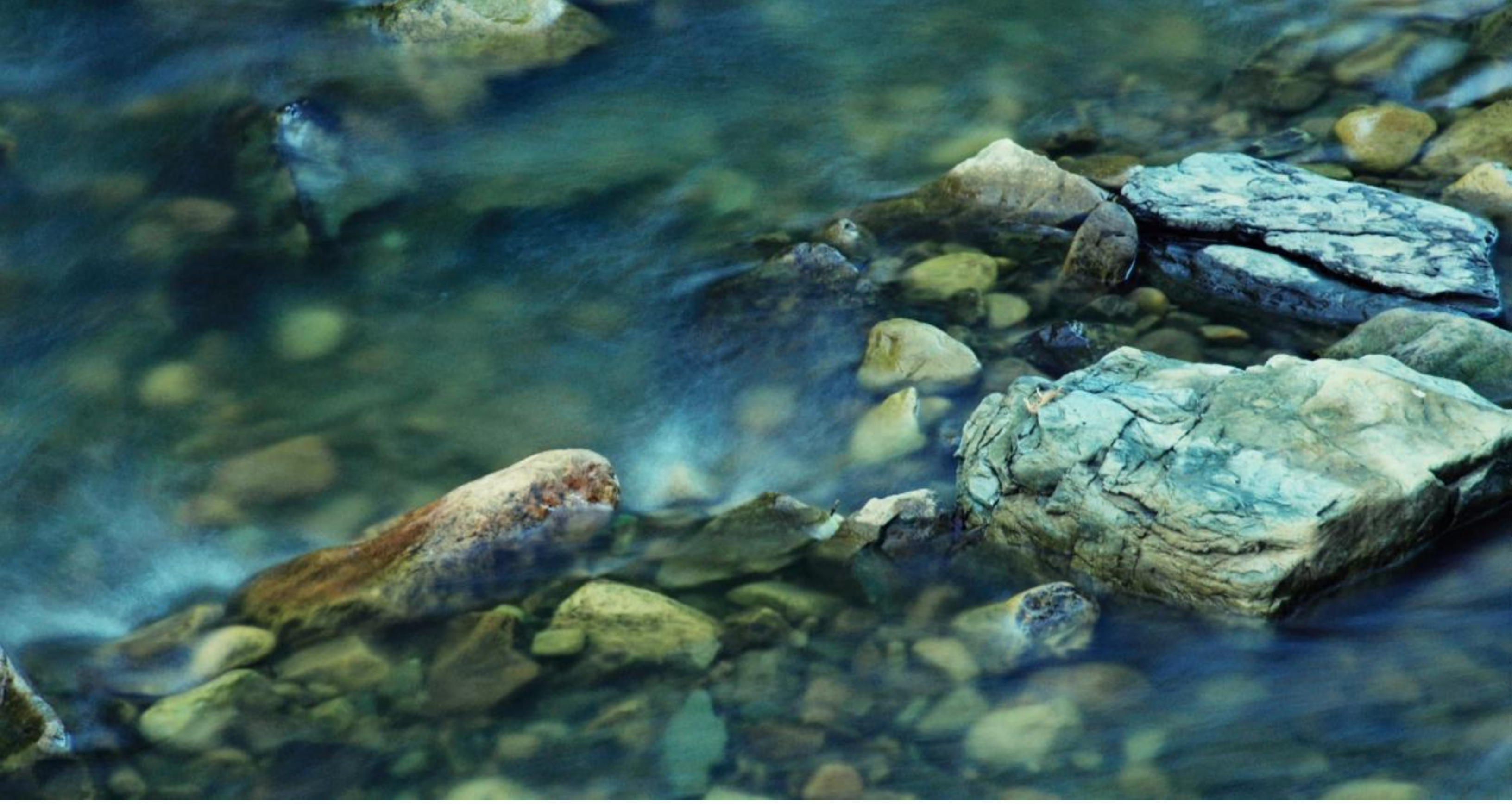


September 2019
Greater Harbor Waters Regional Monitoring Coalition

Fish Tissue Sampling and Analysis Plan

Prepared for Cities of Bellflower, Lakewood, Long Beach, Los Angeles, Paramount, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Signal Hill; Los Angeles County; Los Angeles County Flood Control District; and Ports of Long Beach and Los Angeles

September 2019
Greater Harbor Waters Regional Monitoring Coalition

Fish Tissue Sampling and Analysis Plan

Prepared for
Cities of Bellflower, Lakewood, Long Beach, Los Angeles, Paramount, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Signal Hill; Los Angeles County; Los Angeles County Flood Control District; and Ports of Long Beach and Los Angeles

Prepared by
Anchor QEA, LLC
9700 Research Drive
Irvine, California 92618

Project Number: 141205-01.04

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

1 Introduction

On March 23, 2012, the Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (Harbor Toxics TMDL; RWQCB and USEPA 2011) became effective and was promulgated to protect and restore fish tissue, water, and sediment quality in the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (including Consolidated Slip; Greater Harbor Waters). The Harbor Toxics TMDL indicates that TMDL compliance will be met through the remediation of contaminated sediments and the control of sediment loading and accumulation of contaminated sediments in the harbor. The Harbor Toxics TMDL includes numeric contaminant targets for surface sediment, stormwater effluent, and tissues of fish from the Greater Harbor Waters to protect marine life and minimize human health risks due to the consumption of fish.

The responsible parties listed in the Harbor Toxics TMDL (RWQCB and USEPA 2011) are required to conduct compliance monitoring activities and coordinated and collaborative monitoring efforts are recommended. As such, a Coordinated Compliance Monitoring and Reporting Plan (CCMRP; Attachment A) for the Greater Harbor Waters was prepared to provide guidance for conducting compliance monitoring with the intent of maintaining consistency and to take advantage of coordinated sampling efforts with other regional monitoring programs. The compliance monitoring program consists of the collection of water samples within 12 distinct water quality groups and sediment samples at 22 stations and the collection of fish tissue samples within four waterbodies. Analytical laboratory results will be compared to the Harbor Toxics TMDL numeric targets, and compliance will be based on whether concentrations below these targets have been achieved.

This Sampling and Analysis Plan (SAP) is an addendum to the CCMRP (Attachment A) and includes additional information specific to the collection and analysis of fish tissue (i.e., research vessel, sampling equipment, details specific to the subcontracted analytical laboratory, and alternative species recommendations if target species are not captured in adequate numbers). Details for the water and sediment sampling components of the compliance monitoring program are provided under separate covers.

1.1 Objective

The objective of this sampling effort is to fulfill the requirements of the Harbor Toxics TMDL for fish monitoring required biennially, beginning in 2014.

1.2 Document Organization

The remainder of the document is organized as follows:

- **Section 2: Project Management and Responsibilities.** This section presents the organizational relationship between and responsibilities of field program managers and subcontractor(s).
- **Section 3: Field Sampling Methods.** This section presents details of the field sampling program.
- **Section 4: Laboratory Analytical Methods.** This section presents key analytes, methods, associated detection limits, and minimum requirements.
- **Section 5: Quality Assurance and Quality Control.** This section presents quality assurance and quality control (QA/QC) procedures associated with field sampling methods and chemical analyses.
- **Section 6: Electronic Data Deliverables, Data Analysis, and Reporting.** This section presents data processing objectives and reporting requirements.
- **Section 7: References.** This section presents relevant citations or reference material.

2 Project Management and Responsibilities

Members of the project team and their responsibilities are summarized in this section.

2.1 Project Manager

Andrew Martin of Anchor QEA, LLC, will be the project manager for fish tissue compliance monitoring. Mr. Martin will be responsible for:

- Providing oversight, overall compliance monitoring project management, and progress reports
- Communicating with the Regional Monitoring Coalition
- Organizing field staff
- Coordinating with subcontract laboratory
- Scheduling sampling days
- Maintaining field sampling equipment, sample handling and transport, data transmittal in accordance with the CCMRP (Attachment A), Programmatic Quality Assurance Project Plan (PQAPP; Attachment B), and study reporting

2.2 Field Coordinator

Claire Dolphin of Anchor QEA will be the field coordinator for fish tissue compliance monitoring. Ms. Dolphin will be responsible for day-to-day technical and QA/QC oversight. She will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will submit environmental samples to the appropriate laboratory for chemical and physical analyses. Ms. Dolphin will also be responsible for submitting the finalized field data to the QA manager in accordance with Section 2.2 of the PQAPP (Attachment B).

2.3 Quality Assurance Manager

QA management will be performed in accordance with Section 2.1 of the PQAPP. The QA manager will coordinate with and oversee the analytical laboratory listed in Table 1. Responsibilities of the laboratory project manager are also detailed in Section 2.1 of the PQAPP.

3 Field Sampling Methods

3.1 Field Program Overview

The Harbor Toxics TMDL requires the collection of fish tissue samples once every 2 years (beginning in 2014) at four stations: one in Consolidated Slip, one each in Los Angeles Outer Harbor and Long Beach Outer Harbor, and one in (eastern) San Pedro Bay (Figure 1). Composite samples of three target[1] fish species (white croaker [*Genyonemus lineatus*], California halibut [*Paralichthys californicus*], and shiner surfperch [*Cymatogaster aggregate*]) will be collected at all stations, with the exception of Consolidated Slip; only white croaker will be collected at this station. Fish tissue samples will be submitted for the following parameters:

- Percent lipids
- Percent moisture
- Organochlorine pesticides (including dichlorodiphenyltrichloroethane and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- Polychlorinated biphenyl (PCB) congeners

Station locations, sample identifications, target species, and prescribed laboratory analyses are summarized in Table 1. Further details are presented in subsequent sections.

3.2 Sampling Frequency

Fish tissue samples will be collected twice every 5 years (coordinated with sediment monitoring events). In accordance with the *Bight Field Operations Manual* (BCEC 2008), fish tissue collection efforts will be conducted between July 1 and September 30. Fish are more robust in the summer, as their food is more abundant during this time; thus, they have the potential to bioaccumulate more contaminants during the summer. This timeframe was selected as a conservative approach to provide data that reflects the maximum levels of bioaccumulatives present in fish tissues for the given sampling year.

3.3 Sampling Locations

The CCMRP does not specify exact locations (i.e., geographic coordinates) for fish collection by trawling or other methods. Instead, the following guidelines have been established that allow for some flexibility in selecting the most appropriate fish collection area within each waterbody (Figure 1) to improve the chances for success of the fish monitoring program.

- Fish collection should be targeted as close to the following four areas as practicable, while accounting for limitations in the sampling vessel due to size and draft, and the type of equipment (e.g., trawl and seine) necessary for fish collection:

[1] See Section 3.4 for discussion on alternate fish species.

    - Cabrillo Pier (Los Angeles Outer Harbor)
    - Long Beach Outer Harbor breakwater (inside), midway between Angel's Gate and Queen's Gate
    - Pier J ([Eastern] San Pedro Bay)
    - Consolidated Slip
- Every effort should be taken to ensure than any particular trawl track (or alternative fish sampling technique) occurs within the proposed target sampling areas. However, it is recognized that 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 outside the boundaries of the target sampling areas.
- If extensive efforts have been made and insufficient fish have been caught at the target locations, then 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, still within the waterbody specified in the Harbor Toxics TMDL (i.e., Los Angeles Outer Harbor, Long Beach Outer Harbor, [Eastern] San Pedro Bay, and Consolidated Slip). The field crew will note the reasons for relocation in the field form, and fish collection efforts will be attempted at the secondary location.

3.4 Alternate Species Considerations

As stated above, target species include white croaker, California halibut, and shiner surfperch; however, new data have become available since the target species were selected and identified in the CCMRP. Specifically, preliminary data from the Ports of Long Beach and Los Angeles Biological Baseline Study (Ports 2013) indicates that shiner surfperch may not be present within the compliance monitoring areas in adequate abundances for tissue analysis. The Biological Baseline Study did capture moderate numbers of California halibut; however, due to the highly mobile nature of this sport fish, it should be recognized that this species may be difficult to capture in the specific areas targeted for the compliance monitoring program.

3.4.1 Alternate Sport Fish Species

In the event that California halibut cannot be successfully captured from the target waterbodies, acceptable alternate species should be retained for potential analyses. These species include barred sand bass (*Paralabrax nebulifer*) and California lizardfish (*Synodus lucioceps*). These species have been selected as alternative sport fish for California halibut, because they also meet the considerations listed in the CCMRP (Attachment A), with one exception. California lizardfish are not on the Office of Environmental Health Hazard Assessment (OEHHA) consumption advisory list (OEHHA 2009); however, given the abundance noted in the Biological Baseline Study (Ports 2013), the similarity in consumed prey and feeding mode compared with California halibut, this species is a suitable surrogate.

3.4.2 Alternate Prey Fish Species

In the event that shiner surfperch cannot be successfully captured from the target waterbodies, acceptable alternate species should be retained for potential analyses. These species include white surfperch (*Phanerodon furcatus*), topsmelt (*Atherinops affinis*), and Northern anchovy (*Engraulis mordax*). These species have been selected as alternative prey fish for shiner surfperch, because they also meet the considerations listed in the CCMRP (Attachment A), with one exception. Northern anchovy are not on the OEHHA consumption advisory list (OEHHA 2009); however, given its abundance noted in the Biological Baseline Study (Ports 2013), the similarity in consumed prey and feeding mode compared with shiner surfperch, this species is a suitable surrogate.

3.5 Station and 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 identifier
- Date and time of sample collection
- Preservative type (if applicable)
- Analysis to be performed

The sample nomenclature will be based on the identifiers provided in Table 2.

- 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
- Date of collection
- Indication of field duplicate if applicable (i.e., add 1000 to station number)

As an example, the sample identifiers for the second white croaker collected (for fish fillet skin off analysis) from within Fish Harbor on July 31, 2014, is as follows:

FH-FF-WC-02-20140731

3.6 Sample Platform

Fish tissue sampling will be conducted from the research vessel (R/V) *Early Bird II*. The vessel is 42 feet in length and has an open deck suitable for staging, collecting, and processing fish samples. Deployment of fish sampling gear (e.g., trawl) will be deployed from a 13-foot hydraulic A-frame from the stern of the deck. The *R/V Early Bird II* is a U.S. Coast Guard (USCG)-inspected vessel and will be captained by a USCG-licensed Master.

If it is determined that hook and line method is the only feasible option in an area, fish may be collected from Anchor QEA's vessel, a 21-foot Carolina Skiff that conforms to USCG safety standards.

3.7 Navigation

On-vessel navigation and positioning will be accomplished using a differential GPS. 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).

3.8 Collection Methods

Detailed collection methods are provided in the CCMRP (Attachment A) and corresponding Standard Operating Procedures (Appendix A of CCMRP). Methods are summarized below.

3.8.1 Fish Collection

When possible, fish will be collected using a semi-balloon, 7.6–meter headrope otter trawl. A pre-trawl survey will be conducted to determine if the site is suitable for trawling. The pre-trawl survey will consist of examining the seafloor for obstructions using a fathometer. The sampling site will be abandoned after three unsuccessful pre-trawl attempts, and the sampling site will either be moved or a different sampling method (hook and line, etc.) may be used instead. Once a pre-trawl survey has been conducted and the area is found suitable for trawling, the trawl net will be deployed in accordance with *Standard Operating Procedures: Fish Collection* (Appendix A of the CCMRP; see Attachment A) and towed for 10 minutes before retrieval.

When trawling is not feasible, other collection methods—such as long lining, gill netting, beach seining, fyke or hoop nets, spear fishing, or hook and line sampling—may be used in accordance with *Standard Operating Procedures: Fish Collection* (Appendix A of the CCMRP; see Attachment A).

3.9 Sample Handling

Once the catch is on board the vessel, the targeted species will be identified and separated for subsequent processing. At each station, all three target fish species will be collected for further processing at all stations with the exception of Consolidated Slip. Only white croaker will be targeted at Consolidated Slip.

White croaker collection will target a minimum length of 160 millimeters (mm) (total length). California halibut collection will target the legal size limit (at least 22 inches [559 mm]) (total length). Shiner surfperch collection will target adults (i.e., second year age-class with a target length of 88 mm [Odenweller 1975]). Additional individuals of the three target species and non-target species will be returned to the ocean as soon as possible to minimize loss.

For California halibut and white croaker, 12 individuals per target species (for creation of three composites of four fish each with a mass of fillet that is approximately 50 grams) per station are required to provide the analytical laboratory with sufficient skin-off fillet tissue mass for testing. If more than 12 California halibut and white croaker are caught at a station, the 12 individuals best and most closely distributed about the 75th percentile of the length distribution of all individuals will be used for the composites. For shiner surfperch (or alternate prey fish species), more than 12 individuals per station may be required to create three composites of whole fish without head or internal organs[2] that have enough mass (minimum of 40 grams) for the planned chemical analyses.[3]

If target species are not present in sufficient abundance, the field team will coordinate with the project manager as to how to proceed. Potential alternative options may include the following:

- If target species are caught in sufficient abundance to provide the laboratory with 40 grams of skin-off fillet (or whole fish without head or internal organs), the minimum tissue mass required to conduct testing, then fewer individuals may be used to create each composite.
- If target species are not caught in sufficient abundance to meet the laboratory's minimum mass requirement, then other species may be collected instead in accordance with the recommendations provided in Section 3.4. If alternate species are collected, the number of individuals required may be greater or less than 12, depending on size, to provide the laboratory with adequate skin-off fillet (for sportfish) or whole fish without head or internal organs (for prey fish) for analysis.

Each fish retained for subsequent analysis will be tagged with a unique identifier; measured for total length, fork length, and weight; and examined for gross pathology in accordance with guidance established in the *Bight Field Operations Manual* (BCEC 2008).

3.10 Sample Shipment and Chain-of-custody Procedures

The field team will complete the following steps to prepare fish for shipment to the analytical laboratory:

1. Sacrifice fish and leave the whole body intact.
2. Blot fish dry and pack each fish in aluminum foil (shiny side out).
3. Place each individually packed fish in a labeled, food-grade, resalable plastic bag and store on ice.

[2] See Appendix A-5 of Beegan and Faick (2017)
[3] The mass of skin-off fillet that can be retained from each fish can be estimated as 25 percent of the total weight of the fish.

4. Ship overnight to the analytical laboratory on wet or blue ice. If samples are held more than 24 hours, they will be packed on dry ice.

Fish samples will be held at the laboratory in a freezer until the end of the field program at which time, Anchor QEA will determine which fish will be used to create composites of sport fish, prey fish, and white croaker.

Chain-of-custody (COC) procedures will be followed in accordance with the PQAPP (Attachment B). One COC form will be used to transfer fish from the field to the laboratory for freezing, and a separate COC will be created by Anchor QEA staff at the laboratory after fish have been placed in bags that indicate which fish should be used to create skin-off composites.

3.11 Documentation

Field records will consist of daily logs, fish sampling logs, and COC forms. Examples of these field forms are provided in Attachment C.

3.11.1 Daily Log

The field coordinator or designee will keep a daily record of significant events, observations, and measurements on a daily log (Attachment C). 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 allow the event to be reconstructed without relying on the memory of the field coordinator. 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 of sample collection
- Sampling method and description of activities
- Identification or serial numbers of instruments or equipment used
- Deviations from the PQAPP, CCMRP, and SAP
- Conference calls or discussions related to field sampling activities

3.11.2 Fish Sampling Forms

A field form will be completed for each fish sample collection location (Attachment C). The following information will be recorded on the field form:

- Name of personnel
- Date
- Time
- Station identifier
- Location coordinates (measured by differential GPS)
- Collection method
- Observations
  - Weather (e.g., heavy rains, cold front, very dry, or very wet)
  - Wind speed and direction (see Beaufort Scale; Attachment C)
- Reference to photographs, if taken
- Sample identifier, species, lengths, and weights of fish individuals retained for processing

3.12 Sample Processing

Sample processing will occur at the analytical laboratory in accordance with methods detailed in the CCMRP (Attachment A). Fish will be composited per guidance from Anchor QEA. In general, the laboratory will prepare skin-off fillets, excluding ribs and stomach tissue for sportfish, and fillets will be weighed. For prey fish, the laboratory will remove the head and internal organs and process the remaining whole fish (Beegan and Faick 2017). Three composite samples per species per station will be created. The number of individuals per composite will depend on which species were collected and the total available mass per species and tissue type.

3.13 Analysis Approach

Composited fish tissue samples will be analyzed for percent lipids, percent moisture, PCB congeners, and organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene). A list of analytes is presented in Table 3.

3.14 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 municipal 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.

4 Laboratory Analytical Methods

Section 4 of the PQAPP (Attachment B) provides detailed information regarding analytical methods. A summary of methods is provided in this section.

Dissection and compositing methods will be performed in the analytical laboratory in accordance with USEPA guidance (USEPA 2000) and Section 2.7. Tissue samples will be analyzed for PCB congeners by low-resolution gas chromatography/low-resolution mass spectrometry, percent lipids, low-resolution organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene), and percent moisture. Results are to be reported uncorrected for lipids and moisture content. Tissue analytes, analytical methods, and target reporting limits are listed in Table 3. Physical and chemical analyses will be conducted at Eurofins Calscience, Inc. (ECI) in Garden Grove, California. ECI is accredited through the State of California's Environmental Laboratory Accreditation Program (certificate number 2803). All samples will be maintained according to the appropriate holding times and temperatures for each analysis as listed in Table 4. The laboratory will prepare detailed reports in accordance with Section 4.4 of the PQAPP (Attachment B).

5 Quality Assurance/Quality Control

Field and laboratory QA/QC requirements are described in detail in Sections 3 and 4 of the PQAPP (Attachment B). Field data quality objectives are presented in Table 5. Field (homogenization) duplicates are to be collected at a frequency of 5 percent, or one per 20 samples processed. Field measurements (length, weights, etc.) will be made in triplicate on 5 percent of the measurements. Each result will be recorded along with the average of the three results, the difference between the largest and smallest result, and the percent difference between the largest and smallest result. The percent difference will be calculated as follows:

$$\text{Percent difference} = 100*(\text{largest}-\text{smallest})/\text{average}$$

Triplicate measurements, the average of the results, and percent difference will be recorded on the field form. The percent difference, as appropriate, will be compared against the precision criterion established for field measurements in Table 5. Laboratory QA/QC frequencies are summarized in Table 6. Laboratory data quality objectives were derived from the State of California's Surface Water Ambient Monitoring Program guidance (SWRCB 2008) and are summarized in Table 7.

6 Electronic Data Deliverables, Data Analysis, and Reporting

This section summarizes data management, data analysis, and reporting requirements; further details are provided in the CCMRP (Attachment A).

6.1 Electronic Data Deliverables

Field data collection, including observations, field measurements, and sample generation, will be compiled into a field electronic data deliverable generated from the field collection logs as described in the CCMRP (Attachment A).

6.2 Data Analysis and Compliance Determination

Chemical concentrations measured in fish tissues will be compared to fish tissue numeric targets in the Harbor Toxics TMDL (OEHHA 2009; RWQCB and USEPA 2011), and compliance with the Harbor Toxics TMDL will be evaluated as described in the CCMRP (Attachment A).

6.3 Reporting

Monitoring reports will be prepared by Anchor QEA and submitted to the Regional Water Quality Control Board annually. The first report is due 15 months after monitoring begins (RWQCB 2014), and subsequent reports will be submitted annually thereafter. At a minimum, the following will be included:

- Description of monitoring activities conducted for a given year
- A summary of any deviations from the proposed sampling program
- Sampling locations in latitude and longitude
- A project map with actual sampling locations
- A summary table of fish collected and submitted for analyses
- A summary table of fish tissue analytical results compared to fish tissue numeric targets
- QA/QC summary for laboratory analysis

Laboratory reports, copies of field forms, sample photographs, and data validation reports will be included as appendices. As described, the annual monitoring reports will provide a statement assessing whether or not monitoring results indicate compliance or non-compliance with waste load and load allocations.

7 References

Anchor QEA, LLC, 2014. Programmatic Quality Assurance Project Plan Supporting Compliance Monitoring and Special Studies Related to the Harbor Toxics TMDL. August 2014.

BCEC (Bight Coastal Ecology Committee), 2008. Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Field Operations Manual. July 2008.

Beegan, C. and K. Faick, 2017. *(Proposed) Amendments to the Water Quality Control Plan for Enclosed Bays and Estuaries of California: Sediment Quality Provisions.* October 2017. Amended Plan was adopted at Board Hearing on June 5, 2018.

Odenweller, D.B., 1975. The life history of the shiner surfperch *Cyamatogaster aggregata* in Anaheim Bay, California. The Marine Resources of Anaheim Bay. Available from: http://content.cdlib.org/view?docId=kt6n39n885;NAAN=13030&doc.view=frames&chunk.id=d0e4240&toc.id=0&brand=calisphere.

OEHHA (Office of Environmental Health Hazard Assessment), 2009. Health Advisory and Safe Eating Guidelines for Fish from Coastal Areas of Southern California: Ventura Harbor to San Mateo Point. June 2009.

RWQCB (Los Angeles Regional Water Quality Control Board), 2011. Final Basin Plan Amendment. Attachment A to Resolution No. R11-008. 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. Adopted by the RWQCB on May 5, 2011.

RWQCB, 2014. Letter to Christopher Cannon (Port of Los Angeles) and Heather Tomley (Port of Long Beach). Regarding: Greater Harbor Waters Regional Monitoring Coalition's Coordinated Compliance, Monitoring, and Reporting Plan. June 6, 2014.

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.

USEPA (U.S. Environmental Protection Agency), 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition. USEPA 823-R-93-002B-00-007. USEPA, Office of Water, Washington, DC.

Tables

Table 1
Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Sample ID[1]	Target Species	Tissue(s) for Chemical Analysis[2]	Analytes	Notes[3]
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-01-YYYYMMDD	White croaker	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-02-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-03-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-04-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-05-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-06-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-07-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-08-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-09-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-10-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-11-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-WC-12-YYYYMMDD	White croaker	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-01-YYYYMMDD	California halibut	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-02-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-03-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-04-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-05-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-06-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-07-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-08-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-09-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-10-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-11-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-CH-12-YYYYMMDD	California halibut	Skin-off fillets		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-01-YYYYMMDD	Shiner surfperch	Whole body	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four or more fish fillets in each composite will be analyzed
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-02-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-03-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-04-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-05-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-06-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-07-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-08-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-09-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-10-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-11-YYYYMMDD	Shiner surfperch	Whole body		
Los Angeles Outer Harbor - Cabrillo Pier	CP-FF-SS-12-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-01-YYYYMMDD	White croaker	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-02-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-03-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-04-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-05-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-06-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-07-YYYYMMDD	White croaker	Skin-off fillets		

Table 1
Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Sample ID[1]	Target Species	Tissue(s) for Chemical Analysis[2]	Analytes	Notes[3]
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-08-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-09-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-10-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-11-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-WC-12-YYYYMMDD	White croaker	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-01-YYYYMMDD	California halibut	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-02-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-03-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-04-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-05-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-06-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-07-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-08-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-09-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-10-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-11-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-CH-12-YYYYMMDD	California halibut	Skin-off fillets		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-01-YYYYMMDD	Shiner surfperch	Whole body	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four or more fish fillets in each composite will be analyzed
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-02-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-03-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-04-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-05-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-06-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-07-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-08-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-09-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-10-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-11-YYYYMMDD	Shiner surfperch	Whole body		
Long Beach Outer Harbor (inside breakwater)	OB-FF-SS-12-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-WC-01-YYYYMMDD	White croaker	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Eastern San Pedro Bay - Pier J	SP-FF-WC-02-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-03-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-04-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-05-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-06-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-07-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-08-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-09-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-10-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-11-YYYYMMDD	White croaker	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-WC-12-YYYYMMDD	White croaker	Skin-off fillets		

Table 1
Proposed Sampling Coordinates and Investigation Components

Waterbody or Area	Sample ID[1]	Target Species	Tissue(s) for Chemical Analysis[2]	Analytes	Notes[3]
Eastern San Pedro Bay - Pier J	SP-FF-CH-01-YYYYMMDD	California halibut	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Eastern San Pedro Bay - Pier J	SP-FF-CH-02-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-03-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-04-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-05-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-06-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-07-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-08-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-09-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-10-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-11-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-CH-12-YYYYMMDD	California halibut	Skin-off fillets		
Eastern San Pedro Bay - Pier J	SP-FF-SS-01-YYYYMMDD	Shiner surfperch	Whole body	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four or more fish fillets in each composite will be analyzed
Eastern San Pedro Bay - Pier J	SP-FF-SS-02-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-03-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-04-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-05-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-06-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-07-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-08-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-09-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-10-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-11-YYYYMMDD	Shiner surfperch	Whole body		
Eastern San Pedro Bay - Pier J	SP-FF-SS-12-YYYYMMDD	Shiner surfperch	Whole body		
Consolidated Slip	CS-FF-WC-01-YYYYMMDD	White croaker	Skin-off fillets	PCBs (congeners), organochlorine pesticides, lipids, percent moisture	Three composite samples of four fish fillets in each composite will be analyzed
Consolidated Slip	CS-FF-WC-02-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-03-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-04-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-05-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-06-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-07-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-08-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-09-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-10-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-11-YYYYMMDD	White croaker	Skin-off fillets		
Consolidated Slip	CS-FF-WC-12-YYYYMMDD	White croaker	Skin-off fillets		

Notes:
1. If the target species is not available in adequate mass, an alternate species may be used and the species code will be changed to coincide with the actual species sampled. A list of species codes is provided in Table 2.
2. Whole fish body samples should be prepared by the laboratory to exclude the head or internal organs.
3. The number of individuals needed for non-target species will be dependent upon size and mass.
PCB: polychlorinated biphenyl

Table 2
Sample Nomenclature Codes

Waterbody or Other Area Codes				
Actual	Outer Harbor - LB	Consolidated Slip	Eastern San Pedro Bay	Cabrillo Pier
Code	OB	CS	SP	CP

