USEPA 1668	0.001
CL8-PCB-195	USEPA 1668	0.001
CL8-PCB-196	USEPA 1668	0.001
CL8-PCB-197	USEPA 1668	0.001
CL8-PCB-198	USEPA 1668	0.001
CL8-PCB-199	USEPA 1668	0.001
CL8-PCB-200	USEPA 1668	0.001
CL8-PCB-201	USEPA 1668	0.001
CL8-PCB-202	USEPA 1668	0.001
CL8-PCB-203	USEPA 1668	0.001
CL8-PCB-204	USEPA 1668	0.001
CL8-PCB-205	USEPA 1668	0.001
CL9-PCB-206	USEPA 1668	0.001
CL9-PCB-207	USEPA 1668	0.001
CL9-PCB-208	USEPA 1668	0.001
CL10-PCB-209	USEPA 1668	0.001

Notes:

Data will be reported uncorrected for lipids or moisture content.

Laboratory reporting limits are revised periodically, and may change over the duration of this project. Reporting limits should be verified by each lab when

CFR = Code of Federal Regulations

ng/g = nanogram per gram

MDL = method detection limit

N/A = not applicable

NOAA = National Oceanic and Atmospheric Administration

QAPP = Quality Assurance Project Plan

QA/QC = quality assurance/quality control

RL = reporting limit

PCB = polychlorinated biphenyl

SWAMP = California Surface Water Ambient Monitoring Program

TBD = to be determined

USEPA = U.S. Environmental Protection Agency

a Specific analytes used for each study conducted for the Ports may vary by waterbody, according to the listings.

b Laboratories may use different versions of recommended methods (i.e. USEPA 8270C) as long as the QA/QC elements identified in this QAPP are met.

c Matrix interference and/or dilutions due to non-target analytes may increase target reporting limits. The method detection limit (MDL) should be at least three times lower than the reporting limit (40 CFR part 136) but will vary per instrument by MDL study.

d Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

e PCB co-elutions will vary by instrument and column, and may increase reporting limits for some congeners.

f TMDL sediment target for this compound is currently below achievable laboratory reporting limits. Results should be reported to the EDL/MDL.

Table 9
Laboratory Quality Assurance/Quality Control Definitions

Laboratory Quality Control	Definition
Calibration	A comparison of a measurement standard, instrument, or item with one having higher accuracy to detect, quantify, and record any inaccuracy or variation; the process by which an instrument setting is adjusted based on response to a standard to eliminate the inaccuracy.
Certified/Standard Reference Material	A substance whose property values are certified by a procedure that establishes its traceability and uncertainty at a stated level of confidence.
Continuing Calibration Verification	A periodic standard used to assess instrument drift between calibrations.
Internal Standard	Pure analyte(s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes that are components of the same sample or solution. The internal standard must be an analyte that is not a sample component.
Laboratory Replicate	Two or more representative portions taken from one homogeneous sample by the analyst and analyzed in the same testing facility.
Laboratory Control Sample	A specimen of known composition prepared using contaminant-free reagent water, or an inert solid, which is spiked with the analyte of interest at the midpoint of the calibration curve or at the level of concern, and then analyzed using the same preparation, reagents, and analytical methods employed for regular specimens and at the intervals set in the Quality Assurance Project Plan.
Matrix Spike	A test specimen prepared by adding a known concentration of the target analyte to a specified amount of a specific homogenized specimen where an estimate of the target concentration is available and subjected to the entire analytical protocol.
Matrix Spike Duplicate	A sample prepared simultaneously as a split with the matrix spike sample with each specimen being spiked with identical, known concentrations of targeted analyte.
Method Blank	A blank prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.
Sample Batch	Twenty or fewer field samples prepared and analyzed with a common set of quality assurance samples.
Surrogate	A pure substance with properties that mimics the analyte of interest (organics only) and which is unlikely to be found in environmental samples. It is added into a sample before sample preparation.

Table 10
Frequencies for Laboratory Quality Assurance/Quality Control Samples

Analysis Type	Initial Calibration ^{a,b}	Continuing Calibration Verification	LCS or SRM ^c	Replicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Internal Standard
Total solids and conventionals	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Lipids	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Grain size	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Particle size determination	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Total suspended and dissolved solids	Daily or each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A	N/A
Total and dissolved organic carbon	Daily or each batch	1 per 10 analytical runs	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	N/A	Each batch	N/A	N/A
Particulate organic carbon	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	Each batch	N/A	N/A
Total and dissolved metals	Daily or each batch	Per 10 analytical runs	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	N/A	Each batch	N/A	Per method
PCBs by low resolution method	As needed	Every 12 hours	1 per 20 samples or 1 per batch	N/A	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample
PCB Congeners by high resolution method	As needed	Every 12 hours	1 per 20 samples	N/A	N/A ^d	N/A ^d	1 per 20 samples	N/A ^d	Every sample
PAHs	As needed	Every 12 hours	1 per 20 samples or 1 per batch	N/A	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample
Organochlorine pesticides by low resolution method	As needed	Per 10 analytical runs	1 per 20 samples or 1 per batch	N/A	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample
Organochlorine pesticides by high resolution method	As needed	Every 12 hours	1 per 20 samples	N/A	N/A ^d	N/A ^d	1 per 20 samples	N/A ^d	Every sample

Notes:

Primary column is considered the column that contains the highest value with the least interference.

Values should have RPDs less than 40 percent or they are P flagged. ICALS = 20 percent or less and CCALS = 15 percent or less.

LCS = Laboratory control sample

N/A = not applicable

SRM = standard reference material

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

a For physical tests, calibration and certification of drying ovens and weighing scales are conducted annually.

b Calibrations should be conducted per analytical methods or instrument manufacturers specifications.

c When a Standard Reference Material is not available, an LCS will be analyzed.

d Isotope dilution quantitation technique accounts for matrix interferences thus MS/MSD are not required.