Media Codes		
Actual	Whole Organism	Fish Fillet skin off (muscle)
Code	WO	FF

Organism								
Scientific Name	*Genyonemus lineatus*	*Cymatogaster aggregata*	*Paralichthys californicus*	*Paralabrax nebulifer*	*Synodus lucioceps*	*Phanerodon furcatus*	*Atherinops affinis*	*Engraulis mordax*
Common Name	White Croaker	Shiner Surfperch	California Halibut	Barred Sand Bass	California Lizardfish	White Surfperch	Topsmelt	Northern Anchovy
Code	WC	SS	CH	BS	CL	WS	TS	NA

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

Date of Collection	
Date	1-Jul-14
Code	20140701

Table 3
Tissue Analytical Methods and Target Reporting Limits

Parameter	Analytical Method	Target MDLs	Target RLs[1]	CCMRP RLs	SWAMP RLs
Conventionals (%)					
Lipids	NOAA 1993a	0.1	0.1	0.5	n/a
Percent moisture	ASTM D 2216	0.1	0.1	0.1	n/a
Organochlorine Pesticides (ng/g or µg/kg wet weight) – Low-resolution Analytical Methods					
Total chlordane[2]	USEPA 8270C-SIM		--	--	
alpha-Chlordane (cis-chlordane)	USEPA 8270C-SIM	0.067	0.2	4.0	4.0
gamma-Chlordane (trans-chlordane)	USEPA 8270C-SIM	0.053	0.2	4.0	4.0
Oxychlordane	USEPA 8270C-SIM	0.073	0.2	2.0	2.0
cis-Nonachlor	USEPA 8270C-SIM	0.051	0.2	4.0	4.0
trans-Nonachlor	USEPA 8270C-SIM	0.043	0.2	2.0	2.0
Dieldrin[3]	USEPA 8270C-SIM	0.11	0.2	0.46	4.0
Toxaphene[3]	USEPA 8081A	9	20	6.1	40
2,4′-DDD	USEPA 8270C-SIM	0.076	0.2	4.0	4.0
2,4′-DDE	USEPA 8270C-SIM	0.035	0.2	4.0	4.0
2,4′-DDT	USEPA 8270C-SIM	0.062	0.2	6.0	6.0
4,4′-DDD	USEPA 8270C-SIM	0.04	0.2	4.0	4.0
4,4′-DDE	USEPA 8270C-SIM	0.04	0.2	4.0	4.0
4,4′-DDT	USEPA 8270C-SIM	0.053	0.2	10.0	10.0
PCB Congeners[4] (ng/g wet weight) – Low-resolution Analytical Methods					
CL3-PCB-18	USEPA 8270C-SIM	0.039	0.20	0.4	0.4
CL3-PCB-28	USEPA 8270C-SIM	0.055	0.20	0.4	0.4
CL3-PCB-37	USEPA 8270C-SIM	0.035	0.20	0.4	--
CL4-PCB-44	USEPA 8270C-SIM	0.092	0.20	0.4	0.4
CL4-PCB-49	USEPA 8270C-SIM	0.086	0.20	0.4	0.4
CL4-PCB-52	USEPA 8270C-SIM	0.051	0.20	0.4	0.4
CL4-PCB-66	USEPA 8270C-SIM	0.075	0.20	0.4	0.4
CL4-PCB-70	USEPA 8270C-SIM	0.048	0.20	0.4	0.4
CL4-PCB-74	USEPA 8270C-SIM	0.046	0.20	0.4	0.4
CL4-PCB-77	USEPA 8270C-SIM	0.085	0.20	0.4	--
CL4-PCB-81	USEPA 8270C-SIM	0.064	0.20	0.4	--
CL5-PCB-87	USEPA 8270C-SIM	0.041	0.20	0.4	0.4
CL5-PCB-99	USEPA 8270C-SIM	0.054	0.20	0.4	0.4
CL5-PCB-101	USEPA 8270C-SIM	0.051	0.20	0.4	0.4
CL5-PCB-105	USEPA 8270C-SIM	0.042	0.20	0.4	0.4
CL5-PCB-110	USEPA 8270C-SIM	0.046	0.20	0.4	0.4
CL5-PCB-114	USEPA 8270C-SIM	0.036	0.20	0.4	0.4
CL5-PCB-118	USEPA 8270C-SIM	0.059	0.20	0.4	0.4

Table 3
Tissue Analytical Methods and Target Reporting Limits

Parameter	Analytical Method	Target MDLs	Target RLs[1]	CCMRP RLs	SWAMP RLs
CL5-PCB-119	USEPA 8270C-SIM	0.046	0.20	0.4	--
CL5-PCB-123	USEPA 8270C-SIM	0.047	0.20	0.4	--
CL5-PCB-126	USEPA 8270C-SIM	0.034	0.20	0.4	--
CL6-PCB-128	USEPA 8270C-SIM	0.039	0.20	0.4	0.4
CL6-PCB-132/153	USEPA 8270C-SIM	0.067	0.40	0.4	0.4
CL6-PCB-138/158	USEPA 8270C-SIM	0.075	0.40	0.4	0.4
CL6-PCB-149	USEPA 8270C-SIM	0.048	0.20	0.4	0.4
CL6-PCB-151	USEPA 8270C-SIM	0.062	0.20	0.4	0.4
CL6-PCB-156	USEPA 8270C-SIM	0.066	0.20	0.4	0.4
CL6-PCB-157	USEPA 8270C-SIM	0.051	0.20	0.4	0.4
CL6-PCB-167	USEPA 8270C-SIM	0.042	0.20	0.4	--
CL6-PCB-168	USEPA 8270C-SIM	0.045	0.20	0.4	--
CL6-PCB-169	USEPA 8270C-SIM	0.033	0.20	0.4	--
CL7-PCB-170	USEPA 8270C-SIM	0.050	0.20	0.4	0.4
CL7-PCB-177	USEPA 8270C-SIM	0.040	0.20	0.4	0.4
CL7-PCB-180	USEPA 8270C-SIM	0.030	0.20	0.4	0.4
CL7-PCB-183	USEPA 8270C-SIM	0.032	0.20	0.4	0.4
CL7-PCB-187	USEPA 8270C-SIM	0.039	0.20	0.4	0.4
CL7-PCB-189	USEPA 8270C-SIM	0.025	0.20	20.0	20.0
CL8-PCB-194	USEPA 8270C-SIM	0.041	0.20	0.4	0.4
CL8-PCB-201	USEPA 8270C-SIM	0.044	0.20	0.4	0.4
CL9-PCB-206	USEPA 8270C-SIM	0.045	0.20	0.4	0.4

Notes:
Data will be reported uncorrected for lipid content or percent moisture.
1. Matrix interference and/or dilutions due to non-target analytes may increase target RLs. The MDL should be at least three times lower than the RL (40 Code of Federal Regulations 136) but will vary per instrument by MDL study.
2. Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.
3. Total maximum daily load tissue target for dieldrin and toxaphene are currently below achievable laboratory RLs. Results should be reported to the MDL.
4. PCB co-elutions will vary by instrument and column, and may increase RLs for some congeners.

CCMRP: Coordinated Compliance Monitoring and Reporting Plan
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
ng/g: nanogram per gram
MDL: method detection limit
RL: reporting limit
PCB: polychlorinated biphenyl
USEPA: U.S. Environmental Protection Agency

Table 4
Sample Containers, Holding Times, and Preservation Methods

Parameter	Ideal Sample Size	Minimum Sample Size	Container Size and Type	Holding Time	Preservative
Tissues					
Percent moisture	30 g	10 g	Polyethylene bag or 8-oz glass	1 year	Freeze -20°C
Lipids	60 g	20 g		1 year	Freeze -20°C
Organochlorine pesticides				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				None[1]	Cool ≤ 6°C
					Freeze -20°C

Notes:
Some criteria may differ from California Surface Water Ambient Monitoring Program guidance; however, criterion used are consistent with analytical method criteria.
Recommendations are intended as guidance only. The selection of sample container and amount of sample required may vary per contracted laboratory sampling requirements.
1. PCB hold time was removed in SW-846, Chapter 4, Revision 4, February 2007 for aqueous and solid samples stored cool ≤ 6°C.
g: gram
oz: ounce
PCB: polychlorinated biphenyl

Table 5
Field Measurement Data Quality Objectives

Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Fish species identification	95 percent	NA	NA	NA	NA
Fish enumeration	90 percent	NA	NA	NA	NA
Fish lengths	90 percent	90 percent	NA	NA	NA
Fish weights	90 percent	Within 0.2 kg	NA	NA	NA

Notes:
Field measurements will be made in triplicate on 5 percent of measurements to ensure data quality objectives are met.
kg: kilogram
NA: not applicable

Table 6
Frequencies and Performance Criteria for Laboratory Quality Assurance/Quality Control Samples

Analysis Type	Initial Calibration[1,2]	Continuing Calibration Verification	LCS or SRM[3]	Replicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Internal Standard
Lipids and percent moisture	Daily or each batch	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
PCB Congeners by low-resolution method	As needed	Every 12 hours	1 per 20 samples or 1 per batch	NA	1 per 20 samples or 1 per batch	1 per 20 samples or 1 per batch	Each batch	Every sample	Every sample
Pesticides by low-resolution method	As needed	Per 10 analytical runs	1 per 20 samples or 1 per batch	NA	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 relative percent differences less than 40 percent or they are P flagged. ICALS = 20 percent or less and CCALS = 15 percent or less.
1. For physical tests, calibration and certification of drying ovens and weighing scales are conducted annually.
2. Calibrations should be conducted per analytical methods or instrument manufacturers' specifications.
3. When an SRM is not available, an LCS will be analyzed.
LCS: Laboratory control sample
SRM: standard reference material
NA: not applicable
PCB: polychlorinated biphenyl

Table 7
Laboratory and Reporting Data Quality Objectives

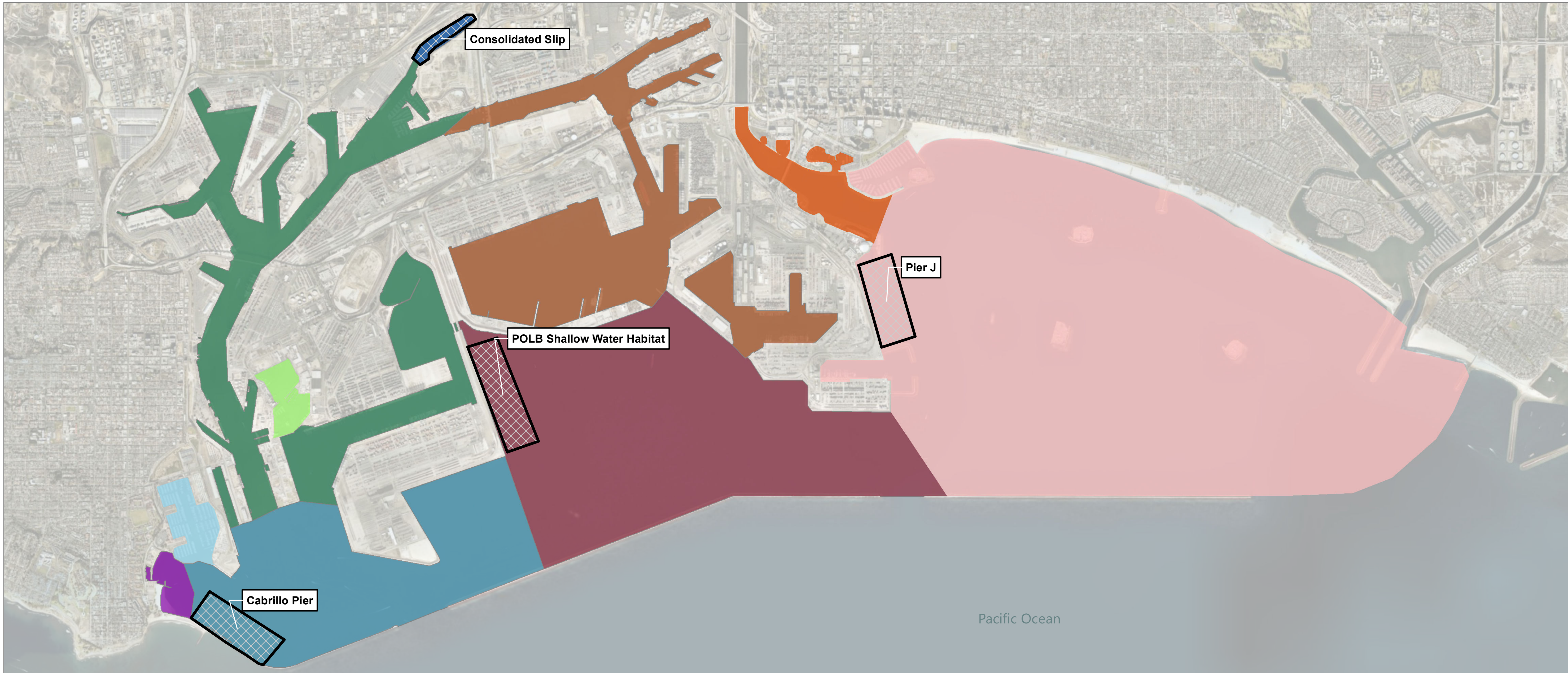
Parameter	Precision[1]	Accuracy[2]	Completeness[3]
Tissues			
Lipids and percent moisture	± 25% RPD	NA	90%
Organochlorine pesticides[4]	± 25% RPD	50-150% R	90%
PCB Congeners[4]	± 25% RPD	50-150% R	90%

Notes:
1. Not applicable if native concentration of either sample is less than the RL
2. Laboratory control sample, certified reference material, and matrix spike/matrix spike duplicate percent recovery
3. 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)
4. The accuracy goal is 70 to 130 percent R if certified reference material is used

NA: not applicable
PCB: polychlorinated biphenyl
R: recovery
RPD: relative percent difference

Bay, S.M., D.J. Greenstein, J.A. Ranasinghe, D.W. Diehl, and A.E. Fetscher, 2009. Sediment Quality Assessment Draft Technical Support Manual. Technical Report 582. Southern California Coastal Water Research Project. May 2009.

Figure



LEGEND:

Proposed Compliance Monitoring Location

POLA/POLB Waterbodies

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

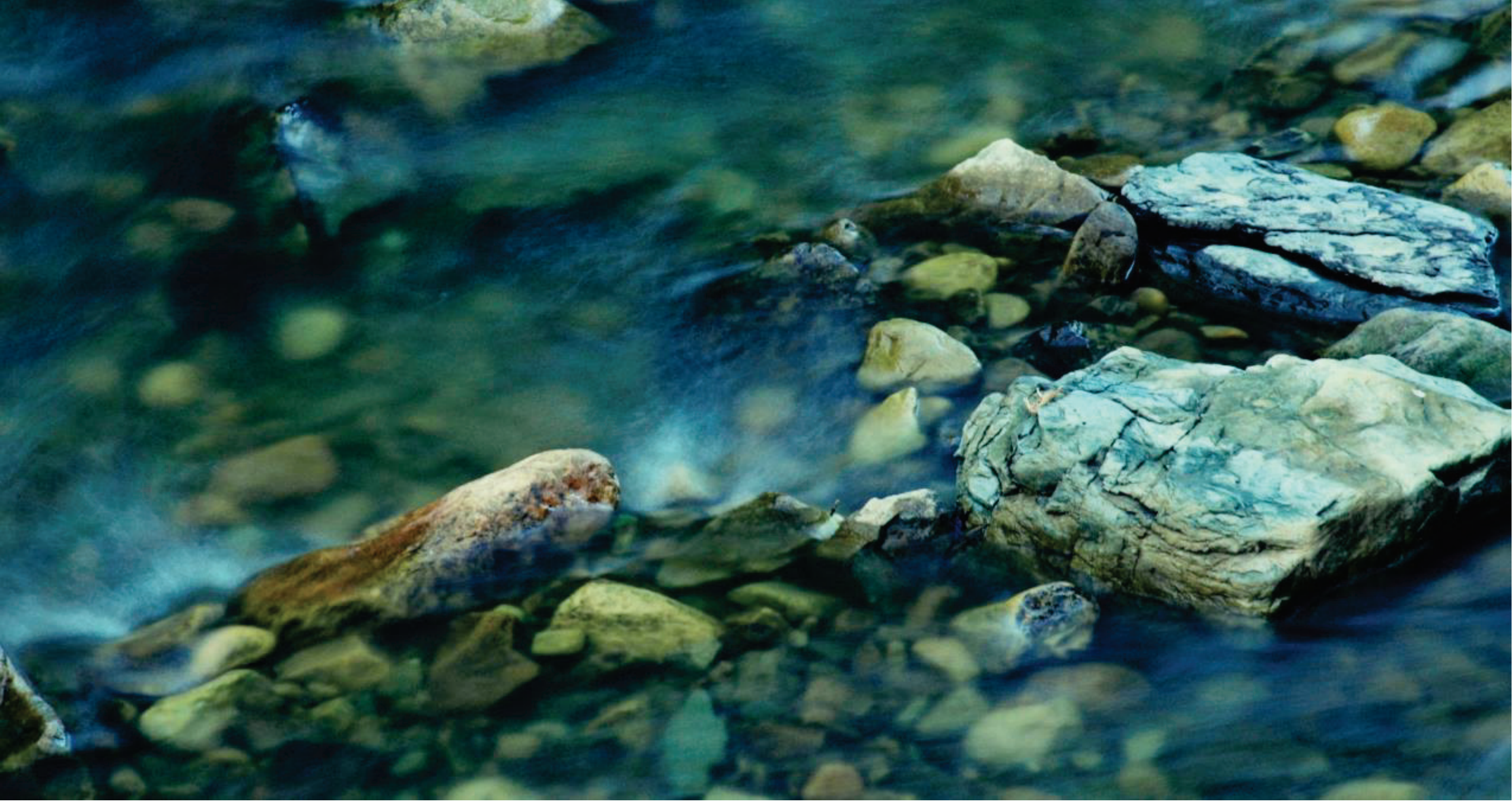
0 4,000
Feet

Publish Date: 2019/08/12, 4:00 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\SAP\Fish\AQ_TMDL_FishMonitoring_2019_SAP.mxd

ANCHOR QEA

Figure 1
TMDL Compliance Fish Monitoring Locations
Fish Tissue Sampling and Analysis Plan
Greater Los Angeles and Long Beach Harbor Waters

Attachment A
Coordinated Compliance Monitoring and Reporting Plan



August 2019
Greater Harbor Waters Regional Monitoring Coalition

Coordinated Compliance Monitoring and Reporting Plan

Incorporating Quality Assurance Project Plan Components

Prepared for Cities of Bellflower, Lakewood, Long Beach, Los Angeles, Paramount, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Signal Hill; Los Angeles County; Los Angeles County Flood Control District; and Ports of Long Beach and Los Angeles

August 2019
Greater Harbor Waters Regional Monitoring Coalition

Coordinated Compliance Monitoring and Reporting Plan

Incorporating Quality Assurance Project Plan Components

Prepared for
Cities of Bellflower, Lakewood, Long Beach, Los Angeles, Paramount, Rancho Palos Verdes, Rolling Hills, Rolling Hills Estates, and Signal Hill; Los Angeles County; Los Angeles County Flood Control District; and Ports of Long Beach and Los Angeles

Prepared by
Anchor QEA, LLC
9700 Research Drive
Irvine, California 92618

Project Number: 141205-01.05

Title and Approval Sheets (Element A1)

Coordinated Compliance, Monitoring, and Reporting Plan incorporating Quality Assurance Project Plan Components related the Greater Los Angeles and Long Beach Harbor Waters

Approval sheets are included in the PQAPP.

Distribution List (Element A3)

Individuals listed below will receive a copy of this document.

City of Bellflower
Bernardo Iniguez, Environmental Services Manager
16600 Civic Center Drive
Bellflower, California 90706
Phone: (562) 804-1424, Extension 2233
Email: biniguez@bellflower.org

City of Long Beach, Department of Public Works
Melissa You
Storm Water/Environmental Compliance Officer
333 W. Ocean Boulevard, 9th Floor
Long Beach, California 90802
Phone: (562) 570-5524
Email: melissa.you@longbeach.gov

City of Paramount
Chris Cash, Director of Public Works
16400 Colorado Avenue
Paramount, California 90723
Phone: (562) 220-2020
Email: ccash@paramountcity.com

City of Rancho Palos Verdes, Public Works
Charles Eder, PE, Senior Engineer
30940 Hawthorne Boulevard
Rancho Palos Verdes, California 90275
Phone: (310) 544-5282
Email: charlese@rpv.com

City of Lakewood, Public Works
Konya Vivanti, Senior Management Analyst
5050 Clark Avenue
Lakewood, California 90712
Phone: (562) 866-9771, Extension 2507
Email: kvivanti@lakewoodcity.org

City of Los Angeles
Donna Toy-Chen, Assistant Division Manager
Watershed Protection Division
Bureau of Sanitation
1149 South Broadway, 10th Floor
Los Angeles, California 90015
Phone: (213) 485-3928
Email: donna.chen@lacity.org

City of Los Angeles, Public Works
Shokoufe Marashi, Environmental
Specialist III
1149 S. Broadway Street, 10th Floor
Los Angeles, California 90015
Phone: (213) 485-3937
Email: shokoufe.marashi@lacity.org

City of Rolling Hills
Yolanta Schwartz, Planning Director
2 Portuguese Bend Road
Rolling Hills, California 90274
Phone: (310) 377-1521

City of Rolling Hills Estates
Greg Grammer, Assistant City Manager
4045 Palos Verdes Drive North
Rolling Hills Estates, California 90274
Phone: (310) 377-1577

City of Signal Hill
Steve Myrter, Public Works Director
2175 Cherry Avenue
Signal Hill, California 90755
Phone: (562) 989-7356
Email: smyrter@cityofsignalhill.org

Los Angeles County and Los Angeles County Flood Control District
Mercedes Passanisi,
P.O. Box 1460
Alhambra, California 91802-1460
Phone: (626) 458-7121
Email: mpassanisi@dpw.lacounty.gov

Port of Long Beach
James Vernon
Manager of Water Quality
415 W. Ocean Boulevard
Long Beach, California 90802
Phone: (562) 283-7114
Email: james.vernon@polb.com

Los Angeles Regional Water Quality Control Board
Thanhloan Nguyen, Water Resources Control Engineer
320 W. 4th Street
Los Angeles, California 90013
Phone: (213) 576-6689
Email: thanhloan.nguyen@waterboards.ca.gov

Port of Los Angeles
Kat Prickett
Environmental Specialist
425 S. Palos Verdes Street
San Pedro, California 90731
Phone: (310) 732-3951
Email: kprickett@portla.org

Andrew Jirik, Environmental Specialist
425 S. Palos Verdes Street
San Pedro, California 90731
Phone: (310) 732-3681
Email: ajirik@portla.org

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

Bight Program	Southern California Bight Regional Monitoring Program
BRI	Benthic Response Index
CA LRM	California Logistic Regression Model
Caltrans	California Department of Transportation
CCMRP	Coordinated Compliance, Monitoring, and Reporting Plan
CDFW	California Department of Fish and Wildlife
CLP	Contract Laboratory Program
cm	centimeter
COC	chain-of-custody
COPC	contaminant of potential concern
CSI	Chemical Score Index
CTR	California Toxics Rule
CWA	Clean Water Act
DGPS	differential global positioning system
DO	dissolved oxygen
DQO	data quality objective
eCOC	electronic chain-of-custody
EDD	electronic data deliverable
EDL	estimated detection limit
ELAP	Environmental Laboratory Accreditation Program
ERL	effects range low
ERM	effects range median
FCEC	Fish Contamination Education Collaborative
FCG	fish contamination goal
Greater Harbor Waters	Greater Los Angeles and Long Beach Harbor Waters (including Consolidated Slip)
Harbor Toxics TMDL	*Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters*
HDPE	high-density polyethylene
IBI	Index of Biotic Integrity
IDL	Interactive Data Language
ITP	Incidental Take Permit
LA	load allocation
LOD	limit of detection
LOE	lines of evidence
MBC	MBC Applied Environmental Sciences

MDL	method detection limit
MLLW	mean lower low water
MLOE	multiple lines of evidence
mm	millimeter
MRL	method reporting limit
MS4	Municipal Separate Storm Sewer System
NAD83	North American Datum 1983
NIST	National Institute of Standards and Technology
NLAP	National Environmental Laboratory Accreditation Program
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health Hazard Assessment
Order	*Waste Discharge Requirements for Municipal Separate Storm Sewer Systems Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4*
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PQAPP	Programmatic Quality Assurance Project Plan
PTFE	polytetrafluoroethylene
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RBI	Relative Benthic Index
RIVPACS	River Invertebrate Prediction and Classification System
RMC	Regional Monitoring Coalition
RWQCB	Los Angeles Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCB	Southern California Bight
SCCWRP	Southern California Coastal Water Research Project
SOP	Standard Operating Procedure
SQO	Sediment Quality Objective
SQV	sediment quality value
SWAMP	Surface Water Ambient Monitoring Program
SWI	sediment-water interface
T/E	threatened or endangered
TIWRP	Terminal Island Water Reclamation Plant
TMDL	Total Maximum Daily Load
TOC	total organic carbon
TSS	total suspended solids

USEPA	U.S. Environmental Protection Agency
WLA	waste load allocation

Forward/Document Organization

The Coordinated Compliance, Monitoring, and Reporting Plan (CCMRP) is developed to be consistent with other California state and regional monitoring programs, as well as other plans developed to support the *Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters* (Harbor Toxics TMDL). These programs, including California's Surface Water Ambient Monitoring Program (SWAMP), California's Sediment Quality Objectives (SQO), and the Southern California Bight Regional Monitoring Program (Bight Program), as well as a supplemental Programmatic Quality Assurance Project Plan (PQAPP), are described in greater detail below and provide the foundation for work to be undertaken as part of this CCMRP.

Surface Water Ambient Monitoring Program

SWAMP is a coordinated, statewide umbrella program that integrates water quality monitoring performed under the State Water Regional Control Board and Regional Water Quality Control Boards, as well as other agencies, dischargers, and private groups. SWAMP provides a consistent approach to sampling, data analysis, quality assurance (QA), and data management. Detailed methods and procedures outlined by SWAMP promote statewide data comparability and will be widely utilized in monitoring conducted for the Harbor Toxics TMDL program.

Sediment Quality Objectives Program

The SQO program provides guidance for the application of the *Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality* (SWRCB 2009). SQOs have been developed for contaminants of concern in bays and estuaries in California based on an approach that incorporates multiple lines of evidence (MLOE; Bay et al. 2014). These MLOE include sediment chemistry, sediment toxicity, and benthic community composition. Further information is provided below. This CCMRP calls for the use of the SQO program to aid implementation of the Harbor Toxics TMDL program.

Sediment Chemistry Line of Evidence

The chemistry line of evidence (LOE) requires chemical analysis of a suite of constituents. Two indices are used to interpret the results: the California Logistic Regression Model (CA LRM) and the Chemical Score Index (CSI). Results produced by these indices are subsequently used to produce a single score representing the chemistry LOE.

Sediment Toxicity Line of Evidence

The toxicity LOE requires two toxicity tests: acute amphipod survival and a sub-lethal test (i.e., bivalve embryo development). The results of each test are compared to classification ranges (nontoxic, low toxicity, moderate toxicity, or high toxicity) and assigned a corresponding score. The two test scores are integrated to produce a single score for the toxicity LOE.

Benthic Community Line of Evidence

The benthic community LOE comprises enumerating and identifying organisms to species level (when possible) and evaluating results based on four indices: the Index of Biotic Integrity (IBI), the Relative Benthic Index (RBI), the Benthic Response Index (BRI), and the River Invertebrate Prediction and Classification System (RIVPACS). The four indices are weighted together to provide an overall score for the benthic community LOE.

Integration of Multiple Lines of Evidence

First, integration of MLOEs aids in determining two broad effects categories. The chemistry and toxicity LOEs are evaluated together to determine the potential for chemically mediated effects; likewise, the toxicity and benthic community LOEs are combined to determine the severity of biological effects. Finally, integration of the two effects categories results in an overall station assessment in which the station is placed into one of six impact categories (unimpacted, likely unimpacted, possibly impacted, likely impacted, clearly impacted, or inconclusive).

Southern California Bight Regional Monitoring Program

The Southern California Bight (SCB) is the approximate 400 miles of coastline from Point Conception in Santa Barbara County to Cabo Colnett in Ensenada, Mexico. The Southern California Coastal Water Research Project (SCCWRP) coordinates an extensive monitoring program within the SCB approximately every 5 years. The Bight program began in 1994, and data gathered during monitoring events has allowed for long-term tracking of benthic communities, fisheries, water quality, sediment chemistry and toxicity, and the general health of the SCB over time. This complex program incorporates multiple agencies and organizations, and, as such, a series of guidance documents for field data collection, laboratory analyses, QA, and data management have been created for each monitoring event. The most recent monitoring event occurred in 2013, and associated guidance is referenced and utilized in this CCMRP.

Programmatic Quality Assurance Project Plan

A PQAPP (Anchor QEA 2013) 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
- Field sampling data quality objectives
- Laboratory data quality objectives
- Data review, verification, and validation

Coordinated Compliance Monitoring and Reporting Plan

The PQAPP was not intended to adhere to all recommended elements of the SWAMP QAPP guidance document. This document, the CCMRP, and any other Sampling and Analysis Plans developed to support Harbor Toxics TMDL-related studies incorporate all relevant PQAPP elements (e.g., *presented in italicized text throughout this document*) in addition to supplemental information specific to each study in order to develop a single, all-inclusive, monitoring plan compatible with SWAMP QAPP requirements.

The required elements of a SWAMP QAPP and their corresponding location in this CCMRP are listed in Table A.