Table 11
Laboratory and Reporting Data Quality Objectives

Parameter	Precision^a	Accuracy^b	Completeness^c
Sediments			
Total solids and conventionals	± 25% RPD	N/A	90%
Grain size	± 25% RPD	N/A	90%
Total organic carbon	± 25% RPD	80-120% R	90%
Porewater dissolved organic carbon	± 25% RPD	80-120% R	90%
Total metals	± 25% RPD	75-125% R	90%
Polycyclic aromatic hydrocarbons ^d	± 25% RPD	50-150% R	90%
Organochlorine pesticides ^d	± 25% RPD	50-150% R	90%
PCB Congeners ^d	± 25% RPD	50-150% R	90%
Tissues			
Lipids	± 25% RPD	N/A	90%
Organochlorine pesticides ^d	± 25% RPD	50-150% R	90%
PCB Congeners ^d	± 25% RPD	50-150% R	90%
Water			
Particle size determination	± 25% RPD	N/A	90%
Hardness	± 25% RPD	N/A	90%
Total suspended and dissolved solids	± 25% RPD	N/A	90%
Total and dissolved organic carbon	± 25% RPD	80-120% R	90%
Particulate organic carbon	± 25% RPD	80-120% R	90%
Total and dissolved metals	± 25% RPD	75-125% R	90%
Organochlorine pesticides ^d	± 25% RPD	50-150% R	90%
PCB Congeners ^d	± 25% RPD	50-150% R	90%

Notes:

CRM = certified reference material

PCB = polychlorinated biphenyl

R = recovery

RPD = relative percent difference

a Not applicable if native concentration of either sample is less than five times the reporting limit.

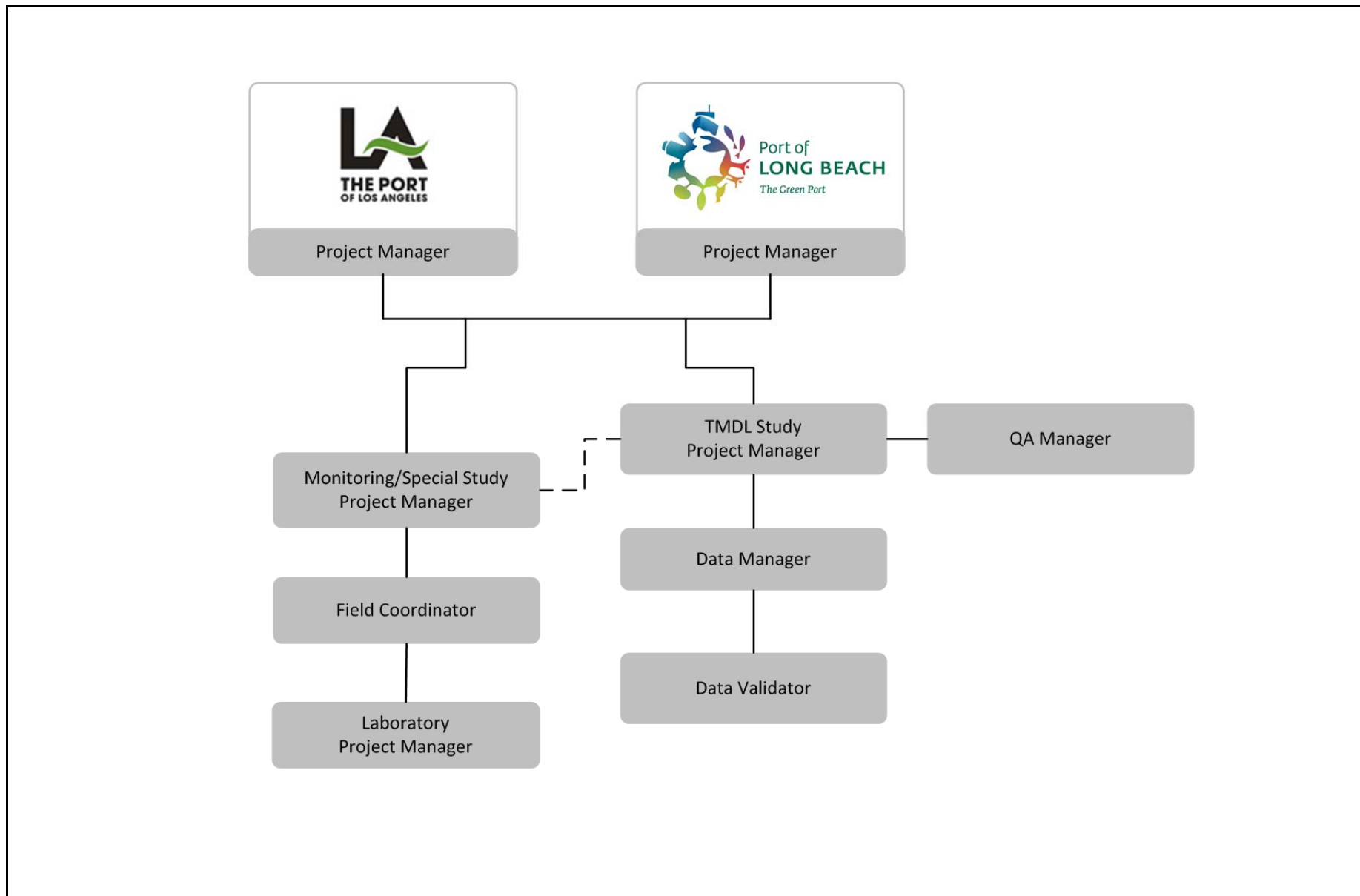
In these situations, the difference between the sample result and duplicate result must be within ± 2 times the reporting limit for sediments, or ± 1 times the reporting limit for waters to meet control

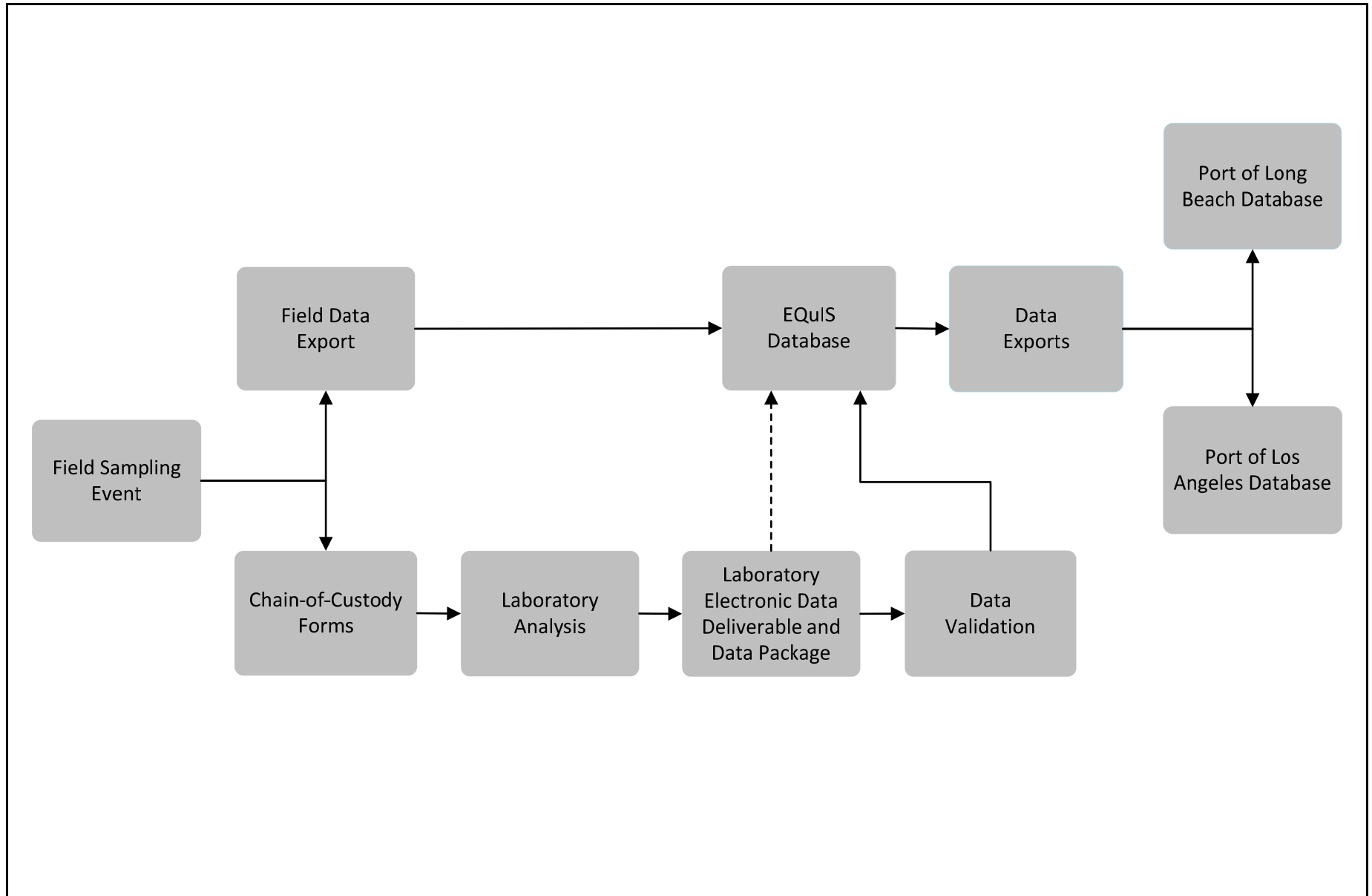
b Laboratory control sample, CRMs, and matrix spike/matrix spike duplicate percent recovery.

c Percent of each class of analytes that are not rejected after data validation conducted in accordance

d The accuracy goal is 70 to 130% R if certified reference material is used.

FIGURES





APPENDIX A
CUSTOM EQUIS ELECTRONIC DATA
DELIVERABLE SPECIFICATIONS

**Table A-1
SMP File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
sys_sample_code	Unique sample identifier	REQUIRED. Text(40)		Sample-CMP4	Each sample, including field and laboratory QC samples, spikes, duplicates, and blanks must have a unique value. It should match the sample ID on the chain-of-custody form. For example, trip blanks should be given a unique value such as "TB-01-20140101" instead of "Trip Blank".
sample_name	Sample identifier	Text(50)		NULL	Populate with the sys_sample_code or leave as NULL.
sample_matrix_code	Code that distinguishes between different types of sample matrix. For example, soil samples must be distinguished from ground water samples.	REQUIRED. Text(10)	Refer to rt_matrix	SE	The matrix of the sample as analyzed may be different from the matrix of the sample as collected (e.g., leachates), so this field is required at both the sample and the test level. For samples that have sample_type_code of MB, BS, BSD, SRM, RB, or TB, the sample_matrix_code should be SQ or WQ.
sample_type_code	Code that distinguishes between different types of samples. For example, normal field samples must be distinguished from laboratory method blank samples.	REQUIRED. Text(20)	Refer to rt_sample_type	N	Use "BS" for ongoing precision and recovery samples.
sample_source	Field that identifies the location where the sample was collected or where the field observation or measurement was made.	REQUIRED. Text(10)	Field - if a test was requested by the client Lab - if a test is run for laboratory QC purposes	Field	
parent_sample_code	The source sample associated with this sample. For example, the parent sample of a lab duplicate sample would be the sample that was duplicated.	REQUIRED if the sample is a matrix spike or a replicate. Text(40)	Must match an existing sys_sample_code in this table.	(Where applicable)	A matrix spike or a replicate would have a sample_type_code of LR, MS, MSD, or BSD, for example. Field replicates may be submitted blind to the laboratory, so this field is not required for those samples. Must be NULL for samples that have no parent (e.g., normal field sample, blank, and blank spike).
sample_date	The date/time data were collected in the field (e.g., sample collection, field measurement, and field observation).	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/5/02 14:30	Date/time information must be identical with the date/time on the chain-of-custody form. Leave blank for laboratory samples.
sys_loc_code	Unique location ID	Optional. Text(20)		NULL	
start_depth	Beginning depth (top) of soil sample	Optional. Numeric		NULL	
end_depth	Ending depth (bottom) of soil sample	Optional. Numeric		NULL	
depth_unit	Depth unit	Optional. Text(15)		NULL	
chain_of_custody	Chain-of-custody identifier	Optional. Text(40)		NULL	
sent_to_lab_date	The date/time sample was sent to the laboratory	Optional. DateTime (mm/dd/yyyy HH:MM)		6/10/02 15:01	Date/time information must be identical with the date/time on the chain-of-custody form. Leave blank for laboratory samples.
sample_receipt_date	The date/time sample was received by the laboratory	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/10/02 15:02	Date/time information must be identical with the date/time on the chain-of-custody form. Leave blank for laboratory samples.