Table A
SWAMP QAPP Elements and Corresponding CCMRP Sections

SWAMP QAPP Element	Title	CCMRP Section
A	**Project Management**	
A1	Title and Approval Sheet (s)	i
A2	Table of Contents	ii
A3	Distribution List	i
A4	Project/Task Organization	2
A5	Problem Definition/Background	1
A6	Project/Task Description	3
A7	Quality Objectives and Criteria	8
A8	Special Training/Certifications	9
A9	Documentation and Records	10
B	**Data Generation and Acquisition**	
B01	Sampling Process Design (Sampling Design and Logistics)	4
B02	Sampling (sample collection) Methods	5
B03	Sample Handling and Custody	6
B04	Analytical Methods and Field Measurements	7
B05	Quality Control	11
B06	Instrument/Equipment Testing, Inspection, and Maintenance	12
B07	Instrument/Equipment Calibration and Frequency	13
B08	Inspection/Acceptance for supplies and Consumables	14
B09	Non-Direct Measurements	15
B10	Data Management	16
C	**Assessment and Oversight**	
C1	Assessments and Response Actions	17
C2	Reports to Management	18

SWAMP QAPP Element	Title	CCMRP Section
D	**Data Validation and Usability**	
D1	Data Review, Verification, and Validation	19
D2	Verification and Validation Methods	20
D3	Reconciliation with User Requirements	21

Executive Summary

On March 23, 2012, the *Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters* (Harbor Toxics TMDL) became effective and was promulgated to protect and restore fish tissue, water, and sediment quality in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (including Consolidated Slip; Greater Harbor Waters) by remediating contaminated sediment and controlling the sediment loading and accumulation of contaminated sediment in the harbor.

Each named responsible party is required to conduct compliance monitoring activities; however, the Harbor Toxics TMDL encourages collaboration and coordination of monitoring efforts. This document is the Coordinated Compliance, Monitoring, and Reporting Plan (CCMRP) for the Greater Harbor Waters. Because the Greater Los Angeles and Long Beach Harbor Responsible Parties recommend a coordinated monitoring effort, all monitoring efforts are proposed to be located in receiving waters at a point that suitably represents the combined discharge of cooperating parties.

The Harbor Toxics TMDL also states that the RWQCB Executive Officer may reduce, increase, or modify monitoring and reporting requirements, as necessary, based on the results of the TMDL monitoring program. This revision (August 2019) incorporates modifications to the compliance monitoring and reporting program based on findings from the initial 5 years of monitoring. Proposed modifications to the program are documented in two technical memoranda to the RWQCB dated April 2, 2019, and July 9, 2019 (Appendix D).

Compliance Monitoring Program

The modified monitoring program consists of the collection of water samples within 12 distinct water quality groups and sediment samples at a total of 22 stations (Table ES-1; Figures ES-1 and ES-2) and the collection of fish tissue samples within four waterbodies (Table ES-1; Figure ES-3). To maintain consistency and to take advantage of coordinated sampling efforts with other regional monitoring programs, sample collection methods will adhere to Bight or Surface Water Ambient Monitoring Program (SWAMP) monitoring protocols (BFSLC 2018; CDFG 2001).

Table ES-1
Station Locations

Waterbody Name	Station ID[2]	Water Quality Group	Latitude (Decimal Degrees) WGS84	Longitude (Decimal Degrees) WGS84	Station Location
Consolidated Slip[1]	1	1	33.774848	-118.245374	Center of Consolidated Slip
Los Angeles Inner Harbor	2	2	33.764900	-118.252089	East Turning Basin
	3	2	33.762288	-118.274100	Center of the Port of Los Angeles West Basin
	4	2	33.751843	-118.270991	Main Turning Basin north of Vincent Thomas Bridge
	5	3	33.732443	-118.251343	Between Pier 300 and Pier 400
	6	2	33.725728	-118.271488	Main Channel south of Port O'Call
Fish Harbor	7	4	33.735801	-118.267260	Center of inner portion of Fish Harbor
Los Angeles Outer Harbor[1]	8	5	33.714661	-118.242389	Los Angeles Outer Harbor between Pier 400 and middle breakwater
	9	5	33.712050	-118.263405	Los Angeles Outer Harbor between the southern end of the reservation point and the San Pedro breakwater
Cabrillo Marina	10	6	33.719386	-118.279074	Center of West Channel
Inner Cabrillo Beach	11	5	33.711801	-118.281063	Center of Inner Cabrillo Beach
Long Beach Inner Harbor	12	7	33.767262	-118.233560	Cerritos Channel between the Heim Bridge and the Turning Basin
	13	8	33.753832	-118.216400	Back Channel between Turning Basin and West Basin
	14	8	33.748982	-118.230825	Center of West Basin
	15	8	33.742143	-118.199488	Center of Southeast Basin
Long Beach Outer Harbor[1]	16	9	33.731449	-118.221001	Center of Long Beach Outer Harbor
	17	9	33.727594	-118.186058	Between the southern end of Pier J and the Queens Gate
San Pedro Bay[1]	18	10	33.753832	-118.181332	Northwest of San Pedro Bay near Los Angeles River Estuary
	19	11	33.736671	-118.131591	East of San Pedro Bay
	20	11	33.725480	-118.157332	South of San Pedro Bay inside breakwater
Los Angeles River Estuary	21	12	33.756444	-118.193394	Los Angeles River Estuary Queensway Bay
	22	12	33.761013	-118.202111	Los Angeles River Estuary

Notes:
WGS84: World Geodetic System 1984
1. Fish tissue samples will be collected within four waterbodies: Consolidated Slip, Los Angeles Harbor, Long Beach Harbor, and San Pedro Bay, from popular fishing areas, or areas with habitat or structure that may attract fish. Specific fish tissue sampling locations will be determined at the time of the sampling event using guidelines outlined in Section 4.2.3.
2. Twenty-two sediment samples will be collected per event; however, they will be randomly selected from an area representative of each of these stations. Twelve water quality samples will be collected per event; one sample per water quality group will be selected from the original stations located within that group.

LEGEND:

- ⊙ Sample Location
- Group 1: Consolidated Slip
- Group 2: Inner Los Angeles Harbor
- Group 3: Seaplane Lagoon
- Group 4: Fish Harbor
- Group 5: Outer Los Angeles Harbor
- Group 6: Cabrillo Marina
- Group 7: Inner Long Beach Harbor
- Group 8: Middle Long Beach Harbor
- Group 9: Outer Long Beach Harbor
- Group 10: Eastern San Pedro Bay (Inner)
- Group 11: Eastern San Pedro Bay (Outer)
- Group 12: Los Angeles River Estuary

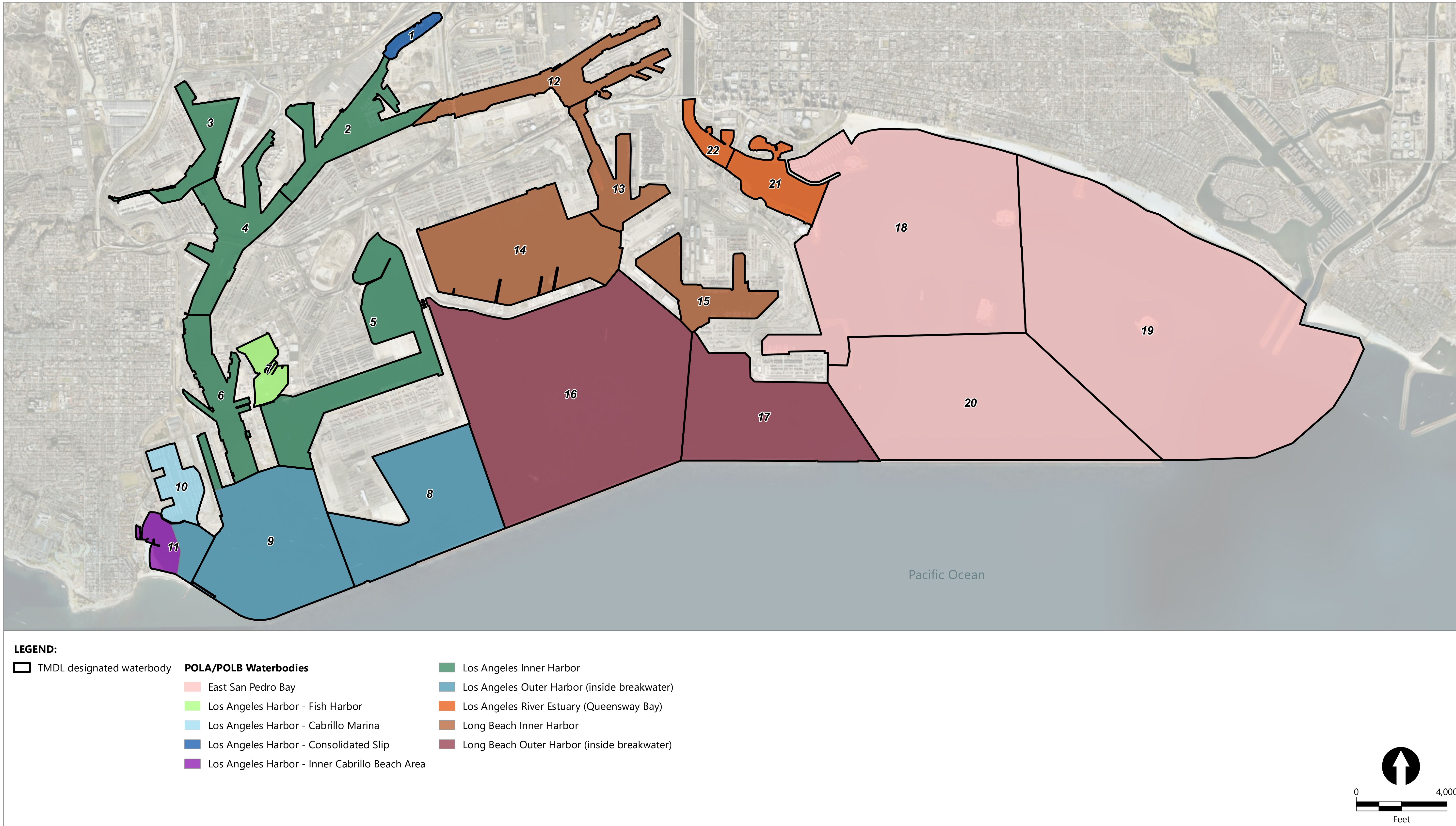
NOTE:
Based on statistical analyses presented in correspondence to the Los Angeles RWQCB (letter to Deborah Smith, April 2, 2019, and technical memorandum to Thahnloan Nguyen and LB Nye, July 9, 2019), the 22 available water quality sampling locations may be grouped into 12 distinct groups representative of the spatial distribution of chemical concentrations within the Greater Harbor Waters. During each sampling event, only 12 (one location selected from available stations within each group according to the method defined in Section 4.1.1) of the 22 available water quality sampling stations would be sampled.

0 4,000
Feet

Publish Date: 2019/08/14, 3:49 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\AQ_TMDL_WQ_Monitoring_2019_CCMRP_ES-1.mxd

ANCHOR QEA

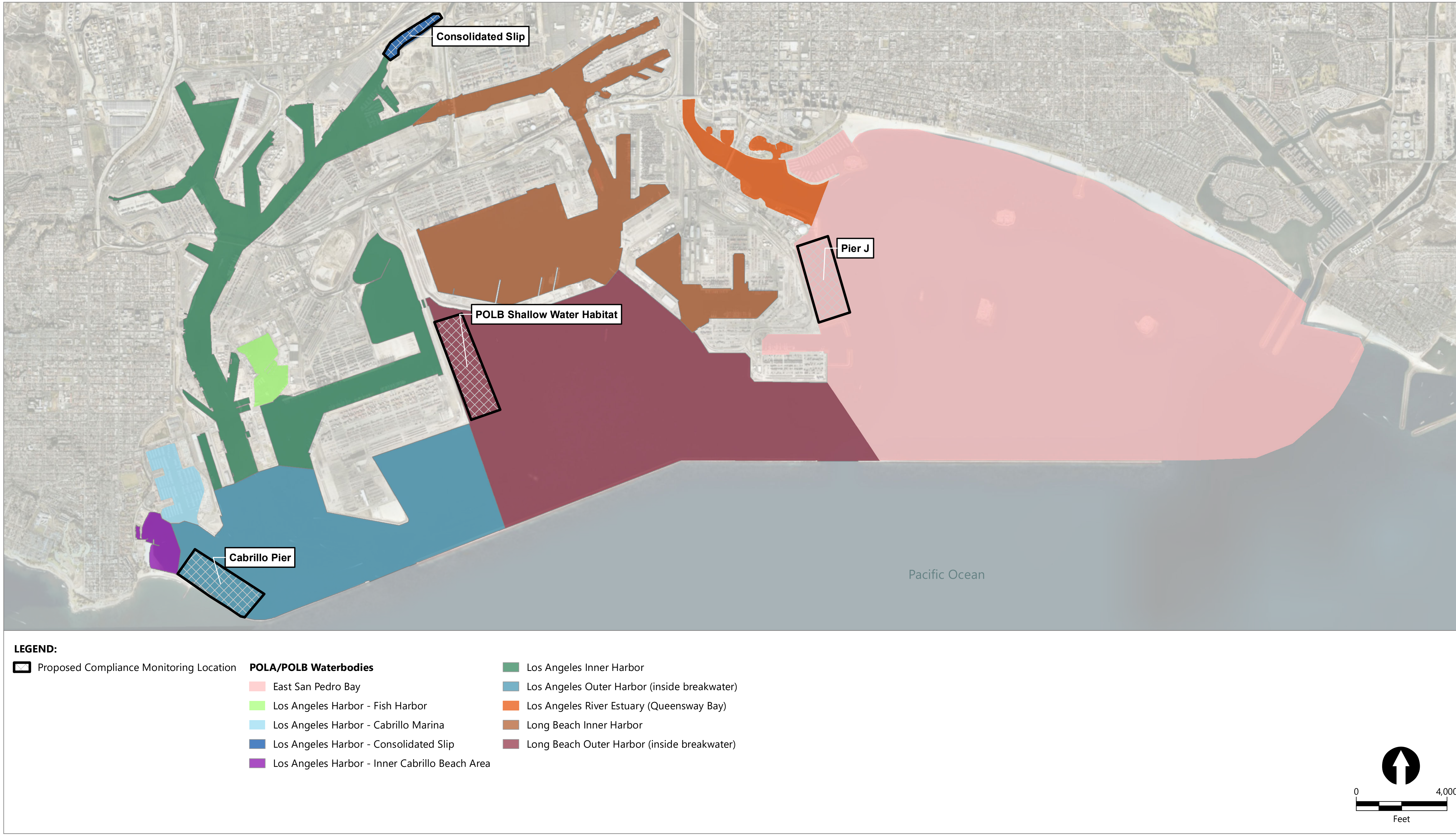
Figure ES-1
TMDL Compliance Water Monitoring Locations
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



Publish Date: 2019/08/14, 3:37 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\AQ_TMDL_SedimentWaterBodies_2019_CCMRP_ES-2.mxd

ANCHOR QEA

Figure ES-2
TMDL Compliance Designated Waterbodies for Sediment Monitoring
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



Publish Date: 2019/08/12, 3:33 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\AQ_TMDL_FishMonitoring_2019_CCMRP_ES-3.mxd

ANCHOR QEA

Figure ES-3
Proposed Fish Tissue Compliance Monitoring Locations
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters

Water

In situ water quality will be measured and water samples will be collected three times annually, two during wet weather events and one during a dry weather event at one station within each of the 12 water quality groups. The first large storm of the season will be targeted as one of the two wet weather events and will have a predicted rainfall of at least 0.25 inch (0.64 centimeter) with a 70% probability of rainfall at least 24 hours prior to the event start time. In situ measurements include temperature, dissolved oxygen, pH and salinity. Water samples will be collected and submitted for the following parameters:

- Total suspended solids
- Dissolved and total metals
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- Polychlorinated biphenyl (PCB) congeners

Flow will not be measured in receiving waters, because mixing and other hydrodynamic factors will confound the flow measurements.

Sediment

Sediment monitoring will be performed twice every 5 years at each of the 22 stations. Surface sediment grabs will be collected and submitted for chemistry, toxicity, and benthic community analyses in accordance with the Sediment Quality Objectives (SQO) Part I sediment triad assessment. Sediment chemistry analyses will include the following parameters:

- Total organic carbon
- Grain size
- Metals
- Polycyclic aromatic hydrocarbons (PAHs)
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- PCB congeners

SQO sediment line of evidence (LOE) toxicity analyses will include an acute amphipod[1] survival test and the chronic, sub-lethal sediment-water interface test using the bivalve, *Mytilus galloprovincialis*. Benthic community analyses will be conducted and benthic community condition will be measured using four indices: IBI, RBI, BRI, and RIVPACS.

---

[1] Acceptable test species in accordance with SQO guidance (Bay et al. 2014) include *Eohaustorius estuarius*, *Leptocheirus plumulosus*, or *Rhepoxynius abronius*.

Tissue

Fish tissue samples will be collected twice every 5 years (coordinated with sediment monitoring events) at only four stations: one in Consolidated Slip, one in Los Angeles Outer Harbor, one in Long Beach Outer Harbor, and one in (eastern) San Pedro Bay. Composite samples of three fish species (white croaker [*Genyonemus lineatus*], California halibut [*Paralichthys californicus*], and shiner surfperch [*Cymatogaster aggregate*]) will be collected at all stations, with the exception of Consolidated Slip; only white croaker will be collected at this station. Fish tissue samples will be submitted for the following parameters:

- Percent lipids
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- PCB congeners

1 Problem Definition and Background (Element A5)

1.1 Introduction

The *Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters* (Harbor Toxics TMDL) became effective on March 23, 2012. The requirements of the Harbor Toxics TMDL are specified in Attachment A to Resolution No. R11-008, Amendment to the Water Quality Control Plan – Los Angeles Region (RWQCB 2011). The Harbor Toxics TMDL was promulgated to protect and restore fish tissue, water, and sediment quality in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (including Consolidated Slip) (Greater Harbor Waters).

1.2 Background

Section 303 (d)(1)(A) of the Clean Water Act (CWA) requires states to identify waterbodies within its boundaries for which effluent limitations are not stringent enough to implement water quality standards applicable to those waters. This list of impaired waterbodies is commonly referred to as the Section 303(d) list. Subsequently, in accordance with Section 303 (d)(1)(C), states are required to develop a Total Maximum Daily Load (TMDL) for pollutants not meeting the effluent limitations and at a level necessary to implement the established water quality standards. A TMDL represents the maximum amount of a pollutant a waterbody can receive and still meet water quality standards.

The 2010 California 303(d) List of Water Quality Limited Segments identified Los Angeles Harbor—including Inner Cabrillo Beach, Cabrillo Marina, Consolidated Slip, Fish Harbor, Inner Harbor, Outer Harbor, San Pedro Bay, and Los Angeles River Estuary—as water segments where standards are not met and a TMDL is required. One or more pollutants or endpoints for each waterbody were listed as the cause of impairment for these waterbodies that comprise the Greater Harbor Waters (Table 1).

1.3 Harbor Toxics Total Maximum Daily Load

To protect marine life and minimize human health risks due to the consumption of fish, the Harbor Toxics TMDL includes annual contaminant limits in surface sediment, stormwater effluent, and fish tissues in the Greater Harbor Waters. These limits are defined as target loads or concentrations for compliance with the Harbor Toxics TMDL. The intent of a TMDL is to: 1) determine the quantity of contaminants a system can assimilate while protecting water quality; 2) determine all inputs of contaminants to the system and linkages of inputs to impairments; and 3) allocate reductions to each source to bring the waterbody into compliance with established criteria for the protection of beneficial uses related to water quality.

1.3.1 Numeric Targets

Applicable water quality objectives for the Harbor Toxics TMDL are narrative objectives for chemical constituents, bioaccumulation, and toxicity in the Basin Plan and the numeric water quality criteria promulgated in 40 Code of Federal Regulations 131.38 (the California Toxics Rule [CTR]). In addition, sediment condition objectives were determined using sediment quality guidelines and the State Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (Sediment Quality Objectives [SQO] Part 1).

Water targets were determined by the Basin Plan and the CTR.

Sediment targets were determined by the narrative standards of the Basin Plan, the SQO, and sediment quality guidelines recommend in Long et al. (1998) and MacDonald et al. (2000). The Harbor Toxics TMDL anticipates that revisions to specific sediment quality targets may be determined by development of site-specific sediment quality values (SQVs).

Fish tissue targets were determined from Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: chlordane, DDTs, dieldrin, methylmercury, polychlorinated biphenyls (PCBs), selenium, and toxaphene, developed by Office of Environmental Health Hazard Assessment (OEHHA; 2008) to assist agencies in developing fish tissue-based criteria for pollution mitigation or elimination and to protect humans from consumption of contaminated fish.

1.3.2 Interim and Final Waste Load Allocations and Load Allocations

Final waste load allocations (WLAs) are assigned to stormwater dischargers (i.e., Municipal Separate Storm Sewer System [MS4], California Department of Transportation [Caltrans], general construction, and general industrial dischargers) and other National Pollutant Discharge Elimination System (NPDES) dischargers. Final load allocations (LAs) are assigned to direct atmospheric deposition and bed sediments in both wet and dry weather. Mass-based allocations have been set where sufficient data were available to calculate mass-based allocations; otherwise, concentration-based allocations have been set.

The following interim and final allocations are listed in Attachment A to Resolution No. R11-008, Amendment to the Water Quality Control Plan – Los Angeles Region (RWQCB 2011):

- Interim concentration-based allocation for sediment in Dominguez Channel Estuary and Greater Harbor Waters
- Final concentration-based WLAs for receiving water in Dominguez Channel Estuary and Greater Harbor Waters
- Final mass-based WLAs and LAs for Dominguez Channel Estuary and Greater Harbor Waters
- Final concentration-based sediment WLAs for metals in Dominguez Channel Estuary, Consolidated Slip, and Fish Harbor
- Final mass-based WLAs and LAs for bioaccumulative compounds in fish tissue for Dominguez Channel Estuary and Greater Harbor Waters

1.4 Compliance Measures

The Harbor Toxics TMDL WLAs in the Greater Harbor waterbodies limit sediment bound pollutant loadings from upstream and on-land sources. In addition, the Harbor Toxics TMDL set LAs in the Greater Harbor waterbodies to limit concentrations in bedded sediments believed to impact marine benthos (direct effects) and fish tissue (indirect effects). Mass-based limits for chemical constituents are provided in Tables 2 and 3.

Water quality currently meets water quality objectives for beneficial use. However, monitoring is required to confirm no degradation is occurring. Water column concentrations will be compared to CTR values.

Compliance with sediments may be demonstrated via any one of three different means:

1. Final sediment allocations, as presented in Attachment A to Resolution No. R11-008, Amendment to the Water Quality Control Plan – Los Angeles Region (RWQCB 2011), are met.
2. The qualitative sediment condition of Unimpacted or Likely Unimpacted via the interpretation and integration of multiple lines of evidence (MLOE) as defined in the SQO Part 1, is met, with the exception of chromium, which is not included in the SQO Part 1.
3. Sediment numeric targets are met in bed sediments over a 3-year averaging period.

Compliance with the fish tissues may be demonstrated via any of four different means:

1. Fish tissue targets are met in species resident to the Harbor Toxics TMDL waterbodies.
2. Final sediment allocations, as presented in Attachment A to Resolution No. R11-008, Amendment to the Water Quality Control Plan – Los Angeles Region (RWQCB 2011), are met.
3. Sediment numeric targets to protect fish tissue are met in bed sediment over a 3-year averaging period.
4. The sediment quality condition protective of fish tissue is achieved per the Statewide Enclosed Bays and Estuaries Plan, as amended to address contaminants in resident finfish and wildlife.

1.5 Reporting Requirements

The Harbor Toxics TMDL identifies specific reporting requirements for compliance. The Coordinated Compliance, Monitoring, and Reporting Plan (CCMRP) will be provided to the Los Angeles Regional Water Quality Control Board's (RWQCB's) Executive Officer for approval within 20 months after the effective date of the Harbor Toxics TMDL. A data summary report will be submitted to the RWQCB within 15 months after monitoring starts and annually thereafter. The Harbor Toxics TMDL further specifies that monitoring and reporting plans shall include a requirement that the responsible parties report compliance and non-compliance with WLA and LAs as part of annual reports submitted to the RWQCB. The evaluation of compliance with WLAs is not applicable to a receiving water monitoring program and will be included in MS4 programs. The Harbor Toxics TMDL permits multiple means for demonstrating compliance with sediment and fish tissue TMDLs. Therefore, the report will include the following data summaries:

- Water quality compared to applicable water quality criteria (e.g., CTR values)
- Sediment quality compared to effects range low (ERL), effects range median (ERM), sediment-associated fish contamination goals (FCGs) values, and a qualitative sediment condition defined by the Statewide Enclosed Bays and Estuaries Plan
- Fish tissue concentrations compared to FCG values

1.6 Programmatic Quality Assurance Project Plan

The Programmatic Quality Assurance Project Plan (PQAPP; Anchor QEA 2013) 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 the specific roles and responsibilities of data collectors and data managers and describes the process through which field and analytical data will be processed, reduced, and stored in an EQuIS database by the managing consultant.
- **Field Sampling Data Quality Objectives (DQOs)**. This section includes detailed information on field collection requirements including sample processing, sample handling, sample identification, sample custody and shipping requirements, field quality control (QC) sample requirements with associated performance criteria, field records, and field electronic data deliverable (EDD) requirements.
- **Laboratory DQOs**. 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 the procedures used to ensure the project DQOs are met.

The PQAPP was designed to be programmatic in nature and not targeted at one study, given the plans for both compliance monitoring and a variety of other Harbor Toxics TMDL-related sampling and analysis activities over the next 5 years. Consequently, while the PQAPP complies with 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 (SWRCB 2017) guidance. This format was not possible because not all special studies have been designed or contractors determined. Instead, the PQAPP states that elements of the SWAMP QAPP guidance document relating to project-specific field collection requirements should be included in the CCMRP or any subsequent Sampling and Analysis Plans (SAPs) developed to support Harbor Toxics TMDL-related studies. The benefit of the programmatic approach outlined in the PQAPP is that there will be a uniform data collection and management program for all Harbor Toxics TMDL-related studies that provides high-quality data and efficiencies due to standardization of sample collection, nomenclature, analysis, data review/validation, processing, storage, management, and seamless data export to the Regional Monitoring Coalition (RMC) and State databases, regardless of study type or contractors performing the work.

This CCMRP has been designed accordingly to incorporate relevant PQAPP elements in addition to supplemental information specific to the compliance monitoring program in order to develop a single, all-inclusive, monitoring plan compatible with SWAMP QAPP requirements.

1.7 Coordinated Compliance and Monitoring Reporting Plan

The Harbor Toxics TMDL requires monitoring activities by the responsible parties in three waterbody areas:

1. Dominguez Channel, Torrance Lateral, and Dominguez Channel Estuary
2. Greater Los Angeles and Long Beach Harbor Waters (including Consolidated Slip)
3. Los Angeles River and San Gabriel River

The Harbor Toxics TMDL also states that the RWQCB Executive Officer may reduce, increase, or modify monitoring and reporting requirements, as necessary, based on the results of the TMDL monitoring program. This revision (August 2019) incorporates modifications to the compliance monitoring and reporting program based on findings from the initial 5 years of monitoring. Proposed modifications to the program are documented in two technical memoranda to the RWQCB dated April 2, 2019, and July 9, 2019 (Appendix D).

The CCMRP outlines the monitoring activities to be conducted by the cooperating parties for the Greater Harbor Waters. To be consistent with and potentially collaborate with other regional monitoring programs, the sample collection methods prescribed within this CCMRP are to be conducted in accordance with methods established for use during Bight- or SWAMP-compatible programs. Compliance monitoring and reporting activities must also be conducted in accordance with the PQAPP developed for the Harbor Toxics TMDL to ensure usability and provide benefits with other Harbor Toxics TMDL-related programs and studies.

1.8 Objectives

The goal of this document is to develop an approach to Harbor Toxics TMDL-required compliance monitoring and reporting elements that will be approved by the RWQCB and considers all aspects of sample collection and handling, analysis, data evaluation, validation and management, quality assurance (QA)/QC, and reporting.

This document fulfills the Harbor Toxics TMDL requirement for the development of a Compliance Monitoring and Reporting Plan that incorporates all elements of SWAMP-compatible QAPPs.

1.9 Integration with Other Monitoring Programs

In 2012, the RWQCB adopted Order No. R4-2012-0175 (NPDES Permit No. CAS004001), *Waste Discharge Requirements for Municipal Separate Storm Sewer Systems (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4* (Order). The Order includes requirements that are consistent with and implement WLAs and monitoring requirements that are assigned to discharges from the Los Angeles County MS4 for established TMDLs. Each individual named Permittee of the Order is responsible for discharges from the MS4 for which they are owners and/or operators. For comingled discharges, compliance is determined from the group of Permittees. Individual Permittees are responsible for the determination of compliance with effluent limits.

The provisions included within the Order allow for coordination of integrated monitoring programs for the alignment and efficient implementation of monitoring requirements with Harbor Toxics TMDL monitoring requirements. For example, the Order specifies that receiving water monitoring will be conducted at Harbor Toxics TMDL compliance monitoring stations. However, it should be emphasized that participation in the RMC for the Greater Harbor Waters does not supersede the requirements of the Order, and each RMC responsible party is individually responsible for ensuring requirements of the Order are met.

2 Project Task and Organization (Element A4)

2.1 Responsible Parties

The Harbor Toxics TMDL names the following responsible parties for the Greater Harbor Waters:

- Greater Harbor Waters MS4 Permittees
  - Caltrans
  - City of Bellflower
  - City of Lakewood
  - City of Long Beach
  - City of Los Angeles
  - City of Paramount
  - City of Signal Hill
  - City of Rolling Hills
  - City of Rolling Hills Estates
  - Rancho Palos Verdes
  - Los Angeles County
  - Los Angeles County Flood Control District
- City of Long Beach (including the Port of Long Beach)
- City of Los Angeles (including the Port Los Angeles)
- California State Lands Commission
- Individual and General Stormwater Permit Enrollees
- Other Non-Stormwater Permittees, including City of Los Angeles' Terminal Island Water Reclamation Plant (TIWRP)

The Los Angeles River Estuary responsible parties subgroup includes the following entities:

- Caltrans
- City of Long Beach
- City of Los Angeles
- City of Signal Hill
- Los Angeles County
- Los Angeles County Flood Control District

The Consolidated Slip responsible parties subgroup includes the following entities:

- City of Los Angeles
- Los Angeles County
- Los Angeles County Flood Control District

The Harbor Toxics TMDL encourages collaboration and coordination of monitoring efforts amongst the responsible parties to avoid duplication and reduce associated monitoring costs.