Table A-1
SMP File Structure and Type Descriptions

Field Name	Description	Format	Valid Values	Example	Comments
sampler	Name of person who collected data (e.g., sample, measurement, and observation)	Optional. Text(50)		NULL	
sampling_company_code	Name of the company associated with the sampler	Optional. Text(20)		NULL	
sampling_reason	Reason for sampling	Optional. Text(30)		NULL	
sample_method	Sampling technique	Optional. Text(40)		NULL	
task_code	Task code specific to Anchor QEA's EQUIS database	Optional. Text(40)		NULL	
composite_yn	Indicates whether or not the sample is a composite	Optional. Text(1)	Y - Yes N - No	NULL	
composite_desc	Description related to the composite sample or compositing procedures	Optional. Text(255)		NULL	
sample_class		Optional. Text(10)		NULL	
comment	Sample-specific comments	Optional. Text(2000)		NULL	

Notes:

Red fields are required.

NULL = no value expected from laboratory

**Table A-2
TST File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
sys_sample_code	Unique sample identifier	REQUIRED. Text(40)	Must match the sys_sample_codes listed in .SMP file	Sample-CMP1	Each sample, including field and laboratory QC samples, spikes, duplicates, and blanks must have a unique value. It should match the sample ID on the chain of custody form. For example, trip blanks should be given a unique value such as "TB-01-20140101" instead of "Trip Blank".
analytic_method	Laboratory analytical method name	REQUIRED. Text(20)	Refer to rt_analytic_method	SW8081	Contact Anchor QEA personnel to request a method to be added to the reference tables.
analysis_date	The date/time sample was analyzed in the laboratory	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/21/02 14:10	
fraction	Sample fraction	REQUIRED. Text(10)	T - Total or not applicable D - Dissolved	T	Use "D" for total dissolved solids results.
column_number	Column number assigned by the laboratory	REQUIRED. Text(2)	NA - not applicable 1C - column 1 2C - column 2	NA	All results can be reported as "NA". The column_number could also be 1C or 2C, etc., if the instrument uses multiple columns.
test_type	Type of test in the laboratory. This field is used to distinguish between initial runs, reextractions, reanalysis, and dilutions.	REQUIRED. Text(10)	AverageLab - Average of several results, laboratory calculated Dilution - Dilution Dilution2 - Dilution (second time) Initial - Initial Initial2 - Second initial run where multiple analysis on same sample and test is requested Reanalysis - Reanalysis (first time) Reanal2 - Reanalysis (second time) Reextract - Reextract Refer to rt_test_type for more details.	Initial	

**Table A-2
TST File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
lab_matrix_code	Code which describes the matrix as analyzed by the laboratory	REQUIRED. Text(10)	AIR - Air SE - Sediment SO - Soil SQ - Soil/solid quality control matrix STS - Stormwater solids TA - Animal tissue TBIO - Tissue bioaccumulation testing TQ - Tissue quality control matrix WEL - Elutriate WG - Groundwater WH - Equipment wash water WIPE - Swab or wipe WL - Leachate WQ - Water quality control matrix WS - Surface water WSP - Seep water WST - Stormwater WW - Wastewater WX - Porewater Refer to rt_matrix for complete list.	SE	Lab_matrix_code must match sample_matrix_code for all samples except leachate, elutriate, and porewater samples. All leachate, elutriate, and porewater samples are required to have unique test records that have lab_matrix_code of "WL", "WEL", and "WX", respectively. Do not use "SO" for Solid. SO = Soil Use "SQ" or "WQ" for laboratory or field QC samples (e.g. blank, blank spike, blank spike duplicate, and rinse blank). For samples that have a parent sample (e.g. laboratory replicate, matrix spike, matrix spike duplicate, and field replicate), use the same code as the parent sample.
analysis_location	Note where was sample analyzed	REQUIRED. Text(2)	FI - Field instrument FL - Mobile field laboratory analysis LB - Fixed-based laboratory analysis	LB	Most commonly LB.
basis	Measurement basis for the data	REQUIRED. Text(10)	Dry - Dry-weight basis reporting Wet - Wet-weight basis reporting NA - Not applicable	Dry	For solid matrices, basis must be either "Dry" for dry-weight basis reporting, "Wet" for wet-weight basis reporting, or "NA" for tests for which this distinction is not applicable. For example, total solids should be reported as "NA". For aqueous matrices, basis must be "NA" since measuring basis conversions cannot be performed. Total dissolved solids should be reported as "NA".
container_id	Sample container identifier	Optional. Text(30)			
dilution_factor	Dilution factor at which the analyte was measured effectively	REQUIRED. Numeric		1	Enter "1" if not diluted.
prep_method	Laboratory sample preparation method code	REQUIRED. Text(20)	Refer to rt_prep_method	SW3550B	Use "METHOD" if the preparation method is included in the analytic_method. Contact Anchor QEA personnel to request a value to be added to the reference tables.
prep_date	The date/time sample was prepared or extracted in the laboratory	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/14/02 13:10	

**Table A-2
TST File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
leach_elut_method	Laboratory leachate generation method name	REQUIRED if lab_matrix_code is WL or WEL . Text(15)	DI-WET - Waste Extraction Test with deionized water DRET - Dredge Elutriate Test MET - Modified Elutriate Test PCLT - Pancake Column Leachate Test SBLT - Sequential Batch Leachate Test SET - Standard Elutriate Test SW1311 - TCLP SW1312 - SPLP	SW1311	Must be populated for leachate or elutriate samples. Contact Anchor QEA personnel to request a value to be added to the reference tables.
leach_elut_date	The date/time leachate was prepared or extracted in the laboratory	REQUIRED if lab_matrix_code is WL or WEL . DateTime (mm/dd/yyyy HH:MM)		6/15/02 13:10	
lab_name_code	Unique identifier of the laboratory	REQUIRED . Text(20)	Refer to rt_company	ARIS	Contact Anchor QEA personnel to request a value to be added to the reference tables.
qc_level	Quality control level of analysis	Optional. Text(10)			
lab_sample_id	Laboratory LIMS sample identifier	REQUIRED . Text(40)		02-7599-EL34A	If necessary, a field sample may have more than one LIMS lab_sample_id (maximum one per each test event).
percent_moisture	Default is NULL	NULL		NULL	DO NOT POPULATE WITH A RESULT. These results should be included as a row in the RES file.
subsample_amount	Amount of sample used for test	Optional. Text(14)		25.4	
subsample_amount_unit	Unit of measurement for subsample_amount	Optional. Text(15)	Refer to rt_unit	g	Contact Anchor QEA personnel to request a value to be added to the reference tables.
analyst_name	Name or initials of laboratory analyst	Optional. Text(50)		MDR	
instrument_id	Instrument identifier	Optional. Text(60)		ECD4	
comment	Test-specific comments	Optional. Text(2000)		NULL	
preservative	Sample preservative used	Optional. Text(20)	4degC - Store cool at 4 degC Frozen - Frozen, anything below zero degrees Celsius H2SO4 - Sulfuric acid HCl - Hydrochloric acid HNO3 - Nitric acid MeOH - Methanol NaHSO4 - Sodium bisulfate NaOH - Sodium hydroxide NaOH-ZnAc - Sodium hydroxide and zinc acetate (common preservative for sulfide analysis) None - Unpreserved Refer to rt_preservative	NULL	Contact Anchor QEA personnel to request a value to be added to the reference tables.
final_volume	The final volume of the sample after sample preparation	REQUIRED . Text(15)		5	Include all dilution factors.
final_volume_unit	Unit of measurement for final_volume	REQUIRED . Text(15)		mL	

Table A-2
TST File Structure and Type Descriptions

Field Name	Description	Format	Valid Values	Example	Comments
Lab_SDG	Sample delivery group number assigned by the laboratory	REQUIRED. Text(20)		EL34	

Notes:

Red fields are required.

NULL = no value expected from laboratory

**Table A-3
RES File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
sys_sample_code	Unique sample identifier	REQUIRED. Text(40)	Must match the sys_sample_codes listed in .SMP file	Sample-CMP4	Each sample, including field and laboratory QC samples, spikes, duplicates, and blanks, must have a unique value. It should match the sample ID on the chain of custody form. For example, trip blanks should be given a unique value such as "TB-01-20140101" instead of "Trip Blank".
analytic_method	Laboratory analytic method name	REQUIRED. Text(20)	Refer to rt_analytic_method Must match the analytical method entered in .TST file	SW8270	Contact Anchor QEA personnel to request a method to be added to the reference tables.
analysis_date	The date/time sample was analyzed in the laboratory	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/21/02 14:10	
fraction	Sample fraction	REQUIRED. Text(10)	T - Total or not applicable D - Dissolved	T	
column_number	Column number assigned by the laboratory	REQUIRED. Text(2)	NA - not applicable 1C - column 1 2C - column 2	NA	All results can be reported as "NA". The column_number could also be 1C or 2C, etc., if the instrument uses multiple columns.
test_type	Type of test in the laboratory. This field is used to distinguish between initial runs, reextractions, reanalysis, and dilutions.	REQUIRED. Text(10)	AverageLab - Average of several results, laboratory calculated Dilution - Dilution Dilution2 - Dilution (second time) Initial - Initial Initial2 - Second initial run where multiple analysis on same sample and test is requested Reanalysis - Reanalysis (first time) Reanal2 - Reanalysis (second time) Reextract - Reextract Refer to rt_test_type for more details.	Initial	
cas_rn	CAS Registry Number	REQUIRED. Text(15)	Refer to rt_analyte	108-95-2	
chemical_name	Corresponding chemical name of CAS number	REQUIRED. Text(255)	Must match the CAS number and chemical as listed in rt_analyte	Phenol	