2.2 Roles and Responsibilities

The specific roles and responsibilities of project managers, data managers, and laboratory project managers are shown in Figure 1. A list of names and responsible parties and their respective roles will be provided to the RMC in letter format. The list will be updated as necessary during the course of the project.

2.2.1 Project Managers

The RMC's Chairperson *will be responsible for project administration and will serve as the lead contact for Harbor Toxics TMDL compliance monitoring and related special studies. The* RMC Chairperson *will also serve as the point of contact between the RMC and the consulting team and will manage all project activities.*

The managing consultant's Harbor Toxics *TMDL study project manager will be responsible for:*

- *Managing the overall* Harbor Toxics *TMDL program*
- *Ensuring the project and the* RMC's *objectives are met throughout the conduct of project activities*
- *Coordinating internal communications with the* RMC, *the* RMC *contractors, managing consultant's data manager and QA manager*
- *Overseeing all project deliverables*
- *Performing the administrative tasks needed to ensure timely and successful completion of the* Harbor Toxics *TMDL program studies*
- *Resolution of project concerns or conflicts related to technical matters*

For each compliance monitoring event or special study, the RMC will select a contractor to be the special study/monitoring 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 RMC*
- *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 the PQAPP and CCMRP, and study reporting*

2.2.2 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/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 16.1 of this CCMRP.

2.2.3 Laboratory Project Managers

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

The 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 the analytical methods described in this CCMRP*
- *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* Section 16
- *Meeting turnaround times for deliverables*

2.2.4 Data Managers

The managing consultant's QA manager *will provide QA oversight for field sampling and laboratory programs associated with the Harbor Toxics TMDL study, ensuring that samples are collected and documented appropriately, coordinating with selected analytical laboratories, ensuring data quality, overseeing data validation, and supervising project QA coordination.*

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

The managing consultant's *designated data validator will be responsible for verifying and validating all analytical data and submitting assigned data qualifiers to the database manager.*

3 Project Task Description (Element A6)

3.1 Summary of Monitoring Plan

The project area is a dynamic system. First and foremost, the project area contains the busiest container Port complex in the United States (Journal of Commerce 2012). The project area is defined by numerous channels, slips, and marinas throughout the Inner Harbors and relatively open water in the Outer Harbors. Three major rivers and drainage channels, the Los Angeles River, Dominguez Channel, and San Gabriel River, discharge to the project area. Storm events are infrequent, but during the winter months stormwater discharges from surrounding watersheds are substantial. Therefore, natural variability, both temporal and spatial, must be considered when designing and evaluating a monitoring program. This monitoring program is appropriately designed to address these concerns by conducting frequently recurring monitoring events during both summer and winter seasons and at multiple stations throughout the project area.

The monitoring program consists of the collection of water, sediment, and tissue samples. Water will be collected during multiple events, both dry and wet weather, annually. Sediment and fish tissue samples will be collected every 2 to 3 years to assess sediment quality per SQO Part 1 (Bay et al. 2014) and fish tissue quality, respectively.

3.2 Project Schedule

Compliance Monitoring and Reporting Plans will be submitted 20 months after the effective date of the Harbor Toxics TMDL for RWQCB Executive Officer approval. Monitoring will begin 6 months after the monitoring plan is approved by the Executive Officer and continue annually until the Executive Officer has determined no additional monitoring is necessary (i.e., compliance has been achieved) or an amended program is appropriate. Annual monitoring reports will be submitted. A summary of the field schedule projected on a 10-year recurring timeline is presented in Table 4. Adaptions will be made as necessary through the course of the project.

3.3 Deliverables

The PQAPP, along with this CCMRP, are the first deliverables to the RWQCB. Once approved and monitoring is initiated, monitoring reports will be submitted to the RWQCB annually. The first report is due 15 months after monitoring begins, and subsequent reports will be submitted annually thereafter. A schedule of reports due to the RWQCB is presented in Table 5.

Annual monitoring reports will include a description of monitoring activities conducted for a given year; a summary table of water, sediment, and tissue analytical results; a data validation report; a summary of any deviations from the proposed sampling program; and associated QA/QC issues, including any action/response activities. As prescribed, the annual monitoring reports will provide a statement assessing whether or not monitoring results indicate compliance or non-compliance with WLAs and LAs.

4 Sampling Process and Design (Element B01)

4.1 Station Locations

The Harbor Toxics TMDL Basin Plan Amendment (RWQCB and USEPA 2011) defines 22 waterbody areas for monitoring water and sediment quality and four monitoring locations for fish tissue sampling. The following subsections describe how water, sediment, and fish tissue sample locations will be selected.

4.1.1 Water Quality

The station locations for water sample collections are presented in Figure 2. Beginning in August 2019, water samples will be collected at one station within each of the 12 water quality groups. Stations will be selected from the 22 Harbor Toxics TMDL-specified station locations that occur within each water quality group. To ensure each of the Harbor Toxics TMDL-specified stations within a group is equally represented, stations will be selected on a rotating basis per event and per event type. For example, Group 5 includes three stations (Stations 8, 9, and 11). Station 8 will be selected first (corresponding with the 2019/20 monitoring year's dry event), Station 9 will be selected second (corresponding with the 2019/20 monitoring year's first flush wet weather event), and Station 11 will be selected third (corresponding with the 2019/20 monitoring year's second wet weather event). In the subsequent monitoring year (2020/21), Station 9 will be selected first, then Station 11, and then Station 8. This process will continue until each station in each group has been sampled for each event type and then repeat itself (Table 6). Because the Greater Los Angeles and Long Beach Harbors Responsible Parties propose a coordinated monitoring effort, water quality stations were located in receiving waters at a point that suitably represents the combined discharge of cooperating parties. Detailed station location information is presented in Table 7.

Actual locations will be within 15 meters of the proposed sampling station. If a station cannot be sampled, the sampling site will be moved to a location within 100 meters horizontal distance from the original site, staying within plus or minus 10% of the depth of the original station.

4.1.2 Sediment Samples

For monitoring years that do not coincide with the Bight program, a randomly selected station location will be determined for each of the 22 Harbor Toxics TMDL-specified sampling areas (Figure 3). Methods used to randomly select station locations will be similar to those used by Southern California Coastal Water Research Project (SCCWRP) for random selection of stations within the Bight Program. If necessary, a subset of the compliance monitoring stations may be strategically placed at a previously sampled location to confirm results of Bight Program or other program SQO results. Locations of all sediment sampling stations and the justification for their selection will be provided to the RWQCB for approval prior to conducting each monitoring event.

In years when sampling for the sediment quality component of the compliance monitoring program aligns with the Southern California Bight Regional Monitoring Program (Bight Program), station locations will be modified in order to meet the Bight Program's requirement that station locations representing different strata (bay, port, marina, and estuary) be selected randomly. Therefore, Bight Program stations that are located within the same waterbody segment (e.g., turning basin and channel) as the Harbor Toxics TMDL-specified station locations will be considered representative of the Harbor Toxics TMDL-specified station location. If a randomly selected Bight Program station does not fall within each of the 22 specified sampling areas in years when sediment monitoring events are coordinated with the Bight Program, then a sediment sampling station will be drawn randomly for each of these areas not containing a Bight Program station.

Actual locations will be within 15 meters of the proposed sampling station. If a station cannot be sampled, the sampling site will be moved to a location within a 100-meter horizontal distance from the original site, staying within plus or minus 10% of the depth of the original station.

Prior to each sediment sampling event, it is anticipated that correspondence with the RWQCB will be required to confirm the location of sediment sampling stations for two reasons:

1. The Bight Program randomly selects stations locations, and confirmation with the RWQCB regarding whether a Bight Program station is representative of a Harbor Toxics TMDL-specified station will be required.
2. In non-Bight Program years, sediment sampling locations will be determined using random sample selection methods that are similar to those used by SCCWRP for selecting Bight Program stations. Locations will be provided to the RWQCB for approval prior to the event.

4.1.3 Fish Tissue

In accordance with the requirements of the Harbor Toxics TMDL (RWQCB 2011), fish tissue monitoring must be conducted in the following four waterbodies: Consolidated Slip, Port of Angeles, Port of Long Beach, and (Eastern) San Pedro Bay (Figure 4). The proposed target sampling areas were designed to address two concerns raised by stakeholders during the public review period for this TMDL: 1) popular fishing areas for local anglers; and 2) known contaminated sites. To address the stakeholder concerns about popular fishing areas, three proposed target sampling areas will be monitored: 1) Cabrillo Pier in Los Angeles Outer Harbor; 2) Pier J in Eastern San Pedro Bay; and 3) Outer Long Beach Harbor shallow water habitat. Cabrillo Pier and Pier J are well-known, popular fishing spots for local anglers, according to the Fish Contamination Education Collaborative (FCEC), a regional educational outreach program whose purpose is to protect vulnerable populations from the risks associated with fish consumption (FCEC 2013). Due to its popularity, Cabrillo Pier was also included in the 1992 regional seafood consumption study (SCCWRP and MBC 1994). There are no public fishing piers in Outer Long Beach Harbor; however, the Outer Long Beach Harbor shallow water habitat located east of Pier 400 is recommended for fish collection due to the higher diversity and abundance of benthic organisms and fishes in this area, as compared to those in the deep water habitat of the Outer Long Beach Harbor waterbody (SAIC 2010). In addition, this area has been recommended by experienced anglers for the collection of the target fish species listed in Section 5.3.1 (Nielson 2013). To address the stakeholder concerns about known contaminated sites, Consolidated Slip, specified as a target fish sampling location in the Harbor Toxics TMDL, will be monitored.

This CCMRP does not specify exact locations (i.e., geographic coordinates) for fish collection by trawling or other methods. Instead, guidelines have been established that allow for some flexibility in selecting the most appropriate fish collection area within each waterbody to improve the chances for success of the fish monitoring program.

Specifically, the following guidelines will be followed for the collection of fish within the four waterbodies specified in the TMDL:

1. Fish collection should be targeted as close to the following four areas as practicable, while accounting for limitations in the sampling vessel due to size and draft, and the type of equipment (e.g., trawl and seine) necessary for fish collection:
    - Cabrillo Pier (Los Angeles Outer Harbor)
    - Long Beach Outer Harbor breakwater (inside), midway between Angel’s Gate and Queen’s Gate
    - Pier J ([Eastern] San Pedro Bay)
    - Consolidated Slip
2. Every effort should be taken to ensure than any particular trawl track (or alternative fish sampling technique) occurs within the proposed target sampling areas. However, it is recognized that 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 outside the boundaries of the target sampling areas.
3. If extensive efforts have been made and insufficient fish have been caught at the target 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 still within the waterbody specified in the Harbor Toxics TMDL (i.e., Los Angeles Outer Harbor, Long Beach Outer Harbor, [Eastern] San Pedro Bay, and Consolidated Slip). The field crew will note the reasons for relocation in the field log, and fish collection efforts will be attempted at the secondary location.

It is recognized that fish tissue sampling will also be important in waterbodies other than those prescribed by the TMDL (e.g., Fish Harbor, Inner Los Angeles Harbor, and Inner Long Beach Harbor) to better understand the linkages between sediment contaminants and fish tissue contaminant concentrations in these waterbodies and throughout the entire Harbor. Fish tissue sampling in waterbodies not specified in the TMDL will be conducted as part of special studies that will be designed to address sediment-fish linkages, characterize the food web structure of the target fish species, support the development of a site-specific Harbor bioaccumulation model, and, ultimately, determine compliance with the TMDL.

4.2 Field Samples

A summary of water, sediment, and fish tissue samples to be collected at each station is presented in Table 8. A schedule for data collection and the type and number of samples by matrix to be collected over the 20-year project is provided in Table 4.

4.2.1 Water

Water quality measurements and samples will be collected at two depths during wet and dry weather events (surface and bottom). Surface samples are defined as those collected between 0 and 1 meter below the water surface. Bottom samples are defined as those collected within 1 meter above the mudline.

4.2.2 Sediment

Surface sediment samples will be collected at each of the 22 randomly selected station locations (or approved, alternative Bight Program locations).

4.2.3 Fish

The Harbor Toxics TMDL requires the collection of three different fish species: white croaker (*Genyonemus lineatus*), a sport fish, and a prey fish. White croaker was likely selected as a target species for the TMDL compliance monitoring program for numerous reasons. A regional fish consumption study (SCCWRP and MBC 1994) demonstrated that white croaker was caught off Cabrillo Pier and the Cabrillo Beach Boat Ramp in Los Angeles/Long Beach Harbor and consumed by some recreational anglers. The health advisory and safe eating guidelines developed by the Office of Environmental Health Hazard Assessment (OEHHA; 2009) suggest that white croaker caught from Ventura to San Mateo Point should not be eaten (regardless of age or gender); these guidelines are based on elevated concentrations of PCBs and DDTs in croaker fillets, which have historically been above fish consumption advisory tissue levels. White croaker is found in nearshore habitats and is a bottom-dwelling species that primarily feeds on benthic organisms including polychaetes and clams. Consequently, it is likely that white croaker is indirectly exposed to sediment contaminants through the consumption of benthic organisms (Moore 1999). This species is also a preferred target species for monitoring because they are abundant throughout Los Angeles/Long Beach Harbor and easy to catch, as demonstrated by the Biological Baseline studies conducted in 1988, 2000, and 2008 (MEC 1988, 2002; SAIC 2010).

The selection of a sport fish species for compliance monitoring was based on similar rationale as to what is described above for white croaker. For the selection of sport fish, the following considerations were evaluated:

- The sport fish selected should be one that is fished in the Harbor and consumed, based on the SCCWRP and MBC Applied Environmental Sciences regional fish consumption survey (SCCWRP and MBC 1994).
- The sport fish selected should be one for which there is a fish consumption advisory (OEHHA 2009), or the sport fish selected should be one that has been shown to have elevated concentrations of PCBs and DDTs in muscle tissue.
- The sport fish selected should be abundant in the Los Angeles/Long Beach Harbor.

Based on these considerations, California halibut (*Paralichthys californicus*) was selected as the sport fish for the monitoring program. The SCCWRP and MBC (1994) fish consumption survey demonstrated that this species was caught and consumed by anglers in Los Angeles/Long Beach Harbor (i.e., Cabrillo Pier and Cabrillo Beach Boat Ramp). OEHHA (2009) recommends reduced servings of halibut caught in the Los Angeles/Long Beach Harbor region, and concentrations of PCBs and DDTs have been elevated in some halibut caught within the Harbor. Biological baseline studies in 2000 and 2008 demonstrated that California halibut is abundant throughout the Harbor (MEC 2002; SAIC 2010). In addition, this species has been selected because it is being studied as part of other TMDL-related special studies being conducted to support Phase II and III TMDL implementation efforts. Specifically, a fish movement study using both white croaker and California halibut will be initiated in June 2013 to understand the movement of these species and their exposure to Harbor sediments. Halibut was chosen over other fish species for the fish movement study because juveniles and adults caught in the Harbor have large body cavities and adequate body size and are sturdy enough to be used in a fish movement (i.e., tracking) study, which involves the use of electronic fish tagging devices. While species such as barred sand bass and queenfish meet the considerations for monitoring, they are not appropriate for use in the fish movement study (i.e., barred sand bass caught in the Harbor are typically too small for tagging and queenfish body cavities are too small for tagging). Consequently, the use of California halibut in the monitoring program will maximize the usefulness of fish tissue data collected as part of both TMDL programs.

A similar selection process was used to determine the most appropriate prey fish for TMDL monitoring. For the selection of prey fish, the following considerations were evaluated:

- The prey fish selected should be a species that is a prey item or a representative prey item of white croaker and the sport fish selected for monitoring.
- The prey fish selected should be one for which there is a fish consumption advisory (OEHHA 2009) or the prey fish selected should be one that has been shown to have elevated concentrations of PCBs and DDTs.

- The prey fish selected should be one that is abundant in the Los Angeles/Long Beach Harbor. The size of abundant prey fishes should also be considered.

Based on these considerations, shiner surfperch (*Cymatogaster aggregate*) was selected as the prey fish for the monitoring program. In California, white croaker has been shown to consume small fishes (e.g., anchovies) in addition to a wide variety of other organisms, such as worms, shrimps, crabs, squid, clams, and other items, living or dead (CDFG 2001, 2002). In contrast to white croaker, the California halibut diet is primarily composed of small fishes. Halibut have been shown to prey upon Pacific sardines (*Sardinops sagax caerulea*), white croaker, Northern anchovy (*Engraulis mordax*), atherinids (e.g., topsmelt [*Atherinops affinis*]) and surfperches (including shiner surfperch [*Cymatogaster aggregate*] and walleye surfperch [*Hyperprosopon argenteum*]), in addition to some invertebrates (Allen 1990; CDFG 2002; CDFW 2013a). Two of the prey fishes listed above are on OEHHA's list for reduced consumption or no consumption (OEHHA 2009): surfperches and topsmelt, respectively. Both surfperches and topsmelt have been shown to be abundant prey fishes in the Los Angeles/Long Beach Harbor (SAIC 2010). However, the most abundant size classes of shiner surfperch (4 to 6 centimeters [cm]) were smaller than those of topsmelt (6 to 8 cm; SAIC 2010). Consequently, shiner surfperch was selected as the prey fish for the monitoring program because the most abundant white croaker size classes in the Los Angeles/Long Beach Harbor (16 to 20 cm) were more likely to prey upon the smaller shiner surfperch than the larger topsmelt due to the ease of catching smaller prey fish. In addition, shiner surfperch is representative of important prey fish because their diets are similar to topsmelt; both species have been shown to feed on zooplankton, algae, amphipods, polychaetes, and gastropods (Odenweller 1975; Sempier 2013; UC 2013).

4.2.3.1 Alternate Species Considerations

As stated above, target species include white croaker, California halibut, and shiner surfperch. However, preliminary data from the Ports of Long Beach and Los Angeles Biological Baseline Study (Ports 2013) indicated that shiner surfperch may not be present within the compliance monitoring areas in adequate abundances for tissue analysis. The Biological Baseline Study did capture moderate numbers of California halibut; however, due to the highly mobile nature of this sport fish, it should be recognized that this species may be difficult to capture in the specific areas targeted for the compliance monitoring program.

4.2.3.1.1 Alternate Sport Fish Species

In the event that California halibut cannot be successfully captured from the target waterbodies, acceptable alternate species should be retained for potential analyses. These species include barred sand bass (*Paralabrax nebulifer*) and California lizardfish (*Synodus lucioceps*). These species have been selected as alternative sport fish for California halibut because they also meet the considerations listed above, with one exception. California lizardfish are not on the OEHHA consumption advisory list (OEHHA 2009); however, given the abundance noted in the Biological Baseline Study (Ports 2013) and the similarity in consumed prey and feeding mode compared with California halibut, this species is a suitable surrogate.

4.2.3.1.2 Alternate Prey Fish Species

In the event that shiner surfperch cannot be successfully captured from the target waterbodies, acceptable alternate species should be retained for potential analyses. These species include white surfperch (*Phanerodon furcatus*), topsmelt, and Northern anchovy. These species have been selected as alternative prey fish for shiner surfperch because they also meet the considerations listed above, with one exception. Northern anchovy are not on the OEHHA consumption advisory list (OEHHA 2009); however, given its abundance noted in the Biological Baseline Study (Ports 2013) and the similarity in consumed prey and feeding mode compared with shiner surfperch, this species is a suitable surrogate.

4.3 Sample Frequency

The proposed frequency for water, sediment, and tissue monitoring events is presented in Table 4.

4.3.1 Water

Water samples will be collected during two wet weather events and one dry weather event each year. The wet weather events will be targeted 24 hours after a storm event occurring between October 1 and April 30. This 24-hour period provides time for Permittees to monitor stormwater outfalls and allows runoff from the watershed to reach the receiving waters. In addition, for health and safety purposes, allowing 24 hours to pass before launching vessels and conducting sampling improves the likelihood of sampling in less dangerous conditions than those present at the start of a storm. The first storm of the season will be targeted. The first storm is defined as having a predicted rainfall of at least 0.25 inch (0.64 cm) and a 70% probability of rainfall at least 24 hours prior to the event start time. Defining a storm event as having a predicted rainfall of at least 0.25 inch (0.64 cm) is consistent with the Los Angeles County Department of Public Works' trigger for monitoring mass emission stations of 0.25 inch (0.64 cm) rainfall received within a 24-hour period. Constraining the first storm event of a season to be greater than 0.25 inch (0.64 cm) may preclude characterizing contaminants of potential concern (COPCs) if a larger storm does not occur until late in the season. For example, a study funded by Caltrans (Stenstrom and Kayhanian 2005) revealed that concentrations of COPCs declined as the wet season progressed. One additional wet weather event occurring in the same season will be sampled. Depending on the seasonal forecast (e.g., drought vs. wet years), this wet weather event will consist of a storm that produces at least 0.1 inch (0.25 cm) of precipitation per day and has an antecedent dry period (less than 0.1 inch [0.25 cm] of rain per day) of at least 72 hours, but consideration will be given to monitor larger storm events (0.5 inch [1.28 cm] or greater) if forecasted. The dry weather event may be conducted at any time of the year but only after an antecedent dry period of at least 72 hours has passed since the last rainfall event. Although unlikely, the lack of storm events, especially during drought years, may constrain the ability to successfully monitor wet weather.

4.3.2 Sediment

SQO Part 1 (sediment triad sampling) will be performed twice every 5 years. Sediment will be sampled in Year 1 and Year 4, and this cycle will repeat every 5 years. This schedule guarantees no single sediment sampling event is greater than 3 years from the previous effort. The schedule outlined in Table 4 illustrates this approach. The proposed sediment sampling approach will be conducted in the same years as the Southern California Regional Bight Monitoring Program, assuming that program maintains the current frequency of once every 5 years.

In accordance with the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014), sediment triad sampling will be conducted between July 1 and September 30. Benthic assemblages change with season, light, and temperature. The manual recommends sampling during a specific time of year for consistency and comparability of data. The greatest organism abundances and diversities are typically observed in the summer months. Due to the increased data available in summer months, this time frame was selected to provide the best representation of benthic community health. No other time or resource constraints are anticipated for the collection of sediment samples.

4.3.3 Fish Tissue

Starting in August 2019, fish tissue samples will be collected twice every 5 years, in coordination with sediment sampling events. In accordance with the Bight Field Operations Manual (BFSLC 2018), fish tissue collection efforts will be conducted between July 1 and September 30. Fish are more robust in the summer, as their food is more abundant during this time. Thus, they have the potential to bioaccumulate more contaminants during the summer. This time frame was selected as a conservative approach to provide data reflective of the maximum levels of bioaccumulatives present in fish tissues for the given sampling year. No other time or resource constraints are anticipated for the collection of fish tissue samples.

4.4 Station and Sample Identification

Each station identification code will be unique and be maintained throughout the duration of compliance monitoring activities. The station identification codes are consistent with the station numbers listed in Sediment Chemistry Monitoring Requirements table of the Harbor Toxics TMDL Basin Plan Amendment (RWQCB and USEPA 2011).

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 (sample identification code)*
- *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 9. *The identification codes shown below should be used when applicable; however, sample identification code 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*
- *Media or sampling method code*
- *Station number*
- *Organism common name, if applicable*
- *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 the end in YYYYMMDD format.

For fish tissue samples, no station number will be used. Because one station will be selected in each of the four required waterbodies, the waterbody code will be sufficient to identify fish tissue samples.

Sample nomenclature for water and sediment samples is shown in Figure 5, using the following example: a surface sediment grab at 0-5 cm, station number 09 from Outer Harbor – Los Angeles on July 31, 2019, would be written as:

OA-SS-09-0-5-20190731

Sample nomenclature for tissue samples is shown in Figure 6, using the following example: *a white croaker, fish fillet skin off, from Outer Harbor – Long Beach on July 31, 2019* would be written as:

OB-FF-WC-20190731

Sample nomenclature for field duplicates is shown in Figure 7, using the following example: a water sample collected at the surface, station number 09 from Outer Harbor – Los Angeles on July 31, 2019, that is a field duplicate would be written as:

OA-RW-1009-S-20190731

Sample nomenclature for equipment blanks is shown in Figure 8, using the following example: *an equipment blank of the decontaminated sample processing equipment after sample collection* on July 31, 2019, would be written as:

EB-20190731

4.5 Critical Information

Supplemental information relating to the different types of data to be collected and whether those data are considered informational or critical to the project is provided in Table 10. In general, visual observations are informational and all other data are critical.

5 Sample Collection (Element B02)

Methods adhere to Bight and SWAMP protocols. A list of field Standard Operating Procedures (SOPs) is presented in Table 11; SOPs are provided in Appendix A. Additional information regarding samplers and sample processing for each matrix is provided in Table 12. Specific information regarding chemical constituents to be analyzed, sample containers and volumes, holding times, temperatures, and preservatives is presented in Table 13.

5.1 Water

Water quality monitoring consists of in situ measurements and the collection of water samples for chemical analyses.

5.1.1 In Situ Measurements

For each sampling event and at each station, water depth and in situ[2] water quality parameters (temperature, dissolved oxygen [DO], pH, and salinity) will be collected. Water quality parameters and water depth will be recorded on a field data sheet.

The water depth at each station should be recorded using a probe or lead line. Water quality will be measured in situ at the station by immersing a multi-parameter instrument[3] into the water at the same location where the water sample is collected. The instrument must equilibrate for at least 1 minute before collecting temperature, pH, conductivity and/or salinity measurements and at least 90 seconds before collecting DO measurements. Because DO takes the longest to stabilize, record this parameter after temperature, pH, and salinity. See the SWAMP SOP for additional details on the collection of field parameters (MPSL-DFG 2007). Methods are also summarized in the SOP: In Situ Water Quality Monitoring (Appendix A). Water quality measurements will be collected at two depths during wet and dry weather events (surface and bottom).

The Harbor Toxics TMDL states that flow should also be included as a parameter to be measured. At the point of a stormwater or dry weather discharge, it is appropriate to measure for flow. In these cases, flow measurements (i.e., the volume of water discharged per unit of time from a specific discharge point) may be used to calculate suspended sediment and pollutant loadings to a receiving waterbody. In contrast, at stations within a receiving waterbody, it is not appropriate to measure flow for two primary reasons:

- Tidal and wind currents (in bays and estuaries) or flows originating from upstream sources (in rivers and channels) will cause inaccurate flow measurements of the discharge after it mixes with receiving water.

---

2 Water quality parameter measurements may be taken in the laboratory immediately following sample collection, if auto samplers are used for sample collection or if weather conditions are unsuitable for field measurements.

3 A multi-parameter instrument is preferred; however multi-parameter specific water quality meters may also be used.

- Mixing of the discharge with receiving water prevents calculations of loadings (i.e., the pollutant concentration multiplied by flow measurement) because the discharge and its suspended sediment and pollutant load are immediately diluted in the receiving water.

This CCMRP proposes to sample at locations within receiving waters. As such, flow will not be measured because mixing and other hydrodynamic factors will confound the flow measurements and loading calculations.

5.1.2 Grab Samples

Water samples will be collected from the same two depths as the in situ water quality measurements. Grab samples (i.e., instantaneous, not time or flow-weighted composites) for total suspended solids (TSS) will be taken at both depths during wet and dry weather events. Grab samples for analytical chemistry will be taken only from the surface sample. Water samples will be collected with a grab sampler (e.g., Niskin or Van Dorn) that has been decontaminated prior to sample collection at each station. Sampling methods will generally conform to U.S. Environmental Protection Agency's (USEPA's) clean sampling methodology described in the SWAMP SOP (MPSL-DFG 2007). Methods are also summarized in the SOP: Grab Water Sampling (Appendix A).

Sample processing and handling for water chemistry will be conducted in accordance with guidance developed in the Quality Assurance Management Plan for the State of California's SWAMP (Pucket 2002). Aliquots for TSS, metals, organochlorine pesticides, and PCBs will be taken directly from the grab sampler into appropriate containers or bottles (Table 32). Water samples will be preserved, depending on the type of analysis, in the field in order to meet specified holding time (Table 13). Water samples will be stored at <4°C until delivery to the appropriate analytical laboratory.

5.2 Sediment

Surface sediment samples will be collected at each station. Multiple grab samples may be required at each station in order to provide sufficient sediment volumes to complete all analyses required for the SQO Part 1 assessment (Bay et al. 2014). Sediment grabs will be evaluated for acceptance as outlined in the Bight Field Operations Manual, Section 8 (BFSLC 2018).

Surface sediment grab samples procedures will be collected using a Van Veen sampler, or similar sampling device as appropriate for the type of sediment sample being collected, as described in the Bight Field Operations Manual, Section 8 (BFSLC 2018) and summarized in the SOP: Surface Sediment Grab Sampling (Appendix A).

Sediment sample processing and handling for purposes of sediment chemical analyses, sediment toxicity, and benthic community assessment in support of the SQOs Part 1 assessment will be performed in accordance with procedures specified in the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014) and the Bight Field Operations Manual (BFSLC 2018).

Methods are also included in SOPs: Sediment Chemistry Sample Processing, Sediment Toxicity Sample Processing, and Benthic Infauna Processing (Appendix A). Recommended conditions for sampling containers and sample handling and storage are listed in Table 13. Sediment samples for chemistry and toxicity analyses will be stored at <4°C until delivery to the appropriate analytical laboratory. Benthic infauna samples will be stored in 10% buffered formalin in the short term and then subsequently transferred to 70% ethanol (or equivalent) for long-term storage.

Using similar methods as defined in Section 5.1.1, in situ water quality will be measured within 1 meter of the sediment surface prior to sediment collection to document and confirm salinity measurements are consistent with Bight Program requirements for estuarine samples.

5.3 Fish Tissue

Fish tissue samples will be collected and analyzed for chemical contaminants of concern. Sampling, processing, and testing methods will be carried out in accordance with Bight protocols (BFSLC 2018; BCEC 2009). Methods are summarized in SOPs: Fish Collection and Fish Processing (Appendix A). Necessary permits (e.g., scientific collection and incidental take) will be secured prior to fish collection. Applications and procedures for permits can be found online at the California Department of Fish and Wildlife (CDFW) website (2013b).