**Table A-3
RES File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
result_value	Result value with appropriate significant digits	REQUIRED. Text(19)		20	Must be left blank if analyte was not detected. Surrogates must be reported as a percent recovery in "pct" units and not as the measured concentration. Laboratory QC samples (e.g., blank, blank spike, and matrix spike) must be reported as a measured concentration. If result is numeric, ensure that significant digits for zeros are maintained. May be populated with non-numeric results (e.g., "Non-Plastic" for Atterberg Limits or "DETECT" for TPH-HCID results).
result_error_delta	Error range applicable to the result value	REQUIRED for radiochemistry results. Text(20)		0.07	Typically used for radiochemistry results
uncertainty	Amount of uncertainty associated with result_value	REQUIRED for radiochemistry results. Text(10)		2 sigma	Typically used for radiochemistry results (e.g., 2 sigma)
result_type_code	Result type	REQUIRED. Text(10)	IS - Internal standard SC - Spiked compound SUR - Surrogate TIC - Tentatively identified compound TRG - Target compound (regular result)	TRG	Typically "TRG" for regular results and "SC" for blank spikes and matrix spikes
reportable_result	Indicates whether or not the result is reportable or useable	REQUIRED. Text(10)	Yes No	Yes	If a dilution, reextraction, or reanalysis was completed, assign "No" to the superseded or unusable results.
detect_flag	Indicates whether or not the result is detected	REQUIRED. Text(2)	Y - detect N - non-detect	Y	
lab_qualifiers	Qualifier flags assigned by the laboratory	REQUIRED. Text(20)		J	If applicable
method_detection_limit	MDL value	REQUIRED. Text(20)		15	May be populated with the EDL for high-resolution methods or CRDL. Limits should be reported in the same unit as the result_value.
reporting_detection_limit	MRL	REQUIRED. Text(20)		20	Limits should be reported in the same unit as the result_value.
quantitation_limit	PQL	Optional. Text(20)		15	Limits should be reported in the same unit as the result_value.
result_unit	Units of measurement for the result unit	REQUIRED. Text(15)	Refer to rt_unit	µg/kg	
tic_retention_time	TIC retention time	Optional. Text(8)			
result_comment	Result-specific comments	Optional. Text(2000)			

**Table A-3
RES File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
qc_original_conc	The concentration of the analyte in the original (unspiked) sample	REQUIRED for laboratory QC samples. Text(14)		0	Might be required for spikes and spike duplicates (depending on user needs). Not necessary for surrogates or blank spikes where the original concentration is assumed to be zero. Must be reported in the same units as the result_value.
qc_spike_added	The concentration of the analyte added to the original sample	REQUIRED for laboratory QC samples. Text(14)		450	Might be required for matrix spikes, surrogates, blank spikes, and any spiked samples (depending on user needs). Must be reported in the same units as the result_value.
qc_spike_measured	The measured concentration of the analyte	REQUIRED for laboratory QC samples. Text(14)		400	Use zero for spiked compounds that were not detected in the sample. Might be required for matrix spikes, spike duplicates, surrogates, blank spikes, and any spiked samples (depending on user needs). Must be reported in the same units as the result_value.
qc_spike_recovery	The percent recovery calculated as specified by the laboratory QC program	REQUIRED for laboratory QC samples. Text(14)		0	Always required for matrix spikes, spike duplicates, surrogates, blank spikes, and any spiked samples. Report as percentage multiplied by 100 (e.g., report 120% as 120).
qc_dup_original_conc	The concentration of the analyte in the original (unspiked) sample	REQUIRED for laboratory QC samples. Text(14)			Might be required for spike or blank spike duplicates only (depending on user needs). Not necessary for surrogates or blank spikes (where the original concentration is assumed to be zero). Must be reported in the same units as the result_value.
qc_dup_spike_added	The concentration of the analyte added to the duplicate sample	REQUIRED for laboratory QC samples. Text(14)			Might be required for spike or blank spike duplicates, surrogates, and any spiked and duplicated samples (depending on user needs). Must be reported in the same units as the result_value.
qc_dup_spike_measured	The measured concentration of the analyte in the duplicate	REQUIRED for laboratory QC samples. Text(14)			Use zero for spiked compounds that were not detected in the sample. Might be required for matrix spikes and blank spike duplicates, surrogates, and any other spiked and duplicated samples.
qc_dup_spike_recovery	The duplicate percent recovery calculated as specified by the laboratory QC program	REQUIRED for laboratory QC samples. Text(14)			Always required for matrix spike or blank spike duplicates, surrogates, and any other spiked and duplicated samples. Report as percentage multiplied by 100 (e.g., 50% as 50).

**Table A-3
RES File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
qc_rpd	The relative percent difference calculated as specified by the laboratory QC program	REQUIRED for laboratory QC samples. Text(14)			Required for duplicate samples as appropriate. Report as percentage multiplied by 100 (e.g., report 30% as 30).
qc_spike_lcl	Lower control limit for spike recovery	REQUIRED for laboratory QC samples. Text(14)		52	Required for matrix spikes, spike duplicates, surrogates, blank spikes, and any spiked samples. Report as percentage multiplied by 100 (e.g., report 80% as 80).
qc_spike_ucl	Upper control limit for spike recovery	REQUIRED for laboratory QC samples. Text(14)		130	Required for matrix spikes, spike duplicates, surrogates, blank spikes, and any spiked samples. Report as percentage multiplied by 100 (e.g., report 120% as 120).
qc_rpd_cl	Relative percent difference control limit	REQUIRED for laboratory QC samples. Text(14)			Required for any duplicated sample. Report as percentage multiplied by 100 (e.g., report 25% as 25).
qc_spike_status	Used to indicate whether the spike recovery was within control limits	REQUIRED for laboratory QC samples. Text(10)	NULL - if within control limits * - if out of control limits		Use the * character to indicate failure, otherwise leave blank. Required for matrix spikes, spike duplicates, surrogates, blank spikes, and any spiked samples.
qc_dup_spike_status	Used to indicate whether the duplicate spike recovery was within control limits	REQUIRED for laboratory QC samples. Text(10)	NULL - if within control limits * - if out of control limits		Use the * character to indicate failure, otherwise leave blank. Required for any spiked and duplicated sample.
qc_rpd_status	Used to indicate whether the relative percent difference was within control limits	REQUIRED for laboratory QC samples. Text(10)	NULL - if within control limits * - if out of control limits		Use the * character to indicate failure, otherwise leave blank. Required for any duplicated sample.