CDFW code section 1002 and Title 14 sections 650 and 670.7 requires a Scientific Collecting Permit to take, collect, capture, mark, or salvage, for scientific purposes, fish and invertebrates. CDFW section 2081(b) requires an Incidental Take Permit (ITP) for any species listed as threatened or endangered (T/E). Although none of the targeted species for this study are T/E species, it is possible that T/E species will be accidentally caught as bycatch. An ITP is required for T/E species that are caught or handled in any way, even if they are returned to the ocean.

In addition, the permit holders must notify the local CDFW 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. More information is available on CDFW's website (2013a).

5.3.1 Fish Collection and Processing

Composite samples of three fish species (white croaker, California halibut, and shiner surfperch) will be collected at all stations, with the exception of Consolidated Slip; only white croaker will be collected at this station. White croaker is the only species being sampled in Consolidated Slip for the following reasons:

- White croaker is more abundant in this subarea and easier to catch than California halibut or shiner perch as demonstrated in the Ports' Biological Baseline Survey from 2008 (SAIC 2010).
- The Consolidated Slip area is small and consequently has limited space available for targeted fish collection of uncommon species such as California halibut and shiner perch.

- Based on historical data, white croaker represent the fish with the highest concentrations of PCBs and other organics, and therefore, croaker is indicative of the highest human health exposure levels in relation to seafood consumption from this subarea.

When possible, fish will be collected using a semi-balloon, 7.6-meter headrope otter trawl following the methods in the Bight Field Operations Manual (BFSLC 2018). 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 (MPSL-DFG 2001). SOPs for fish collection are provided in Appendix A.

Once the catch is onboard the vessel, the targeted species will be identified and separated for subsequent processing. At each station, 12 individuals of each fish species will be collected for further processing. There is currently no legal size limit for white croaker. An ocean fish contaminant survey was performed from 2002 to 2004 (NOAA 2007). In part, this survey sought to generate information on contaminants of concern for fish caught for sustenance in Southern California. Collection of white croaker for the Harbor Toxics TMDL study should 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 (559 mm; total length) for California halibut (FGC 2012). 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 should be noted that field personnel may encounter bycatch that are potentially harmful while sorting for targeted species. The Bight Field Operations Manual (BFSLC 2018) and Fish Collection SOPs in Appendix A provide information on the safe handling of these organisms.

Each targeted fish kept will be tagged with a unique identification number; measured for total length, fork length, and weight; and examined for gross pathology in accordance with guidance established in the Bight Field Operations Manual (BFSLC 2018). Three composite samples per species per station will be created. A composite sample will comprise four individuals; therefore, a total of 12 individuals per station are required. If more than 12 specimens are caught, then the 12 individuals best and most closely distributed about the 75th percentile of the length distribution of all individuals will be used for the composites. The selected 12 individual fish will then be arranged by size, and the smallest four fish, the middle four fish, and the largest four fish within a species will be grouped for each composite to satisfy the 75% rule (the smallest individual in a composite is no less than 75% of the total length of the largest individual in a composite; USEPA 2000). This may permit data evaluation based on size class, if necessary. Skin-off fillets will be used for white croaker and California halibut to be consistent with the *2002 – 2004 Southern California Coastal Marine Fish Contaminants Survey* (NOAA 2007) and *Amendments to the Water Quality Control Plan for Enclosed Bays and Estuaries of California: Sediment Quality Provisions* (Beegan and Faick 2017) . For shiner surfperch (or alternate prey fish species), whole fish without head or internal organs[4] will be used to be consistent with Beegan and Faick (2017). Dissection and compositing methods will be performed in the analytical laboratory in accordance with USEPA guidance (USEPA 2000).

Fish tissue will be analyzed for chemical parameters. Processing and preservation will be performed in accordance with the methods described in the Bight Field Operations Manual and Bioaccumulation Workplan (BFSLC 2018; BCEC 2009). Fish will be processed in the field according to the following steps:.

- Sacrifice fish and leave whole body intact.
- Blot fish dry and pack each fish in aluminum foil (shiny side out).
- Place each packed fish in a labeled, food-grade, resalable plastic bag and store on ice.
- Ship overnight to the analytical laboratory on wet or blue ice. If samples are held more than 24 hours, pack on dry ice.

Chain-of-custody (COC) forms will be maintained. Tissue compositing will be conducted by the analytical laboratory. Recommended conditions for sampling containers, sample handling, and storage are listed in Table 13.

5.4 Field Equipment Decontamination Procedures

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.*

Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.

Water quality probes will be rinsed three times with distilled water prior to collecting measurements at each station.

[4] See Appendix A-6 of Beegan and Faick (2017)

5.5 Waste Disposal

All disposable sampling materials and personal protective equipment used in sample 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. Waste disposal procedures for specific media are as follows.

5.5.1 Water

Excess water from the sampler will be returned to the collection site, prior to moving to the next sampling location.

5.5.2 Sediment

Any incidental sediment remaining after sampling will be washed overboard at the collection site, prior to moving to the next sampling location. Any sediment spilled on the deck of the sampling vessel will be washed into surface waters at the collection site after sampling.

5.5.3 Fish Tissue

After target fish have been collected, the remaining catch should be returned to the sea. Dead specimens should be discarded offshore, outside the breakwater, to avoid spoiling of nearshore areas (i.e., harbors and bays).

5.6 Sampling Platform and Equipment

The 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 should 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 should be used for the deployment of fish sampling (e.g., trawl) gear. An A-frame or davit may also be used for the deployment of water quality and sediment sampling gear. In addition, the vessel should 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. A list of equipment and support facilities that may be necessary to conduct sampling is provided in Table 14. Subcontractors are responsible for providing a complete list of equipment and support facilities to be used for sampling.

5.7 Positioning and Vertical Controls

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 pre-determined core sampling locations, with an accuracy of plus or minus 10 feet. The vessel will maintain position using a three-point anchoring system. The coordinates of the actual sampling locations will be reported in latitude and longitude in degrees, decimal, and minutes (to three decimal places). Positions will be relative to the North American Datum 1983 (NAD83).

Upon locating the sampling location, station depth will be measured using an onboard, calibrated fathometer or a leadline. The mudline elevation relative to mean lower low water (MLLW) datum will be determined by adding the tidal elevation to the measured depth. In the Port of Los Angeles, the Los Angeles, California, tide gauge (Station ID 9410660) will be referenced. In the Port of Long Beach and San Pedro Bay, the Long Beach Terminal Island tide gauge (Station ID 9410680) will be referenced. Vertical elevations will be reported to the nearest 0.1 foot relative to MLLW.

6 Sample Handling and Custody (Element B03)

6.1 Sample Shipping

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 hold time requirements.

Specific sample shipping procedures are as follows:

- *Each cooler or container containing the 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.*
- *The shipping waybill number will be documented on all COC forms accompanying the 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 persons 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.

6.2 Chain-of-Custody Procedures

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).

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 will be emailed directly to the laboratory and QA manager.

A COC form will accompany each container of samples to the analytical laboratories. 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.

7 Field Measurements and Analytical Methods (Element B04)

Field SOPs for field measurements are listed in Table 15 and included in Appendix A. Field instruments are presented in Table 16. Water, sediment, and tissue analytical chemistry will be performed by a laboratory certified by the California Environmental Laboratory Accreditation Program (ELAP) and/or National Environmental Laboratory Accreditation Program (NELAP) on contract with Ports of Long Beach and Los Angeles. Sample containers and preservatives, as appropriate, will be provided by the analytical laboratory. The laboratory will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided. A summary of the major chemical constituents to be analyzed is presented in Table 17. A complete list of analytes by matrix is included in Tables 18, 19, and 20.

7.1 Water

In situ water quality field measurements will be made for the following parameters:

- pH
- Temperature
- DO
- Salinity

Water quality will be measured in situ at the station location by immersing a water quality sonde into the water at the same location where the water sample is collected. See Appendix A and the SWAMP SOP for additional details on the collection of field parameters (MPSL-DFG 2007).

Water samples will be analyzed for the following:

- TSS
- Dissolved and total metals
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- PCBs

Table 18 lists the specific compounds to be analyzed and details the analytical methods and target reporting limits. Sample volumes and preservation techniques for required analyses are included in Table 13. The sample volume needed may vary due to the analytical methods and reporting limit capabilities of the laboratory.

7.2 Sediment Triad Sampling

7.2.1 Chemistry

Sediment chemistry is one of three essential lines of evidence (LOE) required for the SQO Part 1 (sediment triad assessment), which helps determines the type of chemical exposure and its potential for producing adverse biological effects. Determination of the chemistry LOE comprises two main components: 1) measurement of a suite of constituents; and 2) interpretation of the results using two indices of chemical exposure: California Logistic Regression Model (CA LRM) and chemical score index (CSI; Bay et al. 2014).

Sediment samples will be analyzed for the following:

- Total organic carbon (TOC)
- Grain size
- Metals
- Polycyclic aromatic hydrocarbons (PAHs)
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- PCB congeners

Specific compounds to be analyzed and analytical methods and target reporting limits are provided in Table 19. Sample volumes and preservation techniques for required analyses are presented in Table 13. Sediment chemical analyses will be conducted in accordance with the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). The sample volume needed may vary due to the analytical methods and reporting limit capabilities of the laboratory.

7.2.2 Toxicity

Sediment toxicity is the second essential LOE for conducting an SQO Part 1 assessment. Toxicity tests will be conducted in accordance with the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). Methods are summarized in the SOP: Sediment Toxicity Testing (Appendix A). Two sediment toxicity tests, including an acute amphipod survival and a chronic, sub-lethal test are required for the assessment (Bay et al. 2014). For consistency and comparability with the Bight program and over time, the *Eohaustorius estuarius* amphipod toxicity test should be used for compliance monitoring. *E. estuarius* has been historically used during Bight Monitoring in the Los Angeles and Long Beach Harbors in 1998, 2003, and 2008 (SCCWRP 2003, 2007; Nautilus 2009) and Ports of Long Beach and Los Angeles' Biological Baseline Monitoring in 2008 (SAIC 2010). The continued use of this species as part of future monitoring events will allow for the greatest data comparability over time. However, due to the intolerance of *E. estuarius* for sediment with a high percent of clay, alternative species accepted by the SQO guidance (e.g., *Leptocheirus plumulosus*) should be considered in areas expected to have a high percent of fines. In addition, if healthy *E. estuarius* organisms are not available during the required sampling period, then *Rhepoxynius abronius* may be an acceptable species for toxicity testing. It is unlikely, due to holding time restraints, that grain size data will be available from the analytical laboratory prior to species determination for toxicity testing. As such, species determinations should be made via best professional judgment based on the physical appearance and texture of test sediments and availability of test organisms at the time of sample collection. The field manager and toxicity laboratory manager should work together to identify the grain size and appropriate test species for each test sediment. It is not uncommon to use two different species within the same study to accommodate testing sediments of differing grain size.

The chronic, sublethal toxicity test that should be conducted as part of an SQO assessment in the Los Angeles/Long Beach Harbor Complex is the mussel (*Mytilus galloprovincialis*) sediment-water interface test. Recent Bight monitoring in 2008 employed the sediment-water interface (SWI) test, and continued use of this test will provide the best data comparability between previous and future sampling events. Consistent with Bight Program recommendations, homogenized sediment will be used in this testing program.

A description of these toxicity test methods specified under the SQO policy is provided in Chapter 4 of the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). Specifically, Chapter 4 provides guidance on sample preparation, organism acclimation, test methods, QA/QC procedures, and data analysis and interpretation.

7.2.3 Benthic Community

The third essential LOE for sediment quality assessment is the composition of the benthic community. The benthic LOE is a direct measure of the effect that sediment contaminant exposure has on the benthic biota of California's bays and estuaries. Determination of the benthic LOE is based on four measures of benthic community condition: Index of Biotic Integrity (IBI), Relative Benthic Index (RBI), Benthic Response Index (BRI), and River Invertebrate Prediction and Classification System (RIVPACS; Bay et al. 2014). Benthic community analyses will be conducted in accordance with the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). Chapter 5 of the manual details recommended laboratory procedures for the processing of benthic infauna samples and subsequent data analysis necessary for the SQO Part 1 assessment. Methods are included in the SOP: Benthic Infauna Community Analysis (Appendix A).

7.3 Sediment Quality Objective Assessment

The SQO assessment incorporates the MLOEs described above (chemistry, toxicity, and benthic community) to develop final station assessments. SQO assessment should be conducted in accordance with the Water Quality Control Plan (SWRCB and CalEPA 2009) and the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). The calculation of the toxicity LOE is straightforward, as described in the manual. Consequently, only supplemental guidance is provided here for the chemistry and benthic LOEs.

7.3.1 Chemistry Line of Evidence

Calculation of the chemistry LOE should follow methods described in the Water Quality Control Plan (SWRCB and CalEPA 2009) and the *Sediment Quality Assessment Draft Technical Support Manual*

(Bay et al. 2014). Specific attention should be given to guidance on the summing of total high-molecular-weight PAHs, low-molecular-weight PAHs, total PCBs, and total DDTs. Guidance on using the specific chemical constituents in each class to sum, managing non-detects, and applying a multiplication factor as part of the total PCB concentration estimate should be strictly followed.

For individual analytes with a non-detect result, an estimated concentration represented by half the detection limit should be consistently used. Using this method will ensure consistency across all monitoring events. This stipulation does not apply to non-detect results used in a sum (as previously described). While there are other ways that non-detects can be estimated (i.e., non-detect equals detection limit), the recommended method is in agreement with the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014).

Calculations may be performed using various tools, including a calculator, Microsoft Excel, or programming languages (i.e., Interactive Data Language [IDL]). SCCWRP has also developed a data integration tool in Microsoft Excel (Data Integration Tool v5.5) for calculating each LOE and the final MLOE. The current version is available on the Sediment Quality Assessment Tools page of the SCCWRP website (SCCWRP 2017). It should be noted that this tool is currently under revision.

7.3.2 Benthic Line of Evidence

Calculation of the benthic LOE should follow methods described in the Water Quality Control Plan (SWRCB and CalEPA 2009) and the *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014). As part of this calculation, data should be prepared and benthic indices calculated in accordance with this manual. The preparation of data for benthic indices calculations is a critical step that has significant impacts on the results and SQO outcome. The *Sediment Quality Assessment Draft Technical Support Manual* (Bay et al. 2014) describes most key steps required to prepare data prior to benthic indices calculations. In addition, the manual states that data should be prepared by identifying each taxon to the appropriate level "in keeping with the benthic macrofauna species list for the relevant habitat."

While a seemingly uncomplicated task, to address this data requirement in full, the following steps should be taken to ensure consistency with SCCWRP data assessment tools, as it will allow for the most comprehensive QC:

- Species collected from within the Los Angeles/Long Beach Harbor Complex should be compared to the "Benthic Lookup" worksheet found within the Data Integration Tool v5.5 Excel file (SCCRWP 2008). Species should be matched to corresponding names within this species list, and if no corresponding species exists, species should be matched to the next lowest taxonomic level (genus, family, order, class, or phylum). Species may be identified to the nearest taxonomic level using the Southern California Association of Marine Invertebrate Taxonomists Taxonomic Toolbox available at http://www.scamit.org/taxontools/.

- Species not matching a corresponding species or the next lowest taxonomic level should be checked to ascertain that the species name is the most recently accepted name for that organism. For example, *Caesia perpinguis* (Hinds 1844) should be recorded as *Nassarius perpinguis*.
- If benthic species or taxon does not match any taxon provided in the Benthic Lookup worksheet, it should be excluded from benthic indices calculations entirely (i.e., names should be removed from the species listed at that station), until revision of the Data Integration Tool v5.5 is complete, which will allow for the ability to include some species that may not be on the list but are in fact marine benthic invertebrates.
- Upon conversion of species names to the lowest taxonomic level, duplicate, triplicate, or more taxon results should be compiled into one taxon result with one corresponding abundance. For example, if the abundance data show two organisms identified as *Lineus bilineatus* (which can be converted to the family Lineidae, as it is the lowest matching taxonomic level) and four organisms identified as Lineidae, then there should be one line item for Lineidae with a total of six organisms (Ranasinghe 2010).
- Within the Benthic Lookup worksheet found within the Data Integration Tool v5.5 Excel file, there is a species level column that indicates whether or not a species should be dropped. SCCWRP states that "when present, 'Drop' in this column indicates that abundances of this taxon are included in index calculations, but it is not included for counting numbers of taxa because lower taxonomic level entries in this taxon are also present" (SCCWRP 2008). It is critical that programming language or user-designed spreadsheets used to calculate benthic indices incorporate this "drop" instruction.

The supplemental data preparation steps previously described must be followed such that QC checks can be conducted on the numerical results of the indices using the SCCWRP Data Integration Tool v5.5, assuming initial indices calculations were performed using a programming language such as IDL, SAS® software, or separate Excel file. In addition, if species names are not matched to the Benthic Lookup worksheet when they should be, the match between observed and expected species could be reduced, which would affect the RIVPACS score and could also have an impact on the result of other benthic indices due to the inclusion of total number of taxa or subclasses of taxa (i.e., molluscs) in the calculation of these indices. If species names are included in the data analyses when they do not match the species list, the scores of the benthic indices could be impacted, which could potentially affect the benthic LOE outcome.

7.3.3 Quality Control of Chemistry and Benthic Lines of Evidence Data Assessment

A minimum of 10% of any data entry performed prior to data assessment should be assessed as part of the QC program. If major issues are found, then 100% of data entry conducted should be reviewed. If LOE calculations are done using an alternative method to the SCCWRP data integration tool, data from 10% of the samples (minimum of five samples) should be entered into the data integration tool and results of each individual LOE (i.e., CSI, CA LRM, RIVPACS, and IBI) for each sample should be compared to results using alternative methods. If the data integration tool is the primary method used for the calculation, then 10% of the data should be checked using a calculator or alternative method. If major issues are found with indices calculations, then 100% of indices calculations should be reviewed. Results of the QC checks should be presented as part of a QA/QC report attached to any SQO assessments conducted.

7.4 Fish Tissue

The laboratory will receive 12 whole fish per station per species. Three composites of four fish will be used for analysis. White croaker, California halibut, and shiner surfperch will be filleted, and skin-off muscle fillets will be analyzed. Fish tissue samples will be analyzed for the following:

- Percent lipids
- Organochlorine pesticides (including DDT and its derivatives, chlordane compounds, dieldrin, and toxaphene)
- PCB congeners

Specific compounds to be analyzed and analytical methods and target reporting limits are provided in Table 20. Sample volumes and preservation techniques for required analyses are included in Table 13.

7.5 Analyte Lists, Analytical Methods, and Reporting Limits

Analyte lists and target reporting limits for water, sediment, and fish tissue are identified in Tables 18, 19, and 20*, respectively. Analytical methods and target detection limits were selected to comply with SWAMP guidance (SWRCB 2017). The analyte list for sediments includes the recommended chemical analytes needed to calculate the chemistry exposure line of evidence for application of the California sediment quality assessment framework (SWRCB 2009).*

The laboratory should report detected compounds down to the MDL, if applicable. Laboratories should also provide the instrument verified limit of detection (LOD) for each analyte in the laboratory report and EDD. 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.

7.6 Laboratory Turn-Around Times

Turn-around times for laboratory analyses are presented in Table 21.

8 Quality Objectives and Criteria (Element A7)

8.1 Field Measurements

Guidance for DQOs for field measurements is derived from the SWAMP guidance for water parameters (SWRCB 2017) and from the Bight Field Operations Manual for fish tissue parameters (BFSLC 2018). Quality objectives for parameters that will be measured in the field, including in situ water quality and fish measurements, are presented in Table 22. A description of sediment grab quality objectives and criteria is located in the Bight Field Operations Manual (BFSLC 2018; p.24–25).

Field measurements will be made in triplicate on 5% of the measurements. Each result will be recorded along with the average of the three results, the difference between the largest and smallest result, and the percent difference between the largest and smallest result. The percent difference will be calculated as follows:

Percent difference = 100*(largest-smallest)/average

Triplicate measurements, the average of the results, and percent difference will be recorded on the field data sheet. The percent difference, as appropriate, will be compared against the precision criteria established for field measurements in Table 22. If precision does not meet the established criteria, the equipment should be inspected to ensure that it is working properly. Re-calibrate equipment if necessary and then repeat the triplicate measurements process until DQOs are achieved.

8.2 Laboratory Analyses

It is critical to ensure that the data collected are of acceptable quality so that the project objectives for each special study or monitoring program sampling are achievable. Guidance for laboratory DQOs is derived from the SWAMP guidance (SWRCB 2017). The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, completeness, and sensitivity.

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. Examples of how representativeness will be assessed and controlled for include generating analyte lists from known contaminants of concern, field observations made during sample collection, and analytical methods evaluated during data validation.*
- *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 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 study, analytical methods will be selected to achieve reporting limits that comply with, or are close to, target detection limits.*

Chemistry laboratory DQOs are presented in Table 23. Sediment toxicity and benthic community DQOs are provided in Table 24.

9 Special Training and Certifications (Element A8)

For sample preparation tasks, field crews will be trained in standardized sample collection requirements so that the samples collected and the data generated from the 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.

Supplemental information related to field sampling and laboratory analyses is provided in Table 25. All field personnel are responsible for complying with QA/QC requirements that pertain to their organizational and technical function. Each field staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function. Analytical laboratories must be certified by the California ELAP and/or NELAP for the analyses they are responsible for performing.

10 Documentation and Records (Element A9)

Document requirements for field records and laboratory reports are provided in Section 16, Data Management. Each project team member (field coordinator, QA manager, etc.) is responsible for documenting all necessary project information and should maintain files for individual tasks. Upon completion of each sampling event, project team members must provide electronic copies of such files to the Harbor Toxics TMDL project manager. Electronic documents will be maintained by the managing consultant and RMC.

11 Quality Control (Element B05)

Procedures and formulas for calculating quality control results can be found in the SWAMP Manual (SWRCB 2017). Section 8 describes what should be done if control limits are exceeded and how corrective actions will be assessed and documented. Precision and bias are also discussed in Section 8. This section identifies QC activities, including blanks, spikes, and duplicates and provides a definition of the various QA/QC related terms.

11.1 Field Quality Assurance/Quality Control Samples

Field QA/QC samples will be collected along with environmental samples. Field QA/QC samples are 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 2017). Rinsate blanks will be collected by pouring distilled water into a decontaminated grab sampler and poured into an appropriate bottle. Field blanks are required whenever samples for trace metals analysis are being collected. The field blank will be prepared by pouring distilled water for its original container into a sample bottle while in the field; this sample will be analyzed for metals. The field duplicate will be collected and analyzed in the same manner as the original sample immediately following the collection of the original sample. *Field QA/QC sample frequencies and performance criteria are presented in Table 26.*

11.2 Laboratory Quality Assurance/Quality Control

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 Table 27.

11.2.1 Laboratory Quality Control Definitions

Laboratory QA/QC definitions are identified in Table 28.

12 Instrument/Equipment Testing, Inspection, and Maintenance (Element B06)

This section describes procedures for testing, inspection, and maintenance of field and laboratory equipment. A summary is provided in Table 29.

12.1 Field Instruments/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 the recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in the 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. The samplers will be inspected daily for any mechanical problems. Any problems will be noted in the field logbook and corrected prior to continuing sampling operations.

12.2 Laboratory Instruments/Equipment

The 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 and will be taken out of service, or tagged with the discrepancy note, will be 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.

13 Instrument/Equipment Calibration and Frequency (Element B07)

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

13.1 Field Equipment

Field equipment will be calibrated prior to the sampling event according to the manufacturer's recommendations using the 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 the specific manufacturer's instruction manuals. Equipment that fails calibration will be recalibrated prior to use. Supplemental information is provided in Table 30.

13.2 Analytical Laboratory Equipment

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 QA Plan. Calibrations are discussed in the laboratory 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 International, 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 (NIST). 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 SOPs or the laboratory's 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.

14 Inspection/Acceptance of Supplies and Consumables (Element B08)

14.1 Field

Equipment and supplies purchased for use in field sampling will be inspected for damage as they are received. Confirmation that sample bottles are laboratory-certified clean will be made when received.

14.2 Analytical Laboratories

Equipment and supplies purchased for use in analytical laboratories will be inspected for damage as they are received. Supplies purchased from outside sources must be of adequate quality to sustain confidence in the laboratory's test. If no independent QA of outside supplies is available, the laboratory will first perform tests with the new supplies to ensure they comply with specified requirements.

15 Non-Direct Measurements (Element B09)

Measurements of tide are being provided by the National Oceanic and Atmospheric Administration (NOAA 2013). When in the Port of Los Angeles, use Los Angeles, California, tide gauge 9410660. When in Port of Long Beach or San Pedro Bay, use Long Beach Terminal Island tide gauge 9410680. Tide predictions are assumed to be accurate. No other non-direct measurements are anticipated for this project.

16 Data Management (Element B10)

16.1 Overview of Data Management Process

Data will be stored in a customizable database program called EQuisS (version 5, EarthSoft 2013), maintained by the managing consultant. *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 9). Field data collection and management options are described below, along with field EDD requirements. Water quality data will be exported into an EDD format compatible with the 2012 NPDES MS4 permit (RWQCB 2012), specifically the Southern California Storm Water Monitoring Coalition's Standardized Data Transfer Formats, or any subsequently revised RWQCB-required format. *These field data will undergo QC checks such as sample identification code review, transcription error review, and completeness verification. Independent of the field data, laboratory data will be submitted to the QA manager in specified PDF and EDD formats. This data will undergo verification and validation using Automated Data Review 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 agency database requirements.*

16.2 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 so that reconstruction of the event can occur 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, CCMRP, and 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. The field data collection and management options are described below along with field EDD requirements.

16.2.1 Water

Refer to SWAMP SOP (MPSL-DFG 2007) for standardized language for taking notes. Upon arrival at a sampling site, record visual observations on the appearance of the water and other information related to water quality and water use. A field data sheet will be completed for each water sample collection location. The field form should indicate sample time and where the sample was collected within the water column (i.e., surface or bottom). Required data for field EDDs are included as Appendix B.

At a minimum, each field data sheet will include the name of personnel, date, time, location coordinates (measured by DGPS), weather (e.g., heavy rains, cold front, very dry, and very wet), wind speed and direction (see Beaufort Scale as presented in MPSL-DFG 2007), collection depth, physical description of the water sample (e.g., suspended of floating material, color, odor, or sheen), biological activity (e.g., presence of fish, birds, macrophytes, and phytoplankton), description of in-water activities (e.g., recreational boating and active discharges), and the water quality parameter measurements. If the water quality conditions are exceptionally poor, note that standards are not met in the observations (e.g., DO is below State criteria).

Continuous water quality monitoring data collected will be saved in raw format on the field laptop and also saved to a dedicated project file currently maintained by the managing consultant. After completion of each sampling event, data will be transferred to the RMC.

16.2.2 Sediment

A surface sediment collection form will be completed for each grab sediment sample. Required data for field EDDs are included as Appendix B. In addition to standard entries of personnel, date, and time, the form will include information regarding station coordinates, grab sampler penetration, and physical characteristics of the sediment, such as texture, color, odor, and sheen.

A representative grab sample from each location will be photographed. Project, sample identification number, attempt number (if more than one attempt), and sample date and time will be labeled on a white board and included in each photograph.

16.2.3 Fish Tissue

Several datasheets will be utilized in association with fish tissue collection at each location. Required data for field EDDs are included as Appendix B. Data should be collected to include general trawl information and individual fish data, including length, weight, and gross pathology.

16.3 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 managing consultant'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 Section 16.4 *would be captured in the custom field application. To use this application, the field coordinator should coordinate with the QA manager.*

16.4 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 identification code, and sample matrix. The information recorded during sample collection should fulfill the requirements of the Field EDD described in Section 16.5.

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 special study/monitoring study project manager.

16.5 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 the 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 regards to filling out the Field EDD should be directed to the QA manager.

16.6 Laboratory Record Requirements

Analytical data records (bookmarked PDF and EDD formats) will be generated by the laboratory and submitted to the managing consultant upon completion. If the files are too large to be emailed, a notification email with download instructions can be sent to the managing consultant. 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 the 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 the results for each sample analyzed. The summary will include the following information when applicable:*
  - *Field sample identification code 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 (e.g., 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, the 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), including raw data, should be included in all full (Level 4) data packages.*

All instrument data shall be fully restorable at the laboratory from electronic backup.

Laboratories will be required to maintain all records relevant to project analyses for a minimum of 5 years.

16.7 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 laboratory EDDs will be submitted to the Ports' data manager by the laboratory in a custom EQuIS format. Specifications and valid values associated with this format can be found in Appendix C. *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. A validation EDD will provided by the data manager to the Ports' contractor to capture validation qualifiers and qualifier reason codes.*

17 Assessment and Response Actions (Element C1)

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.

17.1 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 assessment of field activities and has the authority to issue a stop work order on sample collection. The Harbor Toxics *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 the 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.*

17.2 Corrective Actions

The following subsections 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.

17.2.1 Field Activities

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

17.2.2 Laboratory

The laboratory is required to comply with their SOPs. The laboratory manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this CCMRP. *All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.*

The laboratory project manager will be notified immediately 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, the 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.*

18 Reports to Management (Element C2)

QA reports to 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 Harbor Toxics *TMDL study project manager.*

Progress reports will be prepared by the field coordinators and delivered to the Harbor Toxics *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.*

19 Data Review, Verification, and Validation (Element D1)

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 the findings of the validation process, data validation qualifiers may be assigned.

The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

20 Verification and Validation Methods (Element D2)

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. 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 2016, 2017a, 2017b), 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

21 Reconciliation with User Requirements (Element D3)

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 problems 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 (USEPA 2016, 2017a, 2017b). 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.

22 Sediment Quality Objectives Part 1 – Stressor Investigations

The SQO Part 1 assessment process categorizes sediment quality and associated benthic health based on MLOE; however, it does not identify the cause of impacts, if present, to the benthic community. For stations that do not meet the SQO for aquatic life (i.e., for stations categorized as Possibly Impacted, Likely Impacted, or Clearly Impacted), the SQO Part 1 Technical Guidance recommends additional investigations in order to identify the cause of sediment impacts (Bay et al. 2014). Table 31 provides a summary of possible outcomes from the integration of three LOEs (sediment chemistry, sediment toxicity, and benthic community).

The Harbor Toxics TMDL mandates, "if moderate toxicity as defined in the SQO Part 1 is observed, results shall be highlighted in annual reports and further analysis and evaluation to determine causes and remedies shall be required in accordance with the EO approved monitoring plan." This CCMRP recommends a modified approach to stressor investigations. Stressor investigations will be conducted if the SQO Part 1 station assessment results in a final category of Likely Impacted or Clearly Impacted. Stressor investigations may be considered if the SQO Part 1 station assessment results in a final category of Possibly Impacted. This recommendation is predicated on three points:

- Compliance with the Harbor Toxics TMDL may be demonstrated by meeting (i.e., final station assessment is Unimpacted or Likely Unimpacted) the SQO Part 1
- Stations may be categorized as Unimpacted or Likely Unimpacted even if moderate toxicity is observed
- Stations may be categorized as Possibly Impacted of Likely Impacted even if no or low toxicity is observed

Attainment of the Harbor Toxics TMDL is the ultimate goal. Stressor investigation studies, as recommended in the SQO Part 1 Technical Guidance (Bay et al. 2014), will more effectively benefit the objectives of the Harbor Toxics TMDL when the SQO Part 1 assessment is not met; rather than when it has been met but moderate toxicity is still observed.

The SQO Part 1 Technical Guidance (Bay et al. 2014) recommends a phased approach to stressor identification, including:

- **Confirmation that pollutants are indeed the basis for the impact** – determine that the benthic community is not impaired due to confounding factors such as physical disturbance or non-pollutant constituents
- **Establishment of what specific chemical(s) is the cause of impact** – using either statistical analyses, laboratory toxicity identification evaluations, or bioavailability analyses, determine the specific chemical(s) causing impairment; then, confirm initial results
- **Identification of the source of the chemical(s)** – conduct additional field investigations to determine source of contaminants causing impairment

In the event sediment quality is categorized as impaired in accordance with SQO Part I, the results will be evaluated to determine the feasibility and scale of a stressor identification study. For example, instead of conducting a separate stressor identification study for each station, it may be more effective to conduct a single stressor identification study for a region if multiple stations located in relative proximity exhibited similar impairments. A site-specific monitoring and reporting plan (separate from this document) will be developed and submitted for approval prior to commencement of investigations. Site-specific monitoring and report plans will address each phase of a stressor identification study (Bay et al. 2014) and will include the following components:

- **Sample Methodology** – when, where, why, and how confirmatory samples will be collected and analyzed
- **QA/QC** – methodology to ensure samples are collected, analyzed, and evaluated according to the Harbor Toxics TMDL program established standards

23 References

Allen, M.J., 1990. The Biological Environment of the California halibut, *Paralichtys californicus*. CADFW Fish Bulletin174: The California Halibut, *Paralichtys californicus,* Resource and Fisheries. Available at: http://www.oac.cdlib.org/view?docId=kt2q2n98z7&brand=oac4&doc.view=entire_text.

Anchor QEA (Anchor QEA, L.P.), 2013. *Programmatic Quality Assurance Project Plan Supporting Compliance Monitoring and Special Studies Related to the Harbor Toxics Total Maximum Daily Load*. January 2013.

Bay et al. (Bay, S.M., D.J. Greenstein, J.A. Ranasinghe, D.W. Diehl, and A.E. Fetscher), 2014. *Sediment Quality Assessment Technical Support Manual*. Technical Report 777. Southern California Coastal Water Research Project. January 2014.

BCEC (Bight Coastal Ecology Committee), 2009. *Southern California Bight 2008 Regional Marine Monitoring Survey (Bight '08) Bioaccumulation Workplan*. July 2009.

Beegan, C., and K. Faick, 2017. *(Proposed) Amendments to the Water Quality Control Plan for Enclosed Bays and Estuaries of California: Sediment Quality Provisions.* October 2017. Amended Plan adopted at Board Hearing on June 5, 2018.

BFSLC (Bight'18 Field Sampling & Logistics Committee), 2018. *Southern California Bight 2018 Regional Marine Monitoring Survey (Bight'18) Sediment Quality Assessment Field Operations Manual.* Prepared for Commission of Southern California Coastal Water Research Project. July 2018.

CDFG (California Department of Fish and Game), 2001. *White Croaker. California's Marine Living Resources: A Status Report.* December 2001.

CDFG, 2002. Life History Database: Biological Characteristics of Nearshore Fishes of California. Version 1.0. October 25, 2002. Available at: http://www.dfg.ca.gov/marine/lifehistory.asp.

CDFW (California Department of Fish and Wildlife), 2013a. Marine Sportfish Identification. Available at: http://www.dfg.ca.gov/marine/mspcont8.asp.

CDFW, 2013b. Collecting and Research Take Permits. Available at: http://www.dfg.ca.gov/wildlife/nongame/research_permit/.

EarthSoft, 2013. EQuiS database. Version 5. Available at: http://www.earthsoft.com/products/professional/.

FCEC (Fish Contamination Education Collaborative), 2013. California Fishing, Pier Fishing. Accessed: May 14, 2013. Available at: http://www.pvsfish.org/index.php/pier-fishing.

FGC (Fish and Game Commission), State of California, 2012. 2012 – 2013 California Ocean Sport Fishing Regulations Section 28.15, California Code of Regulations.

Journal of Commerce, 2012. The JOC Top 50 World Container Ports. Special Report. August 2012.

Long, E.R., L.J. Field, and D.D. MacDonald, 1998. "Predicting Toxicity in Marine Sediments with Numerical Sediment Quality Guidelines." *Environmental Toxicology and Chemistry* 17(4):714–727.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems." *Archives of Environmental Contamination and Toxicology* 39:20–31.

MEC (MEC Analytical Systems, Inc.), 1988. *Biological Baseline and Ecological Evaluation of Existing Habitats in Los Angeles Harbor and Adjacent Waters.* Final Report. Prepared for Port of Los Angeles.

MEC, 2002. *Ports of Long Beach and Los Angeles Year 2000 Biological Baseline Study of San Pedro Bay*. Prepared for the Port of Long Beach Planning Division. Long Beach, California. June 2002.

Moore, S.L., 1999. Age and Growth of White Croaker (*Genyonemus lineatus*) off Palos Verdes and Dana Point, California. SCCWRP 1999-2000 Annual Report.

MPSL-DFG (Marine Pollution Studies Laboratory – Department of Fish and Game), 2001. Standard Operating Procedure (SOP) for Field Collections of Organisms for Tissue Specimens for Analysis of Trace Metals and Synthetic Organic Compounds. Part of SWAMP Appendix D. July 20, 2001.

MPSL-DFG, 2007. Standard Operating Procedures (SOPs) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP. October 2007.

Nautilus (Nautilus Environmental), 2009. Toxicological Testing and Analytical Chemistry Summary for the Ports of Los Angeles and Long Beach, Bight '08 Sediment Monitoring Support DRAFT Report: July – September 2008 Test Series. Prepared for the Port of Los Angeles and the Port of Long Beach. June 2009.

Nielson, Kenny, 2013. Personal communication between Kenny Neilson of Seaventures, Inc., and Wendy Hovel of Anchor QEA. May 2013.

NOAA (National Oceanic and Atmospheric Administration), 2007. *2002 – 2004 Southern California Coastal Marine Fish Contaminants Survey*. Prepared by Industrial Economics, Inc., on behalf of the National Resource Trustees. June 2007.

NOAA, 2013. *Tides and Currents*. Available at: www.tidesandcurrents.noaa.gov/products.

Odenweller, D.B., 1975. The life history of the shiner surfperch *Cyamatogaster aggregata* in Anaheim Bay, California. The Marine resources of Anaheim Bay. Available at: http://content.cdlib.org/view?docId=kt6n39n885;NAAN=13030&doc.view=frames&chunk.id=d0e4240&toc.id=0&brand=calisphere.

Office of Environmental Health Hazard Assessment (OEHHA), 2008. *Development of Fish Contaminant Goals and Advisory Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene*. June 2008.

OEHHA, 2009. Health Advisory and Safe Eating Guidelines for Fish from Coastal Areas of Southern California: Ventura Harbor to San Mateo Point. June 2009.

Ports (Ports of Long Beach and Los Angeles), 2013. Biological Baseline Study (2013) preliminary data. Microsoft Excel file provided to Anchor QEA by Merkel, Inc., on behalf of the Ports on August 29, 2014.

Pucket, M., 2002. *Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Management Plan*. California Department of Fish and Game. First version. December 2002.

Ranasinghe, A., 2010. Personal communication with A. Ranasinghe at SCCWRP. Regarding: Benthic Community Index Calculations. October 18, 2010.

RWQCB (Los Angeles Regional Water Quality Control Board), 2011. Final Basin Plan Amendment. Attachment A to Resolution No. R11-008. 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. Adopted by the California Regional Water Quality Control Board, Los Angeles Region on May 5, 2011. Available at: http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/66_New/11_0630/02%20Final%20BPA%2005%2005%2011.pdf.

RWQCB, 2012. Monitoring and Reporting Program – No. CI-6948 for Order R4-2012-0175, NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges Within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach MS4 (Attachment E). November 8, 2012.

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.

SAIC (Science Applications International Corporation), 2010. Final 2008 Biological Surveys of Los Angeles and Long Beach Harbors.

Sempier, S., 2013. *Marine Species with Aquaculture Potential (MSAP) off the coast of Oregon and Pacific Northwest*. Accessed: April 10, 2013. Available at: http://hmsc.oregonstate.edu/projects/msap/PS/masterlist/.

SCCWRP (Southern California Coastal Water Research Project), 2003. *Southern California Bight 1998 Regional Monitoring Program*. Technical Report.

SCCWRP, 2007. Southern California Bight 2003 Regional Monitoring Program. Technical Report.

SCCWRP, 2008. *Determining Benthic Invertebrate Community Condition in Embayments*. January 21, 2008. Available at: http://www.sccwrp.org/Data/DataTools/SedimentQualityAssessment.aspx/.

SCCWRP, 2017. *Sediment Quality Assessment Tools. Data Integration Tool v5.5*. Updated October 2017. Available at: http://www.sccwrp.org/Data/DataTools/SedimentQualityAssessment.aspx/.

SCCWRP and MBC (MBC Applied Environmental Sciences), 1994. *Santa Monica Bay Seafood Consumption Study*. Technical Report 273. Prepared for Santa Monica Bay Restoration Project. Monterey Park, CA. June 1994.

Stenstrom, M.K. and M. Kayhanian, 2005. *First Flush Phenomenon Characterization*. Prepared for California Department of Transportation, Division of Environmental Analysis. CTSW-RT-05-73-02.6. August 2005.

SWRCB (State Water Resources Control Board), 2009. Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality. August 25, 2009.

SWRCB, 2017. *Surface Water Ambient Monitoring Program Quality Assurance Program Plan* (SWAMP). Final. May 2017.

SWRCB and California Environmental Protection Agency (CalEPA), 2009. *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality*. August 25, 2009.

UC (University of California), 2013. California Fish Website. Accessed on: 10 April 2013. Available at: http://calfish.ucdavis.edu/species/?uid=103&ds=241.

USEPA (U.S. Environmental Protection Agency), 1999. *National Functional Guidelines for Superfund Organic Methods Data Review*. Office of Emergency Response. USEPA 540/R-99/008. October 1999.

USEPA, 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition. EPA 823-R-93-002B-00-007. USEPA, Office of Water, Washington, DC.

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, 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.

USEPA, 2016. *National Functional Guidelines for High Resolution Superfund Methods Data Review.* EPA 542-B-16-001. April 2016.

USEPA, 2017a. *National Functional Guidelines for Inorganic Superfund Methods Data Review.* Office of Superfund Remediation and Technology Innovation. EPA-540-R-2017-001. January 2017.

USEPA, 2017b. *National Functional Guidelines for Organic Superfund Methods Data Review.* Office of Superfund Remediation and Technology Innovation. EPA 540 R 2017-002. January 2017.

Tables

Table 1
Sediment Quality 303(d) Listings for Harbor Waters

Waterbody	Pollutants Requiring TMDL (Sediment and/or Tissue)	Other Requirements
Los Angeles/Long Beach Inner Harbor	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: **Metals** (Copper, Zinc), **Benzo(a)pyrene, Chrysene**	Toxicity, benthic community effects
Los Angeles/Long Beach Outer Harbor	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: None	Toxicity
Los Angeles Harbor – Inner Cabrillo Beach	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: **Metals**	None
Los Angeles Harbor – Cabrillo Marina	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: Benzo(a)pyrene, Pyrene	None
Los Angeles Harbor – Fish Harbor	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: **Metals** (Copper, Lead, Mercury, Zinc), **Chlordane**, **DDT**, **PCBs**, **PAHs** (Benzo[a]pyrene, Phenanthrene, Benzo[a]anthracene, Chrysene, Pyrene, Dibenzo[a,h]anthracene)	Toxicity
Consolidated Slip	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: **Metals** (Cadmium, Copper, Chromium, Lead, Zinc, Mercury), **Chlordane**, **DDT**, **PCBs**, **PAHs** (Benzo[a]pyrene, 2-methyl-napthalene, Phenanthrene, Benzo[a]anthracene, Chrysene, Pyrene)	Toxicity, benthic community effects
San Pedro Bay	Tissue: **Chlordane, Dieldrin, DDT, PCBs, Toxaphene** Sediment: **Metals, Chlordane, PAHs, DDT**	Toxicity
Los Angeles River Estuary	Tissue: None Sediment: **Metals, Chlordane, DDT, PCBs**	Toxicity

Notes:
Bold pollutants are required by the Harbor Toxics TMDL.
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
TMDL: Total Maximum Daily Load

Table 2
Final, Mass-Based TMDLs and Allocations for Metals, PAHs, DDT, and PCBs

Waterbody/Source	Total Cu (kg/year)	Total Pb (kg/year)	Total Zn (kg/year)	Total PAHs (kg/year)	Total DDT (g/year)	Total PCBs (g/year)
Consolidated Slip – TMDL	12.1	16.6	53.3	1.43	0.56	1.14
Inner Harbor – TMDL	76.7	105.3	338.3	9.1	3.56	7.22
Outer Harbor – TMDL	81.6	112.1	360.1	9.7	3.79	7.68
Fish Harbor – TMDL	1.04	1.43	4.59	0.123	0.048	0.098
Cabrillo Marina – TMDL	1.32	1.81	5.8	0.156	0.061	0.124
Inner Cabrillo Beach – TMDL	--	--	--	--	0.04	0.09
San Pedro Bay – TMDL	648	890	2858	76.6	30.1	61.0
LA River Estuary – TMDL	735	1009	3242	86.9	34.1	69.2

Notes:
--: not specified
Cu: copper
g: gram
kg: kilogram
PAH: polycyclic aromatic hydrocarbon
Pb: lead
PCB: polychlorinated biphenyl
TMDL: Total Maximum Daily Load
Zn: zinc

Table 3
Final Concentration-Based Sediment WLAs for Metals in Consolidated Slip and Fish Harbor

Concentration-Based Sediment WLAs (mg/kg dry sediment)		
Cadmium	Chromium	Mercury
1.2	81	0.15

Notes:
Mercury applies to both Consolidated Slip and Fish Harbor; cadmium and chromium applies to Consolidated Slip only.
mg/kg: milligram per kilogram
WLA: waste load allocation

Table 4
10-Year Recurring Schedule

Task	Frequency	10-Year Schedule Recurring Schedule																																							
		[2013]/2023				[2014]/2024*				2015/2025				2016/2026				2017/2027				2018/2028				2019/2029				2020/2030				2021/2031				2022/2032			
		W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F
Water Quality Monitoring	Annually: 3 times	[◆]		[◆]	[◆]	[◆]		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆	◆		◆	◆
Sediment Sampling (SQO)	Two per 5 years			◆												◆								◆												◆					
Fish Tissue Sampling	Biennially			[◆]				◆*								◆								◆												◆					
Reporting	Annually				[◆]				[◆]				◆				◆				◆				◆				◆				◆				◆				◆

Notes:
Wet weather monitoring occurs between October 1 and April 30. For illustrative purposes, wet weather monitoring is shown to occur in winter and fall. Wet weather monitoring may occur during April (spring), and it is likely that two wet weather events may occur in the same season. Similarly for dry weather, it may occur during May or June (spring).
The wet weather season and the reporting schedule are not the same. Annual reports will include all sampling events for a monitoring year (July 1 to June 30).
Water quality monitoring includes in situ monitoring (pH, dissolved oxygen, temperature, and salinity) and water sampling for subsequent chemical analyses.
Sediment sampling includes collecting grab samples for chemical and toxicological analyses and benthic infauna community analysis.
Fish tissue sampling includes compositing fish tissue/species for chemical analyses.
[ ]: Indicates task was not completed in bracketed year. For example, Winter 2013 does not require a wet weather sampling event; however, Winter 2023 will require a wet weather sampling event.
*: Indicates task will not be completed in asterisk year due to realignment of fish tissue sampling with sediment sampling as described in the modified sampling approach.
◆: dry weather
◆: wet weather
◆: Sediment quality evaluations conducted in coordination with Bight Program years.
◆: scheduled event
F: Fall (October 1 to December 31)
Sp: Spring (April 1 to June 30)
SQO: Sediment Quality Objective
Su: Summer (July 1 to September 30)
W: Winter (January 1 to March 31)

Table 5
Deliverables Schedule

Type of Report	Frequency	Project Delivery Date(s)	Persons Responsible for Report Preparation	Report Recipients
PQAPP	Once	March 2013	Field Project Manager and Program Manager	Los Angeles Regional Water Quality Control Board
CCMRP	Once	March 2013		
Draft Monitoring Reports	Annually	September 1		RMC Participants
Final Monitoring Reports	Annually	December 1		Los Angeles Regional Water Quality Control Board

Notes:
CCMRP: Coordinated Compliance, Monitoring, and Reporting Plan
PQAPP: Programmatic Quality Assurance Project Plan
RMC: Regional Monitoring Coalition

Table 6
Schedule for Selected Water Quality Monitoring Stations per Event

Monitoring Year	2019/20			2020/21			2021/22			2022/23			2023/24 and Subsequent Years		
Event	Dry	Wet 1	Wet 2	Dry	Wet 1	Wet 2	Dry	Wet 1	Wet 2	Dry	Wet 1	Wet 2	Dry	Wet 1	Wet 2
Group 1	1	1	1	Repeat every year											
Group 2	2	3	4	6	2	3	4	6	2	3	4	6	Repeat every 4 years		
Group 3	5	5	5	Repeat every year											
Group 4	7	7	7	Repeat every year											
Group 5	8	9	11	9	11	8	11	8	9	Repeat every 3 years					
Group 6	10	10	10	Repeat every year											
Group 7	12	12	12	Repeat every year											
Group 8	13	14	15	14	15	13	15	13	14	Repeat every 3 years					
Group 9	16	17	16	17	16	17	Repeat every 2 years								
Group 10	18	18	18	Repeat every year											
Group 11	19	20	19	20	19	20	Repeat every 2 years								
Group 12	21	22	21	22	21	22	Repeat every 2 years								

Notes:
1. A monitoring year is defined as July 1 to June 30.
2. Dry refers to the dry weather monitoring event.
3. Wet 1 refers to the first storm event (i.e., first flush) after October 1.
4. Wet 2 refers to any other monitored storm event during the monitoring year and prior to April 30.

Table 7
Station Locations

Waterbody Name	Station ID[2]	Water Quality Group	Latitude (Decimal Degrees) WGS84	Longitude (Decimal Degrees)	Station Location
Consolidated Slip[1]	1	1	33.774848	-118.245374	Center of Consolidated Slip
Los Angeles Inner Harbor	2	2	33.764900	-118.252089	East Turning Basin
	3	2	33.762288	-118.274100	Center of the POLA West Basin
	4	2	33.751843	-118.270991	Main Turning Basin north of Vincent Thomas Bridge
	5	3	33.732443	-118.251343	Between Pier 300 and Pier 400
	6	2	33.725728	-118.271488	Main Channel south of Port O'Call
Fish Harbor	7	4	33.735801	-118.267260	Center of inner portion of Fish Harbor
Los Angeles Outer Harbor[1]	8	5	33.714661	-118.242389	Los Angeles Outer Harbor between Pier 400 and middle breakwater
	9	5	33.712050	-118.263405	Los Angeles Outer Harbor between the southern end of the reservation point and the San Pedro breakwater
Cabrillo Marina	10	6	33.719386	-118.279074	Center of West Channel
Inner Cabrillo Beach	11	5	33.711801	-118.281063	Center of Inner Cabrillo Beach
Long Beach Inner Harbor	12	7	33.767262	-118.233560	Cerritos Channel between the Heim Bridge and the Turning Basin
	13	8	33.753832	-118.216400	Back Channel between Turning Basin and West Basin
	14	8	33.748982	-118.230825	Center of West Basin
	15	8	33.742143	-118.199488	Center of Southeast Basin
Long Beach Outer Harbor[1]	16	9	33.731449	-118.221001	Center of Long Beach Outer Harbor
	17	9	33.727594	-118.186058	Between the southern end of Pier J and the Queens Gate
San Pedro Bay[1]	18	10	33.753832	-118.181332	Northwest of San Pedro Bay near Los Angeles River Estuary
	19	11	33.736671	-118.131591	East of San Pedro Bay
	20	11	33.725480	-118.157332	South of San Pedro Bay inside breakwater
Los Angeles River Estuary	21	12	33.756444	-118.193394	Los Angeles River Estuary Queensway Bay
	22	12	33.761013	-118.202111	Los Angeles River Estuary

Notes:

1. Fish tissue samples will be collected within four waterbodies (Consolidated Slip, Los Angeles Harbor, Long Beach Harbor, and San Pedro Bay) from popular fishing areas or areas with habitat or structure that may attract fish. Specific fish tissue sampling locations will be determined at the time of the sampling event using guidelines outlined in Section 4.2.3.
2. Twenty-two sediment samples will be collected per event; however, they will be randomly selected from an area representative of each of these stations as outlined in Section 4.1.1. Twelve water quality samples will be collected per event; one sample per water quality group will be selected from the original stations located within that group.

Table 8
Collection of Data Parameters by Station

Matrix	Depth	pH	Salinity	DO	Temperature	TSS	Analytical Chemistry	Toxicity	Benthic Infauna
Water[1]	Surface	X	X	X	X	X	X[3]		
	Bottom	X	X	X	X	X	-		
Sediment	Surface						X[4]	X	X
Fish Tissue[2]	Variable						X[5]		

Notes:

1. In situ water quality parameters include pH, salinity, dissolved oxygen (DO), and temperature. Grab water samples will be collected for total suspended solids (TSS) (at both depths) and chemical constituents (at the surface only).
2. Fish tissue will be collected via trawling, beach seine, etc. over a specific area rather than a point station.
3. Constituents to be measured in water samples include dissolved and total metals, pesticides, and polychlorinated biphenyls (PCBs). A complete list is provided in Table 17.
4. Constituents to be measured in sediment samples include total organic carbon, grain size, metals, polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides, and PCBs. A complete list is provided in Table 18.
5. Constituents to be measured in tissue samples includes lipids, organochlorine pesticides, and PCBs. A complete list is provided in Table 19.

-: analytical chemistry is not required

Table 9
Sample Nomenclature

Waterbody or Other Area Codes		Station Number[1]		Media Codes		Organism			Organism or Composite Number		Depth		Date of Collection	
						Scientific Name	Common Name	Code						
Outer Harbor – LA	OA	1	01	Receiving water	RW	*Genyonemus lineatus*	White croaker	WC	1 or C1	01 or C1	0–1 cm	0–1	1-Jul-13	20130701
Outer Harbor – LB	OB			Surface sediment	SS	*Paralichthys californicus*	California halibut	CH			0–5 cm	0–5		
Inner Harbor – LA	IA			Fish fillet skin off (muscle)	FF	*Cymatogaster aggregata*	Shiner surfperch	SS			S	Surface		
Inner Harbor – LB	IB			Whole organism	WO	*Paralabrax nebulifer*	Barred sand bass	BS			B	Bottom		
Consolidated Slip	CS			Field blank	FB	*Synodus lucioceps*	California lizardfish	CL						
Fish Harbor	FH			Equipment rinsate blank	EB	*Phanerodon furcatus*	White surfperch	WS						
Cabrillo Marina	CM					*Atherinops affinis*	Topsmelt	TS						
Cabrillo Beach	CB					*Engraulis mordax*	Northern anchovy	NA						
San Pedro Bay	SP													
Dominguez Channel	DC													
Cabrillo Pier	CP													

Notes:
Water and Sediment Sample IDs include: waterbody/station number/media code/depth/date.
Tissue Sample IDs include: waterbody/station number/media code/organism name/organism or composite number/date.
1. When collecting a field duplicate, add "1000" to the station number.
cm: centimeter

Table 10
Informational vs. Critical Data

Type of Data	Are Data Informational or Critical?
Visual observations (weather, fish anomalies, photographs, etc.)	Informational
Physical station measurements (water depth, tide, etc.)	Informational
Water samples	Critical
In situ water quality measurements	Critical
Sediment samples	Critical
Fish tissue samples	Critical
Fish measurements (lengths, weights, etc.)	Informational

Table 11
Field Standard Operating Procedures

Field SOP	Number	Date	Regulatory Citation	Corresponding CCMRP Section
Grab Water Sampling	MPSL-DFG Procedure Number 1.0	10/15/2007	SWAMP (MPSL-DFG 2007)	5.1.2
In Situ Water Quality Monitoring	MPSL-DFG Procedure Number 1.0	10/15/2007	SWAMP (MPSL-DFG 2007)	5.1.1
Surface Sediment Grab Sampling	Pgs. 25	7/2018	Bight Field Operations Manual (BFSLC 2018)	5.2
Sediment Chemistry Sample Processing	Pgs. 32	7/2018	Bight Field Operations Manual (BFSLC 2018)	5.2
Sediment Toxicity Sample Processing	Pg. 32	7/2018	Bight Field Operations Manual (BFSLC 2018)	5.2
Sediment Toxicity Testing	Chapter 4	1/2014	SQO Draft Technical Support Manual (Bay et al. 2014)	7.2.2
Benthic Infauna Processing	Pgs. 29	7/2018	Bight Field Operations Manual (BFSLC 2018)	5.2
Benthic Infauna Community Analysis	Chapter 5	1/2014	SQO Draft Technical Support Manual (Bay et al. 2014)	7.2.3
Fish Collection (otter trawl nets)	Pgs. 39	7/2018	Bight Field Operations Manual (BFSLC 2018)	5.3
Fish Collection (all other methods)	MPSL-DFG Method Number 102	7/20/2001	SWAMP (MPSL-DFG 2007)	5.3
Fish Processing	Pgs. 44–454 Pg. 7 (Section C3)	7/2018	Bight Field Operations Manual (BFSLC 2018); Bight Bioaccumulation Workplan (BCEC 2009)	5.3

Notes:
CCMRP: Coordinated Compliance, Monitoring, and Reporting Plan
MPSL-DFG: Marine Pollution Studies Laboratory – Department of Fish and Game
SOP: Standard Operating Procedure
SQO: Sediment Quality Objective
SWAMP: Surface Water Ambient Monitoring Program

Table 12
Sampling Methods and Processing

Sample Matrix	Sampler	Sample Processing
Water	Grab sampler (e.g., Van Dorn or niskin bottle)	None
In situ water quality measurements	Multi-parameter water quality sonde equipped with probes for temperature, dissolved oxygen, pH, and salinity	None
Sediment	Van Veen	Chemistry: homogenize Toxicity: none Benthic infauna: sieve
Fish tissue	Otter trawl or lampara net, beach seine, fish trap, or hook and line	Composite

Note:
More sampling equipment may be added by contractors as needed.

Table 13
Sample Containers and Holding Conditions

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Waters				
Total suspended solids	1 L	1-L HDPE	7 days	Cool ≤6°C
Total metals	100 mL	250-mL HDPE	48 hours until preservation	Cool ≤6°C
			6 months to analysis	Ambient; HNO_3 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
PCB Congeners	1 to 2 L	2 X 1-L amber glass	None[2]	Cool ≤6°C
Sediments				
Bulk density	50 g	4-oz glass	None established	Ambient
Specific gravity	100 g	16-oz glass	None established	Ambient
Total solids	10 g	8-oz glass	14 days	Cool ≤6°C
Grain size	300 g	16-oz plastic	6 months	Cool ≤6°C
DOC in porewater	1- 2 L sediment[1]	2 X 1-L amber glass	48 hours for extraction, filtration and preservation; 28 days to analysis	HCl or $H2SO_4$ 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	None
			1 year; samples must be extracted within 14 days of thawing	Freeze -20°C[3]
PAHs/ Organochlorine pesticides	500 g	Two 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
PCB Congeners	500 g	Two 8-oz glass	None[1]	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	Polyethylene bags or 8-oz glass	14 days to extraction	Cool ≤6°C
			1 year to extraction; samples must be extracted within 14 days of	Freeze -20°C

Table 13
Sample Containers and Holding Conditions

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
			thawing	
			40 days after extraction	Cool ≤6°C
PCB Congeners	200 g	Polyethylene bags or 8-oz glass	None[2]	Cool ≤6°C
				Freeze -20°C

Notes:
Some criteria may differ from SWAMP guidance but are consistent with analytical method criteria.
Recommendations are intended as guidance only. The selection of sample container and amount of sample required may vary per contracted laboratory sampling requirements.

1. Volume of sediment collected must be sufficient to produce a minimum of 40 mL of porewater.
2. PCB hold time was removed in SW-846, Chapter 4, Revision 4, February 2007, for aqueous and solid samples stored cool ≤6°C.
3. Mercury will be analyzed prior to freezing.
4. 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.

DDT: dichlorodiphenyltrichloroethane
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

Table 14
Equipment and Support Facilities Needed

Equipment/Support Facility	Provided By
General	
Sampling platform	Anchor QEA/Subcontractor
Water	
Water quality sonde	Anchor QEA/Subcontractor
Water sampler	Anchor QEA/Subcontractor
Sediment	
Sediment sampler	Subcontractor
Fish	
Fish collection gear (trawl nets, beach seine, fish traps, and hook/line)	Anchor QEA/Subcontractor
Scales	Anchor QEA/Subcontractor
Other[1]	

Note:
1. Other equipment/support facilities needed to be provided by subcontractors.