Notes:

Red fields are required.

NULL = no value expected from laboratory

**Table A-4
BCH File Structure and Type Descriptions**

Field Name	Description	Format	Valid Values	Example	Comments
sys_sample_code	Unique sample identifier	REQUIRED. Text(40)	Must match the sys_sample_codes listed in .SMP file	Sample-CMP4	Each sample, including field and laboratory QC samples, spikes, duplicates, and blanks, must have a unique value. It should match the sample ID on the chain of custody form. For example, trip blanks should be given a unique value such as "TB-01-20140101" instead of "Trip Blank".
analytic_method	Laboratory analytic method name	REQUIRED. Text(20)	Refer to rt_analytic_method Must match the analytical method entered in .TST file	SW8270	
analysis_date	The date/time sample was analyzed in the laboratory	REQUIRED. DateTime (mm/dd/yyyy HH:MM)		6/20/02 17:10	
fraction	Sample fraction	REQUIRED. Text(10)	T - Total or not applicable D - Dissolved	T	
column_number	Column number assigned by the laboratory	REQUIRED. Text(2)	NA - not applicable 1C - column 1 2C - column 2	NA	All results can be reported as "NA". The column_number could also be 1C or 2C, etc., if the instrument uses multiple columns.
test_type	Type of test in the laboratory. This field is used to distinguish between initial runs, reextractions, reanalysis, and dilutions.	REQUIRED. Text(10)	AverageLab - Average of several results, laboratory calculated Dilution - Dilution Dilution2 - Dilution (second time) Initial - Initial Initial2 - Second initial run where multiple analysis on same sample and test is requested Reanalysis - Reanalysis (first time) Reanal2 - Reanalysis (second time) Reextract - Reextract Refer to rt_test_type for more details.	Initial	
test_batch_type	Laboratory batch type	REQUIRED. Text(10)	Analysis - Sample analysis batch Elut - Elutriate batch Leach - Leachate batch Prep - Sample preparation batch	Prep	
test_batch_id	Unique identifier for all laboratory batches	REQUIRED. Text(20)		580-12345	

Notes:

Red fields are required.

NULL = no value expected from laboratory

APPENDIX B
FIELD ELECTRONIC DATA DELIVERABLE
FILE SPECIFICATIONS

**Table B-1
Sample Location EDD Field Requirements**

Field	Required/Conditional /Optional	Description
#station_id	Required	#Unique location/station identifier used to track spatial point through database system. This is a key field in the database and must be unique for each collection. If the same location is sampled more than once- append the date to the location. Set to 'Field QC' if sample_type is 'RB', 'EB', or 'TB'.
coord_datum_code	Required	Code used to identify correct coordinate system and datum for point projection. This field's vocabulary is controlled. See 'valid coord type codes' tab.
x_coord	Required	Easting/Longitude
y_coord	Required	Northing/Latitude
sample_id	Required	Unique sample identifier, these values must match the IDs provided on the Chain of Custody document. Refer to the 'Sample Nomenclature' tab for ID construction decision making flowchart.
sample_type	Required	Code used to identify sample type. This field's vocabulary is controlled and must match a provided valid value. See 'valid sample type codes' tab.
sample_parent	Conditional	Parent sample identifier for field duplicate/replicate; must match an entry in column E. This field is required if sample_type_code is 'FD' or composite_yn is 'Y'.
matrix_code	Required	Code used to identify type of sample material. This field's vocabulary is controlled and must match a provided valid value. See 'valid sample matrix codes' tab.
sample_date	Required	Date and time of field sample collection, time must be in 24-hour military time.
start_depth	Conditional	Shallowest point of the interval. Required for soil/sediment samples. Not required for composite samples.
end_depth	Conditional	Deepest point of the interval. Required for soil/sediment samples. Not required for composite samples.
depth_unit	Conditional	Code used to identify depth units. This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.
composite_yn	Required	'Y' for Yes if sample is a composite or 'N' for No if not.

**Table B-1
Sample Location EDD Field Requirements**

Field	Required/Conditional /Optional	Description
composite_desc	Conditional	General description of composite. Required if composite_yn is 'Y'. Should include the list of samples combined in the composite.
archive_yn	Required	'N' if the sample is active, 'Y' if the sample is archive.
sampler	Required	Initials or name of the custodian responsible for sampling.
sampling_company	Required	Company responsible for field sampling.
comment	Optional	Optional comment about sample.

**Table B-2
Tissue Sample EDD Field Requirements**

Field	Required/Conditional /Optional	Description
#sample_id	Required	#Unique sample identifier, these values must match the IDs entered in the Loc_Smp tab. Refer to the 'Sample Nomenclature' tab for ID construction decision making flowchart.
parent_composite	Required	Points to the composite that the individual is a part of.
measurement_date	Required	Date and time of sample measurement, time must be in 24-hour military time.
species	Required	Common name (Genus species).
specimen_length	Required	Measured fish length (nose to caudal fork).
length_unit	Required	This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.
specimen_weight	Required	Measured fish weight.
weight_unit	Required	This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.

APPENDIX B
FISH SCALE REMOVAL STANDARD
OPERATING PROCEDURES

The Food Web Sampling Work Plan for the Greater Harbor Waters requires sampling of fish scales for age determination (described in Sections 2.6.1 and 2.7). It is imperative that scale removal be completed carefully and consistently among samples. For white croaker (*Genyonemus lineatus*), California halibut (*Paralichthys californicus*), and shiner surfperch (*Cymatogaster aggregata*), scales will be removed in the field in accordance with well-established methods (Chilton and Stocker 1987; Prentice and Dean 1991; Hoxmeier et al. 2001) prior to sending them to the analytical laboratory for processing.