Table 15
Field Measurement SOPs

Field Measurement SOPs	Number	Date	Regulatory Citation
In Situ Water Quality Monitoring	MPSL-DFG Procedure Number 1.0	10/15/2007	SWAMP (MPSL-DFG 2007)
Fish Processing	Pgs. 44–54	7/2018	Bight Field Operations Manual (BFSLC 2018)

Notes:
MPSL-DFG: Marine Pollution Studies Laboratory – Department of Fish and Game
SOP: Standard Operating Procedure
SWAMP: Surface Water Ambient Monitoring Program

Table 16
Field Instruments

Instrument	Unit	Major Attribute[1]
Water quality sonde – temperature probe	°C	
Water quality sonde – dissolved oxygen probe	mg/L	
Water quality sonde – pH probe	units	
Water quality sonde – salinity probe	ppt	
Scales	g	
Other[2]		

Notes:
1. Major attributes to be provided by subcontractors
2. Other instruments to be determined by subcontractors

g: grams
L: liter
mg: milligram
ppt: parts per thousand

Table 17
Parameters to Be Monitored and Corresponding Analytical Methods

Parameter	Analytical Method	Notes
Water		
TSS	USEPA 160.2/SM 2540D	
Metals – total and dissolved	USEPA 6010A/6020/200.8/1640	
Mercury – total and dissolved	USEPA 7471A/USEPA 245.7	
Organochlorine pesticides	USEPA 8081A/USEPA 625	
PCB Congeners	USEPA 8270C (SIM or TQ)/USEPA 625	
Sediment		
TOC	USEPA 9060A/SM 5310B	
Grain Size	ASTM D442/SM 2560	
Total solids	USEPA 160.3/SM 2540B	
Metals	USEPA 6010B/USEPA 6020	
Mercury	USEPA 7471A/USEPA 245.7/USEPA 1631	
PAHs	USEPA 8270C/USEPA 8270D SIM	
Organochlorine Pesticides	USEPA 8081A/USEPA 8270C	
PCB Congeners	USEPA 8270C (SIM or TQ)/USEPA 625	
Toxicity – Acute	10-day amphipod survival	Bay et al. 2014
Toxicity – Chronic	28-day juvenile polychaete growth and survival or 2-day bivalve embryo development	Bay et al. 2014
Benthic Infauna	Sorting, taxonomic analysis	Bay et al. 2014
Fish Tissue		
Percent Lipids	NOAA 1993A	Gravimetric
Organochlorine Pesticides	USEPA 8081/USEPA 8270C	
PCB Congeners	USEPA 8270C/USEPA 8270D	

Notes:
ASTM: ASTM International
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
SIM: standard ion monitoring
SM: Standard Method
TQ: triple quadrupole
TSS: total suspended solids
USEPA: U.S. Environmental Protection Agency

Table 18
Water Parameters, Analytical Methods, and Reporting Limits

Parameter[1]	Analytical Method[2]	Target RL[3]
Conventionals (mg/L)		
Total suspended solids	SM 2540 D	2
Seawater (and Freshwater) 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
PCB Congeners (ng/L)[4] – Low-Resolution Analytical Methods		
CL2-PCB-08	USEPA 8270C (SIM or TQ)/625	0.1
CL3-PCB-18	USEPA 8270C (SIM or TQ)/625	0.1
CL3-PCB-28	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-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-99	USEPA 8270C (SIM or TQ)/625	0.1
CL5-PCB-101	USEPA 8270C (SIM or TQ)/625	0.1
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-138	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

Table 18
Water Parameters, Analytical Methods, and Reporting Limits

Parameter[1]	Analytical Method[2]	Target RL[3]
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-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-185	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-201	USEPA 8270C (SIM or TQ)/625	0.1
CL9-PCB-206	USEPA 8270C (SIM or TQ)/625	0.1
CL9-PCB-209	USEPA 8270C (SIM or TQ)/625	0.1
Chlorinated Pesticides (ng/L)		
alpha-Chlordane (cis-chlordane)	USEPA 8270C (SIM)/8081A/625	0.50
gamma-Chlordane (trans-chlordane)	USEPA 8270C (SIM)/8081A/625	0.50
Oxychlordane	USEPA 8270C (SIM)/8081A/625	0.50
cis-Nonachlor	USEPA 8270C (SIM)/8081A/625	0.50
trans-Nonachlor	USEPA 8270C (SIM)/8081A/625	0.50
Total chlordane[5]	USEPA 8270C (SIM)/8081A/625	--
2,4′-DDD	USEPA 8270C (SIM)/8081A/625	0.50
2,4′-DDE	USEPA 8270C (SIM)/8081A/625	0.50
2,4′-DDT	USEPA 8270C (SIM)/8081A/625	0.50
4,4′-DDD	USEPA 8270C (SIM)/8081A/625	0.50
4,4′-DDE	USEPA 8270C (SIM)/8081A/625	0.50
4,4′-DDT	USEPA 8270C (SIM)/8081A/625	0.50
Dieldrin	USEPA 8270C (SIM)/8081A/625	0.10
Toxaphene	USEPA 8270C (SIM)/8081A/625	2.0

Notes:
High-volume alternative sampling techniques may be used to achieve lower reporting limits for these analyses.
1. Specific analytes used for each study conducted for the RMC may vary by waterbody, according to the listings.
2. Laboratories may use different versions of recommended methods (i.e., USEPA 8270C) as long as the QA/QC elements identified in this CCMRP are met.
3. Matrix interference and/or dilutions due to non-target analytes may increase target reporting limits. The MDL should be at least three times lower than the RL (40 CFR 136) but will vary per instrument by MDL study. Detected data between the MDL and RL will be reported and flagged by the laboratory as estimated. Non-detected data may be reported at the MDL.

Table 18
Water Parameters, Analytical Methods, and Reporting Limits

4. PCB co-elutions will vary by instrument and column and may increase RLs for some congeners.
5. Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.

--: no RL available
µg/L: microgram per liter
CCMRP: Coordinated Compliance Monitoring and Reporting Plan
CFR: Code of Federal Regulations
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
MDL: method detection limit
ng/L: nanogram per liter
PCB: polychlorinated biphenyl
QA/QC: quality assurance/quality control
RMC: Regional Monitoring Coalition
RL: reporting limit
SIM: selected ion monitoring
SM: Standard Method
TQ: triple quadrupole
USEPA: U.S. Environmental Protection Agency

Table 19
Sediment Parameters, Analytical Methods, and Reporting Limits

Parameter[1,2]	Analytical Method[3]	Target RL[4]
Conventional Parameters		
Total solids (% wet weight)	SM 2540B/USEPA 160.3	0.1
Grain size (% retained)	ASTM D442/SM 2560	1%
Total organic carbon (%)	SM 5310B/USEPA 9060A	0.01% OC
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[5]	USEPA 8081A/8270C – SIM	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A/8270C – SIM	0.5
gamma-Chlordane (trans-chlordane)	USEPA 8081A/8270C – SIM	0.5
Oxychlordane	USEPA 8081A/8270C – SIM	0.5
cis-Nonachlor	USEPA 8081A/8270C – SIM	0.5
trans-Nonachlor	USEPA 8081A/8270C – SIM	0.5
Dieldrin[6]	USEPA 8081A/8270C – SIM	0.02

Table 19
Sediment Parameters, Analytical Methods, and Reporting Limits

Parameter[1,2]	Analytical Method[3]	Target RL[4]
Toxaphene[6]	USEPA 8081A/8270C – SIM	0.10
2,4′-DDD	USEPA 8081A/8270C – SIM	0.5
2,4′-DDE	USEPA 8081A/8270C – SIM	0.5
2,4′-DDT	USEPA 8081A/8270C – SIM	0.5
4,4′-DDD	USEPA 8081A/8270C – SIM	0.5
4,4′-DDE	USEPA 8081A/8270C – SIM	0.5
4,4′-DDT	USEPA 8081A/8270C – SIM	0.5
PCB Congeners (ng/g or µg/kg)[7] – Low-Resolution Analytical Methods		
CL2-PCB-08	USEPA 8270C/8270D – SIM	0.2
CL3-PCB-18	USEPA 8270C /8270D – SIM	0.2
CL3-PCB-28	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-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-99	USEPA 8270C/8270D – SIM	0.2
CL5-PCB-101	USEPA 8270C/8270D – SIM	0.2
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-138	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

Table 19
Sediment Parameters, Analytical Methods, and Reporting Limits

Parameter[1,2]	Analytical Method[3]	Target RL[4]
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-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-185	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-201	USEPA 8270C/8270D – SIM	0.2
CL9-PCB-206	USEPA 8270C/8270D – SIM	0.2
CL9-PCB-209	USEPA 8270C/8270D – SIM	0.2

Notes:

1. Specific analytes used for each study conducted for the Ports may vary by waterbody, according to the listings.
2. Units are in dry weight unless otherwise noted. Specific analytes used for each study conducted for the Ports may vary by waterbody, according to the listings.
3. Laboratories may use different versions of recommended methods (i.e., USEPA 8270C) as long as the QA/QC elements identified in this CCMRP are met.
4. Matrix interference, total solid concentrations, and/or dilutions due to non-target analytes may increase target RLs. The MDL should be at least three times lower than the RL (40 CFR 136) but will vary per instrument by MDL study.
5. Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.
6. TMDL sediment target for this compound is currently below achievable laboratory RLs. Results should be reported to the EDL/MDL.
7. PCB co-elutions will vary by instrument and column and may increase RLs for some congeners.

µg/g: microgram per gram
µg/kg: microgram per kilogram
CCMRP: Coordinated Compliance Monitoring and Reporting Plan
CFR: Code of Federal Regulations
DDT: dichlorodiphenyltrichloroethane
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
EDL: estimated detection limit
MDL: method detection limit
mg/kg: milligram per kilogram
ng/g: nanogram per gram
OC: organic carbon
PCB: polychlorinated biphenyl
QA/QC: quality assurance/quality control
RL: reporting limit
SIM: selected ion monitoring
SM: Standard Method
TMDL: Total Maximum Daily Load
USEPA: U.S. Environmental Protection Agency

Table 20
Fish Tissue Parameters, Analytical Methods, and RLs

Parameter[1]	Analytical Method[2]	Target RLs[3]
Conventionals (%)		
Lipids	NOAA 1993a/Gravimetric	0.5
Organochlorine Pesticides (ng/g or µg/kg wet weight) – Low-Resolution Analytical Methods		
Total Chlordane[4]	USEPA 8081A/8270C – SIM	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A/8270C – SIM	4.0
gamma-Chlordane (trans-chlordane)	USEPA 8081A/8270C – SIM	4.0
Oxychlordane	USEPA 8081A/8270C – SIM	2.0
cis-Nonachlor	USEPA 8081A/8270C – SIM	4.0
trans-Nonachlor	USEPA 8081A/8270C – SIM	2.0
Dieldrin[5]	USEPA 8081A/8270C – SIM	0.46
Toxaphene[5]	USEPA 8081A/8270C – SIM	6.1
2,4′-DDD	USEPA 8081A/8270C – SIM	4.0
2,4′-DDE	USEPA 8081A/8270C – SIM	4.0
2,4′-DDT	USEPA 8081A/8270C – SIM	6.0
4,4′-DDD	USEPA 8081A/8270C – SIM	4.0
4,4′-DDE	USEPA 8081A/8270C – SIM	4.0
4,4′-DDT	USEPA 8081A/8270C – SIM	10.0
PCB Congeners[6] (ng/g wet weight) – Low-Resolution Analytical Methods		
CL2-PCB-08	USEPA 8270C/8270D	0.4
CL3-PCB-18	USEPA 8270C/8270D	0.4
CL3-PCB-28	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-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-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

Table 20
Fish Tissue Parameters, Analytical Methods, and RLs

Parameter[1]	Analytical Method[2]	Target RLs[3]
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-138	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-177	USEPA 8270C/8270D	0.4
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-201	USEPA 8270C/8270D	0.4
CL9-PCB-206	USEPA 8270C/8270D	0.4
CL10-PCB-209	USEPA 8270C/8270D	0.4

Notes:
Data will be reported uncorrected for lipid content.
1. Specific analytes used for each study conducted for the RMC may vary by waterbody, according to the listings.
2. Laboratories may use different versions of recommended methods (i.e., USEPA 8270C) as long as the QA/QC elements identified in this CCMRP are met.
3. Matrix interference and/or dilutions due to non-target analytes may increase target RLs. The MDL should be at least three times lower than the RL (40 CFR 136) but will vary per instrument by MDL study.
4. Total chlordane is calculated using the following compounds: alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor.
5. TMDL tissue target for this compound is currently below achievable laboratory RLs. Results should be reported to the EDL/MDL.
6. PCB co-elutions will vary by instrument and column and may increase RLs for some congeners.

--: not applicable
µg/kg: microgram per kilogram
CCMRP: Coordinated Compliance Monitoring and Reporting Plan
CFR: Code of Federal Regulations
DDD: dichlorodiphenyldichloroethane
DDE: dichlorodiphenyldichloroethylene
DDT: dichlorodiphenyltrichloroethane
EDL: estimated detection limit
MDL: method detection limit
ng/g: nanogram per gram
NOAA: National Oceanic and Atmospheric Administration
QA/QC: quality assurance/quality control
RL: reporting limit
RMC: Regional Monitoring Coalition
PCB: polychlorinated biphenyl
SIM: selected ion monitoring
USEPA: U.S. Environmental Protection Agency

Table 21
Turnaround Times for Laboratory Analyses

Laboratory Analysis	Turnaround Time
Chemistry	Not to exceed 20 business days
Toxicity	Variable and will not have a duration greater than approved sediment holding times plus test duration
Benthic Infauna	Not to exceed 3 months

Table 22
DQOs for Field Measurements

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Water	Depth (m)	± 0.1 m	± 0.1 m	NA	NA	NA
Water	Temperature (°C)	± 0.5°C	± 0.5°C	NA	NA	NA
Water	pH	± 0.2 unit	± 0.2 unit	NA	NA	NA
Water	Dissolved oxygen	± 0.2 mg/L	5%	NA	NA	NA
Water	Salinity[1] (ppt)	± 0.2 ppt	± 0.2 ppt	NA	NA	NA
Fish Tissue	Fish species identification	95%	NA	NA	NA	NA
Fish Tissue	Fish enumeration	90%	NA	NA	NA	NA
Fish Tissue	Fish lengths	90%	90%	NA	NA	NA
Fish Tissue	Fish weights	90%	Within 0.2 kg	NA	NA	NA

Notes:
1. The value for salinity may be computed from specific conductance provided salinity is above 3 ppt based on previous observations at or near that location.

DQO: Data Quality Objective
m: meter
mg/L: milligram per liter
NA: not applicable
ppt: part per thousand

Table 23
Laboratory and Reporting Data Quality Objectives

Parameter	Precision[1]	Accuracy[2]	Completeness[3]
Water			
Total suspended solids	± 25% RPD	NA	90%
Total and Dissolved Metals	± 25% RPD	75-125% R	90%
PCB Congeners[4]	± 25% RPD	50-150% R	90%
Organochlorine Pesticides[4]	± 25% RPD	50-150% R	90%
Sediments			
Total solids	± 25% RPD	NA	90%
Grain size	± 25% RPD	NA	90%
Total organic carbon	± 25% RPD	80-120% R	90%
Total Metals	± 25% RPD	75-125% R	90%
Polycyclic aromatic hydrocarbons[4]	± 25% RPD	50-150% R	90%
Organochlorine pesticides[4]	± 25% RPD	50-150% R	90%
PCB Congeners[4]	± 25% RPD	50-150% R	90%
Tissues			
Lipids	± 25% RPD	NA	90%
Organochlorine pesticides[4]	± 25% RPD	50-150% R	90%
PCB Congeners[4]	± 25% RPD	50-150% R	90%

Notes:
1. Not applicable if native concentration of either sample is less than the reporting limit.
2. Laboratory control sample, certified reference materials, and matrix spike/matrix spike duplicate percent recovery
3. Percent of each class of analytes that are not rejected after data validation conducted in accordance with the Technical Support Manual (Bay et al. 2014)
4. The accuracy goal is 70-130% R if certified reference material is used.

NA: not applicable
PCB: polychlorinated biphenyl
R: recovery
RPD: relative percent difference

Table 24
DQOs for Sediment Toxicity and Benthic Infauna Analyses

Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Toxicity – Acute[1]	Meet all performance criteria in method relative to reference toxicant	Meet all performance criteria in method relative to sample replication	NA	NA	90%
Toxicity – Chronic[1]	Meet all performance criteria in method relative to reference toxicant	Meet all performance criteria in method relative to sample replication	NA	NA	90%
Benthic Infauna – Sorting	95%	NA	NA	NA	NA
Benthic Infauna – Taxonomy	95%	± 5%	NA	NA	NA

Notes:
1. Data quality objectives (DQOs) follow procedures established in Bay et al. (2014)
NA: not applicable

Table 25
Specialized Personnel Training or Certification

Specialized Training Course Title or Description	Training Provider	Personnel Receiving Training/Organizational Affiliation	Location of Records and Certifications[1]
Education and/or project experience in marine biology/ichthyology	Anchor QEA/ Subcontractor	Individuals who will be performing fish identification onboard	NA
Experience using water and sediment grab samplers and in situ water quality probes; review of SOPs	Anchor QEA/ Subcontractor	Individuals who will be collecting water and sediment samples	Signed copies of SOPs will reside with field datasheets
ELAP/NELAP certification for laboratory analyses of water and sediment analyses	Subcontractor	Analytical laboratories	Server currently maintained by the managing consultant

Notes:
1. If training records and/or certifications are on file elsewhere, then document their location in this column. If these training records and/or certifications do not exist or are not available, note this.

ELAP: Environmental Laboratory Accreditation Program
NA: not applicable
NELAP: National Environmental Laboratory Accreditation Program
SOP: Standard Operating Procedure

Table 26
Frequencies and Performance Criteria for Field Quality Assurance/Quality Control Sampling

Analysis Type	Field Duplicate	Field Duplicate Performance Criteria[1,2]	Field and Rinse Blank[3]	Field and Rinse Performance Criteria[4]
Total 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
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
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
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
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:
1. Field duplicate RPD exceedances alone would not result in data qualification. Further evaluation into the sample collection procedures should be conducted.
2. These criteria are a slight deviation from California Surface Water Ambient Monitoring Program (SWAMP) due to the ultra-low detection levels utilized for these studies.
3. If low-level contamination could potentially bias results, field blanks and/or rinse (equipment) blanks should be collected.
4. 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.

NA: not applicable
PCB: polychlorinated biphenyl
RL: reporting limit
RPD: relative percent difference

Table 27
Frequencies and Performance Criteria for Laboratory Quality Assurance/Quality Control Samples

Analysis Type	Initial Calibration[1,2]	Continuing Calibration Verification	LCS or SRM[3]	Replicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Internal Standard
Total solids	Daily or each batch	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Lipids	Daily or each batch	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Grain size	Daily or each batch	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total suspended and dissolved solids	Daily or each batch	NA	NA	1 per 20 samples	NA	NA	NA	NA	NA
Total 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	NA	Each batch	NA	Per method
PCB Congeners 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
Polycyclic aromatic hydrocarbons	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
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

Notes:
Primary column is considered the column that contains the highest value with the least interference.
Values should have RPDs less than 40% or they are P flagged. ICALS = 20% or less and CCALS = 15% or less.
1. For physical tests, calibration and certification of drying ovens and weighing scales are conducted annually.
2. Calibrations should be conducted per analytical methods or instrument manufacturers specifications.
3. When an SRM is not available, an LCS will be analyzed.
DDT: dichlorodiphenyltrichloroethane
LCS: laboratory control sample
NA: not applicable
PCB: polychlorinated biphenyl
SRM: standard reference material

Table 28
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 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 29
Testing, Inspection, Maintenance of Sampling Equipment, and Analytical Instruments

Equipment/ Instrument	Maintenance, Testing, or Inspection Activities	Responsible	Frequency	SOP Reference
Grab water samplers	Inspect to ensure sampler ends close tightly to create seal; ensure sampler is rigged, deployed, and retrieved properly	Anchor QEA/ Subcontractor	With each use	SWAMP SOP (MPSL-DFG 2007)
Water quality sondes	Ensure sonde is calibrated and producing accurate measurements; ensure sonde is deployed and retrieved properly	Anchor QEA/ Subcontractor	With each use	SWAMP SOP (MPSL-DFG 2007)
Sediment grab samplers	Inspect to ensure equipment is in good working order, properly rigged, deployed, and retrieved	Subcontractor	With each use	Bight Field Operations Manual (BFSLC 2018)
Hook and line	Inspect to ensure equipment is in good working order	Subcontractor	Daily	SWAMP SOP (MPSL-DFG 2007)
Beach seines	Inspect for holes; ensure net is properly rigged, deployed, and retrieved	Subcontractor	Daily	SWAMP SOP (MPSL-DFG 2007)
Fish traps	Inspect for holes; ensure trap is properly setup, deployed, and retrieved	Subcontractor	Daily	SWAMP SOP (MPSL-DFG 2007)
Trawl nets	Inspect for holes; ensure net is properly rigged, deployed, and retrieved	Subcontractor	Daily	Bight Field Operations Manual (BFSLC 2018)
Scales	Ensure scales are calibrated and in good working order	Anchor QEA/ Subcontractor	Daily	Manufacturer's recommendation

Notes:
MPSL-DFG: Marine Pollution Studies Laboratory – Department of Fish and Game
SOP: Standard Operating Procedure
SWAMP: Surface Water Ambient Monitoring Program

Table 30
Instrument/Equipment Calibration and Frequency

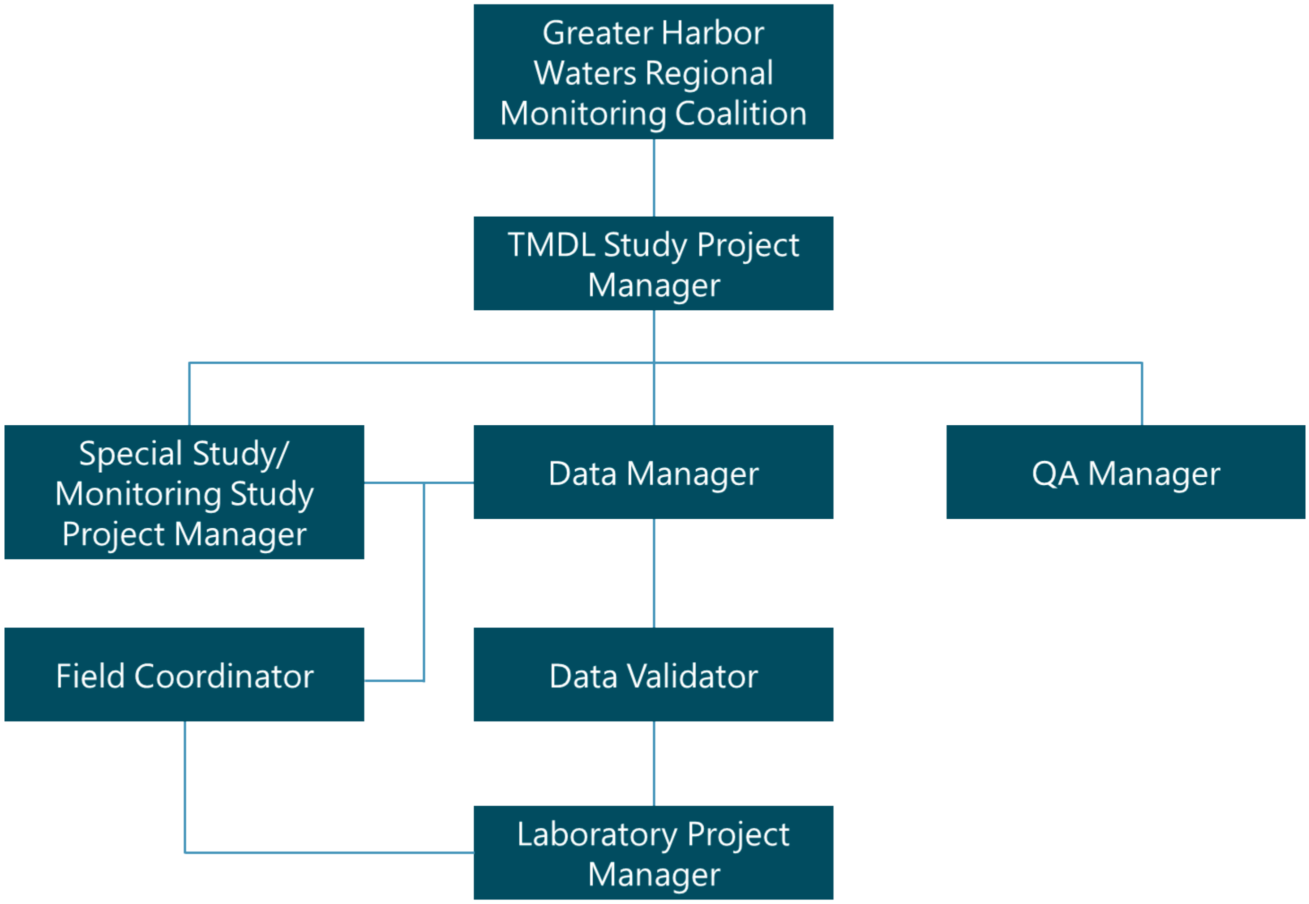
Equipment/Instrument	SOP Reference	Calibration Description and Criteria	Frequency of Calibration	Responsible Person
Water quality sonde	SWAMP	Calibrate each probe to manufacturer's specifications	Daily; more frequently if necessary	Anchor QEA/ Subcontractor
Scales	Manufacturer's specifications	Calibration to known standard weights	Daily	Anchor QEA/ Subcontractor

Notes:
SOP: Standard Operating Procedure
SWAMP: Surface Water Ambient Monitoring Program

Table 31
Recommended Further Actions for Each of the Sediment Quality Categories

<table>
<tr><th>Category</th><th>Description</th><th>Recommended Actions</th></tr>
<tr><td>Unimpacted</td><td>No significant adverse impacts</td><td>None</td></tr>
<tr><td>Likely Unimpacted</td><td>Not expected to cause significantly adverse effects</td><td>None</td></tr>
<tr><td>Possibly Impacted</td><td>Adverse impacts may be present, but they are weak and/or uncertain</td><td>Continue to monitor site until enough information can determine if the site requires further investigation</td></tr>
<tr><td>Likely Impacted</td><td>Evidence of adverse impact</td><td rowspan="2">Follow-on investigation:
• Conduct stressor ID study to confirm linkage to contaminant of concern
• Conduct source ID study to determine management action</td></tr>
<tr><td>Clearly Impacted</td><td>Clear and severe adverse impacts</td></tr>
<tr><td>Inconclusive</td><td>Data are suspect or additional info required</td><td>Additional data required</td></tr>
</table>

Figures



Filepath: S:\PROJECTS\GWMA\RMC_Compliance Monitoring(141205-01.01)\Deliverables\Compliance_Monitoring\Deliverables\CCMRP\Figures\Figure 1_ts_new.docx

ANCHOR QEA

Figure 1
Organizational Chart
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters

LEGEND:

- Available Water Quality Sample Station
- Group 1: Consolidated Slip
- Group 2: Inner Los Angeles Harbor
- Group 3: Seaplane Lagoon
- Group 4: Fish Harbor
- Group 5: Outer Los Angeles Harbor
- Group 6: Cabrillo Marina
- Group 7: Inner Long Beach Harbor
- Group 8: Middle Long Beach Harbor
- Group 9: Outer Long Beach Harbor
- Group 10: Eastern San Pedro Bay (Inner)
- Group 11: Eastern San Pedro Bay (Outer)
- Group 12: Los Angeles River Estuary

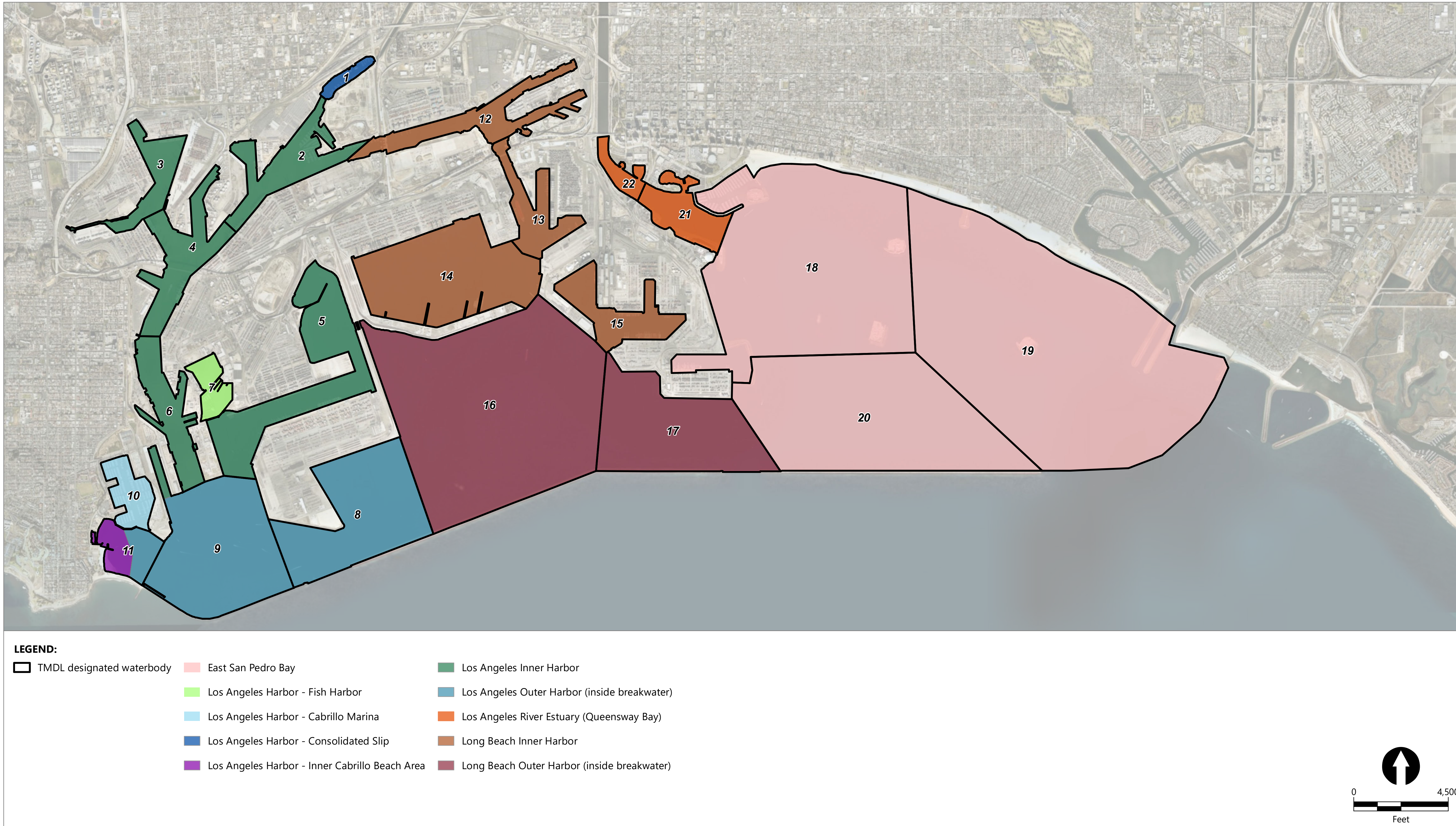
NOTE:
Based on statistical analyses presented in correspondence to the Los Angeles RWQCB (letter to Deborah Smith, April 2, 2019, and technical memorandum to Thahnloan Nguyen and LB Nye, July 9, 2019), the 22 available water quality sampling locations may be grouped into 12 distinct groups representative of the spatial distribution of chemical concentrations within the Greater Harbor Waters. During each sampling event, only 12 (one location selected from available stations within each group according to the method defined in Section 4.1.1) of the 22 available water quality sampling stations would be sampled.