The following steps should be followed to ensure consistency and accuracy in age measurements:

1. Prior to collecting scales, rinse the fish with site water to remove loose scales and mucus.
2. Using forceps, remove six to 10 scales on each side of the fish from the shoulder area behind the pectoral fin and below the lateral line (see Figures B-1 and B-2). Because California halibut is a flatfish, the target area varies slightly in comparison to shiner surfperch and white croaker. It is important to ensure that a minimum of 10 scales are removed from each fish, because some scales are lost and regenerated (without the structure that allows for age determination).
3. When removing scales, feel for resistance. If there is no resistance, the scale should be discarded.
4. Handle the scale carefully with the forceps so as to avoid damaging the rings.
5. Rinse dirt and mucus using clean site water from the scales and immediately store them in a scale envelope specific to the individual fish that was sampled. Do not stack scales within the envelope.
6. Label the scale envelope appropriately using the nomenclature defined in the PQAPP (see Appendix A).
7. Place envelopes in a well-ventilated container and send to the analytical laboratory.
8. Following the sampling event, check data labels for accuracy and store in chronological order for later analysis.

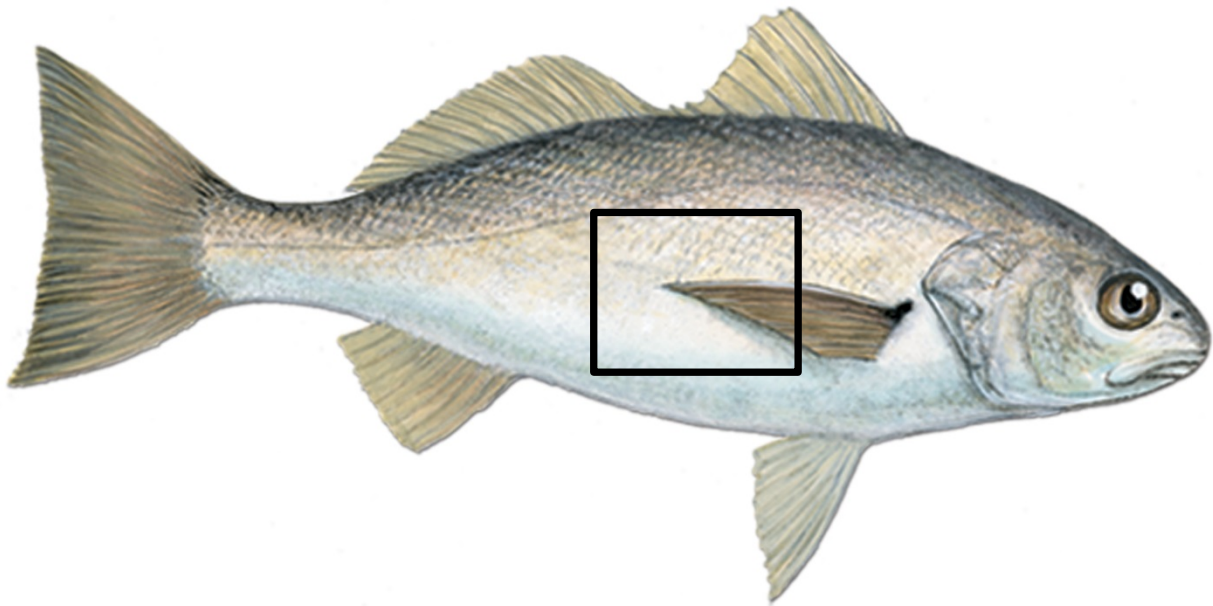


Figure B-1. Location for scale removal on white croaker (shown here) and shiner surfperch (not shown)

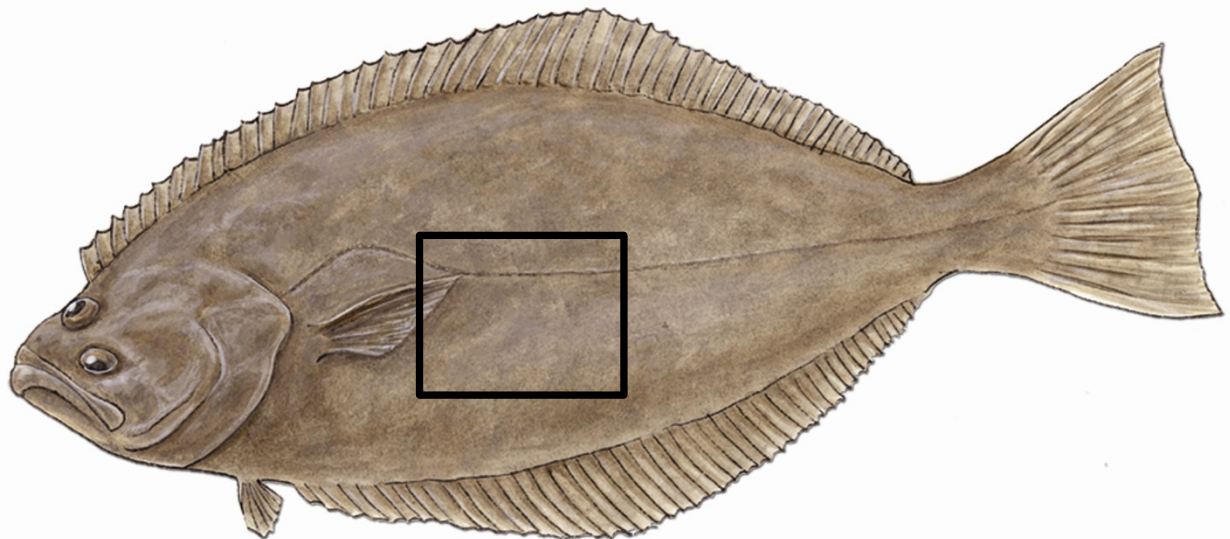


Figure B-2. Location for scale removal on California halibut

REFERENCES

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