0 5,000
Feet

Publish Date: 2019/08/14, 3:50 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\Fig2_POLALB_Copper_Waterbody_Regions.mxd

ANCHOR QEA

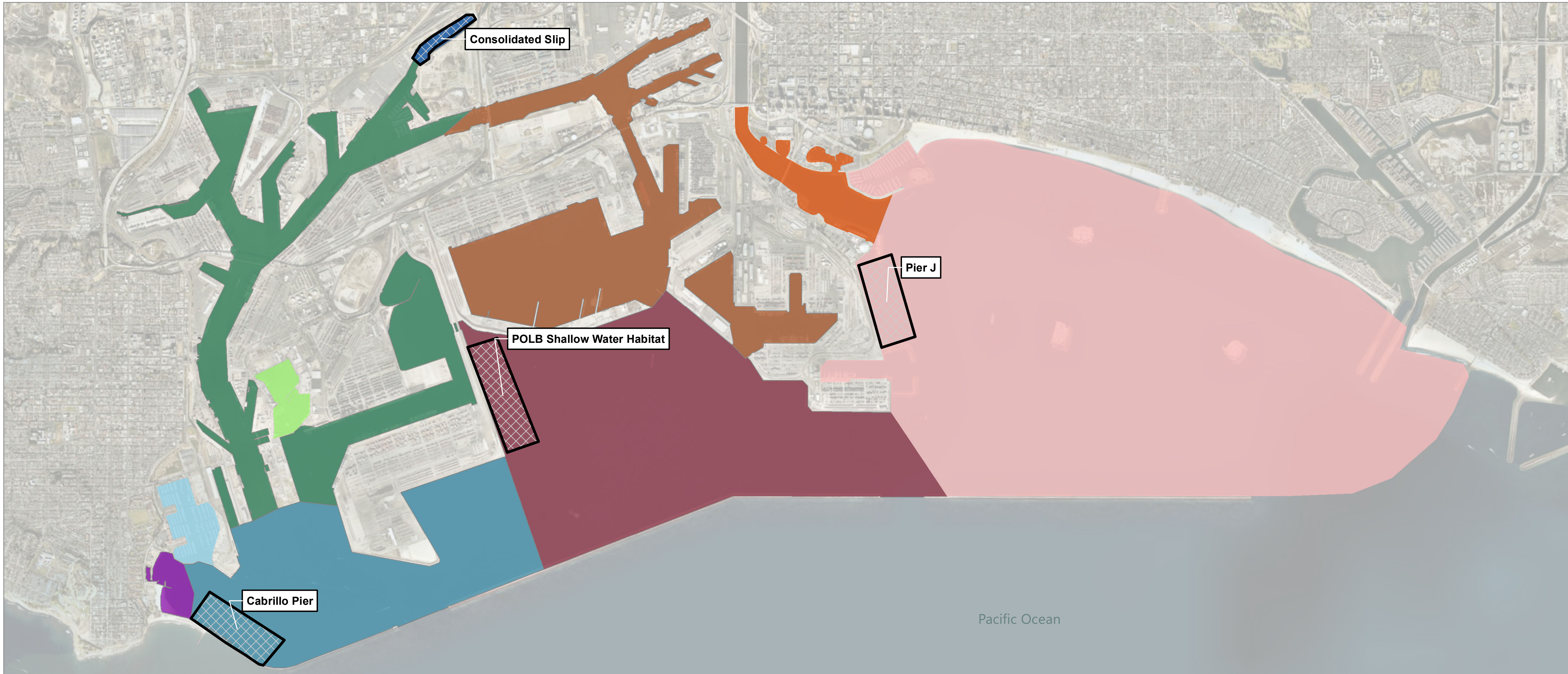
Figure 2
TMDL Compliance Water Monitoring Locations
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



Publish Date: 2019/08/14, 3:44 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\Fig3_TMDL_Designated_Waterbodies_Sediment.mxd

ANCHOR QEA

Figure 3
TMDL Compliance Designated Waterbodies for Sediment Monitoring
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



LEGEND:

Compliance Monitoring Location

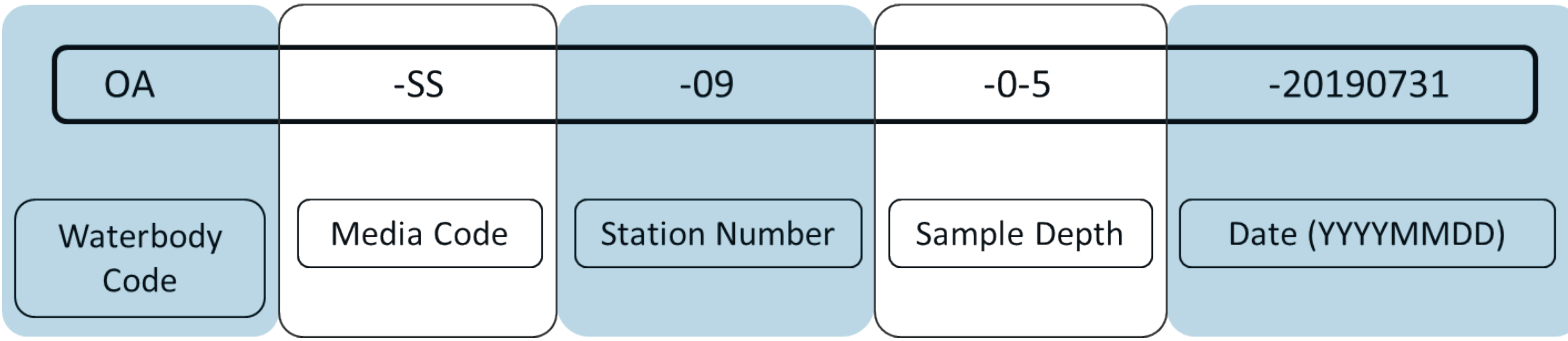
POLA/POLB Waterbodies

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

0 4,000
Feet

Publish Date: 2019/08/12, 3:27 PM | User: jsfox
Filepath: \\orcas\GIS\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Maps\TMDL_ComplainceMonitoring\Fig4_AQ_TMDL_FishMonitoring_2018_CCMRP.mxd

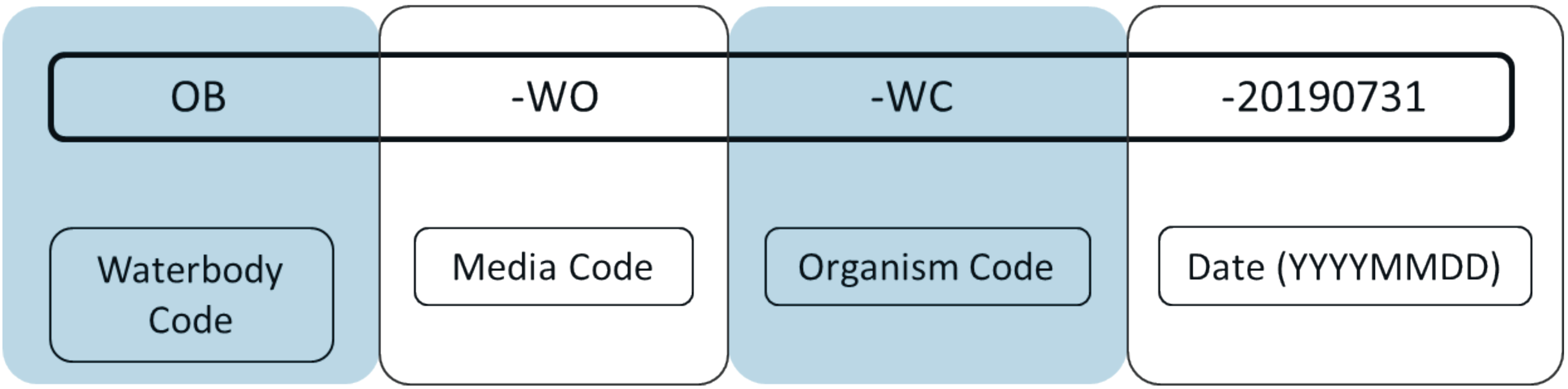
Figure 4
Proposed Fish Tissue Compliance Monitoring Locations
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



Filepath: S:\PROJECTS\GWMA\RMC_Compliance Monitoring(141205-01.01)\Deliverables\Compliance_Monitoring\Deliverables\CCMRP\Figures\Figure 5.docx

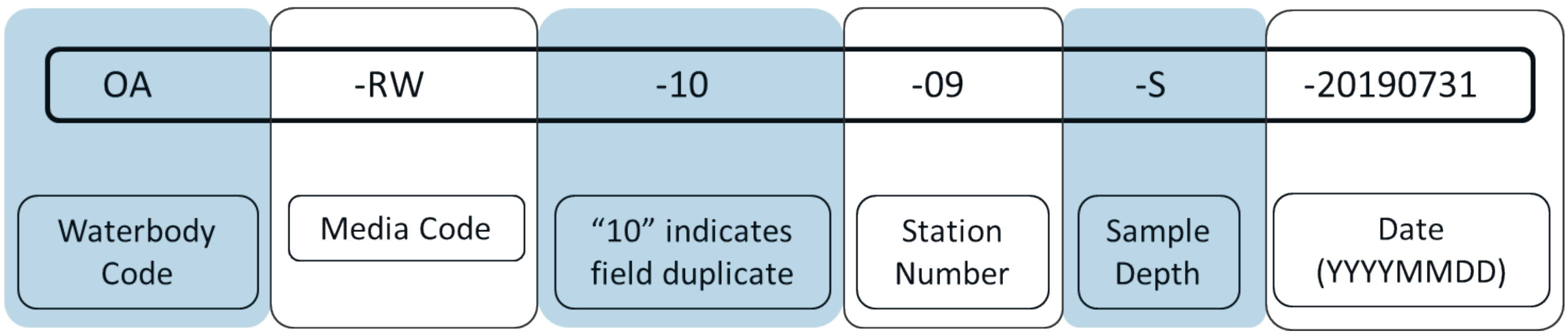
ANCHOR QEA

Figure 5
Water or Sediment Sample Nomenclature
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



ANCHOR QEA

Figure 6
Tissue Sample Nomenclature
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters



Filepath: S:\PROJECTS\GWMA\RMC_Compliance Monitoring(141205-01.01)\Deliverables\Compliance_Monitoring\Deliverables\CCMRP\Figures\Figure 7.docx

ANCHOR QEA

Figure 7
Field Duplicate Sample Nomenclature
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters

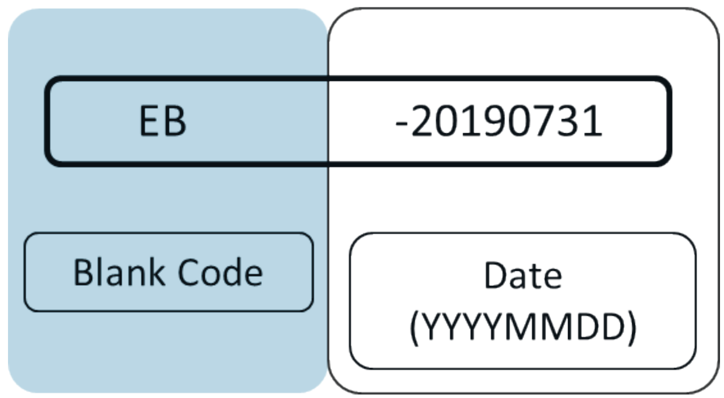
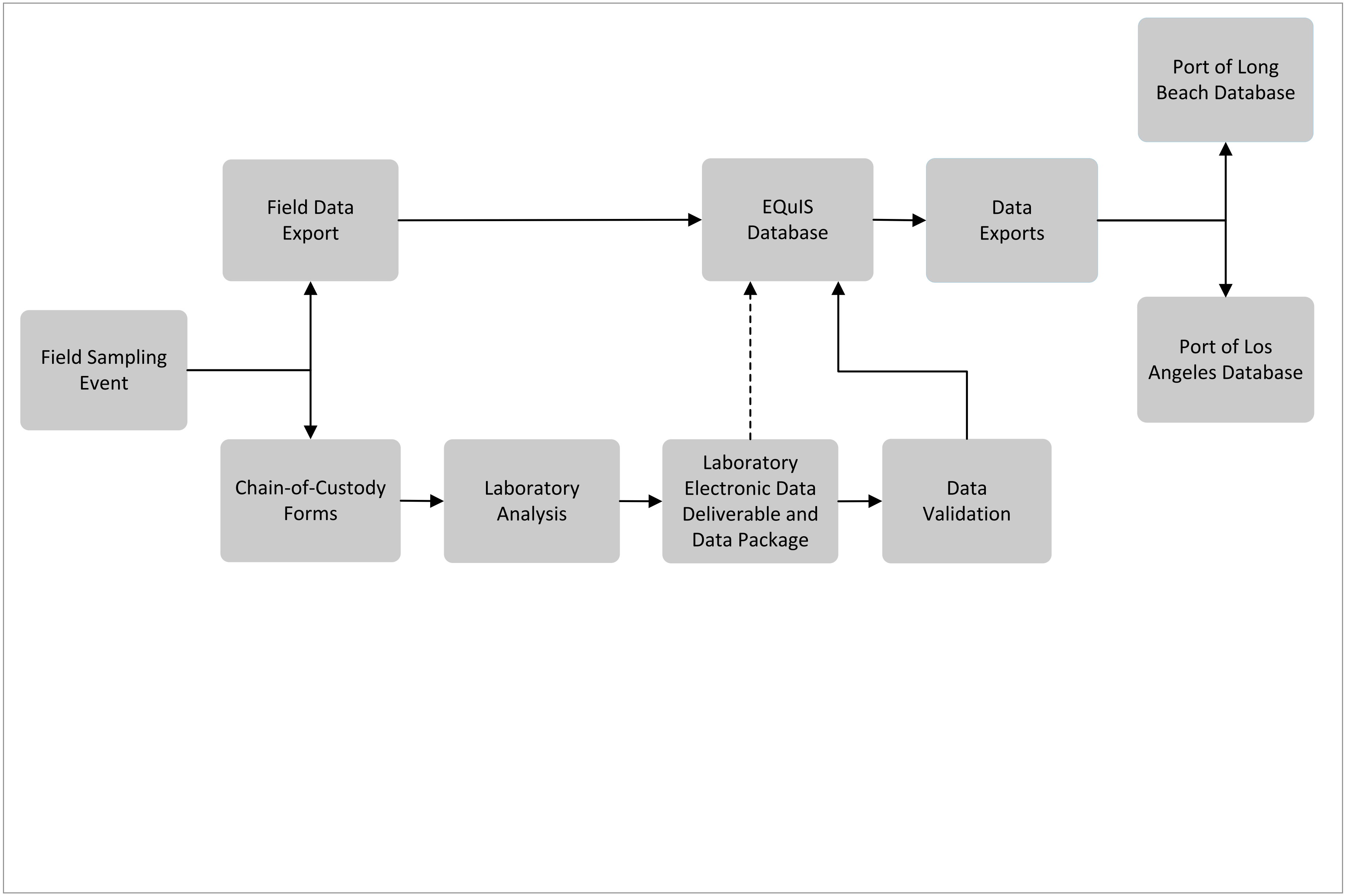


Figure 8
Field Blank/Equipment Blank Sample Nomenclature



Filepath: S:\PROJECTS\GWMA\RMC_Compliance Monitoring(141205-01.01)\Deliverables\Compliance_Monitoring\Deliverables\CCMRP\Figures\Figure 9.docx

ANCHOR QEA

Figure 9
Data Flow Diagram
Coordinated Compliance Monitoring and Reporting Plan
Greater Los Angeles and Long Beach Harbor Waters

Appendix A
Standard Operating Procedures

Standard Operating Procedure: Grab Water Sampling

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________________ Project Name: ____________________

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection of grab water samples using a Niskin, Van Dorn, or equivalent sampler. Grab water samples will be collected at locations described in the Coordinated Compliance Monitoring and Reporting Plan (CCMRP).

1.2 Purpose

The purpose of water sampling is to obtain data on water chemistry for contaminants of concern.

1.3 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., CCMRP and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

1.4 Procedures

Water samples will be collected from the same three depths as the in situ water quality measurements. Grab samples (i.e., instantaneous, not time- or flow-weighted composites) for total suspended solids (TSS) will be taken at all three depths during wet and dry weather events. Grab samples for analytical chemistry will be taken only from the surface sample (-3 feet below water surface). Water samples will be collected with a grab sampler (e.g., Niskin or Van Dorn) that has been decontaminated prior to sample collection at each station. Sampling methods will generally conform to U.S. Environmental Protection Agency's (USEPA's) clean sampling methodology described in the Surface Water Ambient Monitoring Program (SWAMP) SOP (MPSL-DFG 2007).

Sample processing and handling for water chemistry will be conducted in accordance with guidance developed in the Quality Assurance Management Plan for the State of California's SWAMP (California Department of Fish and Game, Pucket 2002). Aliquots for TSS, metals, dichlorodiphenyltrichloroethane (DDT), and polychlorinated biphenyls (PCBs) will be taken directly from the grab sampler into appropriate containers or bottles (Table 1). Water samples will be preserved in the field, depending on the type of analysis, to meet specified holding times (Table 1). Water samples will be stored at less than 4 degrees Celsius (°C) until delivery to the appropriate analytical laboratory.

Table 1
Sample Containers and Holding Conditions

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Water				
Total suspended solids	1 L	1-L HDPE	7 days	Cool ≤6°C
Total Metals	100 mL	250 mL HDPE	48 hours until preservation	Cool ≤6°C
			6 months to analysis	Ambient; HNO_3 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
DDT	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
PCB Congeners	1 to 2 L	2 X 1-L amber glass	None[b]	Cool ≤6°C

Notes:
Some criteria may differ from SWAMP guidance but may be consistent with analytical method criteria.
Recommendations are intended as guidance only. The selection of sample container and amount of samples required may vary per contracted laboratory sampling requirements.
°C: degrees Celsius
DDT: dichlorodiphenyltrichloroethane
HDPE: high-density polyethylene
L: liter
mL: milliliter
PCB: polychlorinated biphenyl

1.5 Quality Assurance/Quality Control

Quality control procedures will consist of following standard practices for the collection of water quality samples. Entries in the field forms and on sample container labels will be double checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that water sampling procedures are in conformance with those stated in this SOP.

Field quality assurance/quality control samples to be collected are included in Table 2.

Table 2
Frequencies and Performance Criteria for Field Quality Assurance/Quality Control Sampling

Analysis Type	Field Duplicate	Field Duplicate Performance Criteria[1,2]	Field and Rinse Blank[3]	Field and Rinse Performance Criteria[4]
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
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
DDT	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:
1. Field duplicate RPD exceedances alone would not result in data qualification. Further evaluation into the sample collection procedures should be conducted.
2. This criteria is a slight deviation from SWAMP due to the ultra-low detection levels utilized for these studies.
DDT: dichlorodiphenyltrichloroethane
NA: not applicable
PCB: polychlorinated biphenyl
RL: recording limit
RPD: relative percent difference

Standard Operating Procedure:
In Situ Water Quality Monitoring

1 Standard Operating Procedure Acknowledgement Form

Project Number: ________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection of in situ water quality data using a multi-probe water quality instrument.

1.2 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Program [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

1.3 Pre-Sampling Procedures

Prior to use in the field, the water quality instrument will be calibrated according to the manufacturer's recommendation. Calibration will be documented on a calibration log.

1.4 Procedure

For each sampling event and at each station, water depth and in situ water quality parameters (temperature, dissolved oxygen [DO], pH, and salinity) will be collected. Water quality parameters and water depth will be recorded on a field data sheet or in the field electronic data deliverable (EDD).

The water depth at each station will be recorded using a probe or lead line. Water quality will be measured in situ at the station by immersing a multi-parameter instrument into the water at the desired depths. The instrument must equilibrate for at least one minute before collecting temperature, pH, conductivity, or salinity measurements, and at least 90 seconds before collecting DO measurements. Because DO takes the longest to stabilize, this parameter will be recorded after temperature, pH, conductivity, or salinity. See the surface water ambient monitoring program (SWAMP) SOP for additional details on the collection of field parameters (MPSL-DFG 2007). Water quality measurements will be collected at three depths during wet and dry weather events (surface [-3 feet below], mid-water column [to be determined in the field], and bottom [3 feet above mudline]).

1.4.1 Observations

- Water appearance – Record general appearance (e.g., color; unusual amount of suspended matter, debris, or foam)
- Water temperature
- pH (standard units)
- DO
- Conductivity/salinity

- Weather – Record recent meteorological events that may have impacted water quality (e.g., heavy rains, cold front, very dry, very wet)
- Biological Activity – Record excessive macrophyte, phytoplankton, or periphyton growth. The observation of water color and excessive algal growth is very important in explaining high chlorophyll values. Also record other observations, such as presence of fish, birds, and spawning fish.

1.5 Quality Assurance/Quality Control

Guidance for data quality objectives (DQOs) for field measurements is derived from the SWAMP guidance for water parameters (SWRCB 2017). Quality objectives for parameters that will be measured in the field are presented in Table 1.

Field measurements will be made in triplicate on five percent of the measurements. Each result will be recorded along with the average of the three results, the difference between the largest and smallest result, and the percent difference between the largest and smallest result. The percent difference will be calculated as follows:

Percent difference = 100*(largest-smallest)/average

Triplicate measurements, the average of the results, and percent difference will be recorded on the field data sheet. The percent difference will be compared against the precision criteria established for field measurements in Table 1, as appropriate. If precision does not meet the established criteria, the equipment should be inspected to ensure that it is working properly. Equipment will be recalibrated, if necessary, and then the triplicate measurements process will be repeated until DQOs are achieved.

Table 1
DQOs for Field Measurements

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Water	Depth (m)	± 0.1 m	± 0.1 m	NA	NA	NA
Water	Temperature (^{0}C)	± 0.5 ^{0}C	± 0.5 ^{0}C	NA	NA	NA
Water	pH	± 0.2 units	± 0.2 units	NA	NA	NA
Water	Dissolved oxygen	± 0.2 mg/L	5 percent	NA	NA	NA
Water	Salinity[1] (ppt)	± 0.2 ppt	± 0.2 ppt	NA	NA	NA

Notes:
1. The value for salinity may be computed from specific conductance provided salinity is above 3 ppt based on previous observations at or near that location.

°C: degrees Celsius
m: meter
mg/L: milligram per liter
NA: not applicable
ppt: parts per thousand

Standard Operating Procedure:
Surface Sediment Grab Sampling

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________ Project Name: ______________________________

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection of surface sediment samples using a Van Veen grab sampler (or similar). Surface sediment samples will be collected at locations described in the Coordinated Compliance Monitoring and Reporting Plan (CCMRP).

1.2 Purpose

The purpose of sediment sampling is to obtain data on localized community structure of infaunal invertebrate assemblages, sediment chemistry for contaminants of concern, and sediment toxicity.

1.3 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., CCMRP and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

1.4 General Procedures

The Field Team Leader is responsible for collecting all of the required information associated with each station occupation and each grab sampling event. While the field computer is the preferred method of collecting these data, paper data forms may be used. The required station occupation information includes the following:

- Station ID
- Date
- Vessel name
- System used for navigation
- Weather and sea conditions
- Latitude and longitude
- Depth
- Distance from station target location

1.5 Grab Sampling Procedures

Surface sediment samples will be collected at each station. Multiple grab samples will be required at each station to provide sufficient sediment volumes to complete all analyses required for the Sediment Quality Objectives (SQO) Part 1 assessment (Bay et al. 2014). The grabs will be numbered sequentially; grab numbers, visual observations, and the type of sample each grab was used for (e.g. benthic infauna, chemistry, or toxicity) will be recorded on datasheets. For benthic infauna processing, the entire grab sample will be processed. For grab samples used for chemistry and toxicity analyses, only the top 5 centimeters (cm) will be collected.

1.6 Deployment and Retrieval of the Grab Sampler

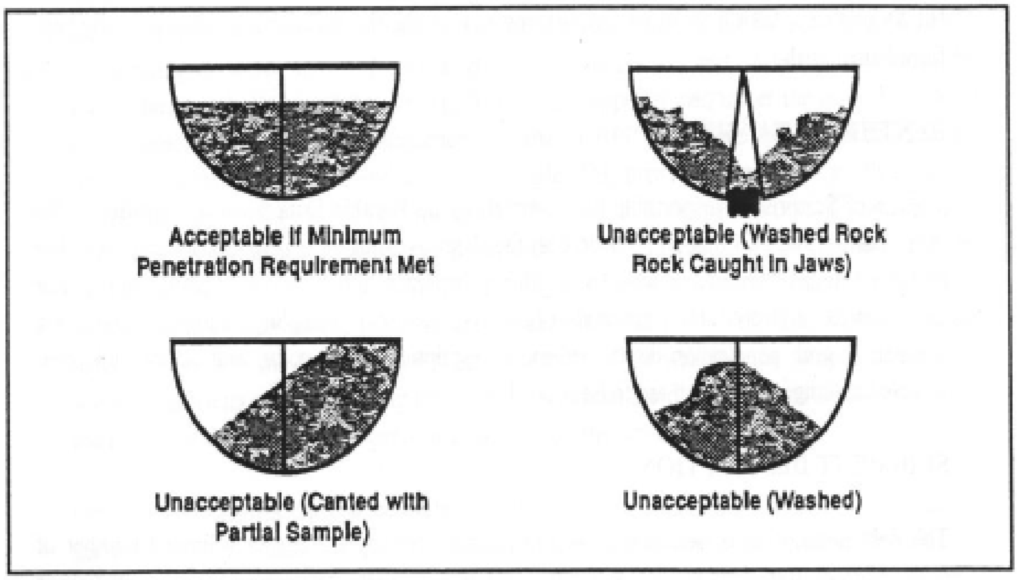
Prior to deployment, the grab sampler will be cocked with the safety key in place, then hoisted over the side of the vessel and the safety key removed. The grab sampler will be lowered at up to 2 meters per second (m/sec) until it is approximately 5 m above the bottom, then lowered at 1 m/sec to minimize the effects of bow wave disturbance of the surface sediment. In water depths greater than 300 m, the rate of deployment may have to be reduced to less than 1 m/sec to avoid “kiting” of the grab sampler or premature tripping in the water column. After bottom contact has been made (indicated by slack in the winch wire), the tension on the wire will slowly be increased, causing the lever arms to close the grab sampler. Once the grab sampler is back on board, the top doors will be opened for inspection.

While a radius limit of 100 m (200 m for island stratum) has been established for sampling, once sampling processes have begun, the Field Team Leader will ensure that the vessel remains in the same position with as much precision as conditions allow. Because analytical results from separate grab samples will be used to characterize the benthic community, contaminant load, and toxicity of the sediment, each successive grab must be collected as close as possible to the others.

1.7 Criteria for Acceptable Grab Samples

Sample acceptance criteria are shown in Figure 1. Upon retrieval of the grab sampler, the acceptability of the sample must be determined. Acceptability is based on two characteristics: sample condition and depth of penetration. Sample condition will be judged using criteria for surface disturbance, leakage, canting, and washing.

Figure 1
Examples of Acceptable and Unacceptable Grab Sample Conditions



A grab sample will be judged acceptable if the sediment has an even surface with minimal disturbance and little or no leakage of the overlying water (see Figure 1). Heavily canted samples will be unacceptable. Samples with a large amount of humping along the midline of the grab, which indicates washing of the sample during retrieval, will also be unacceptable. While some humping will be evident in samples taken from firm sediment where penetration has been poor, this can be due to the closing action of the grab and is not necessarily evidence of unacceptable washing.

If the sample condition is acceptable, the overlying water will be drained off and the depth of penetration will be determined by insertion of a plastic (rather than metal) ruler vertically along the grab midline and measuring to the nearest 0.5 cm. Sediment penetration depth must be at least 5 cm; however, penetration depths of 7 to more than 10 cm should be obtained in silt (fine sand to clay). In habitats where sediments are unusually soft, it may be necessary to remove the lead weights to prevent the grab sampler from toppling onto its side, deeming the sample unacceptable.

Extra caution should be taken to drain the overlying water from the grabs for chemistry and toxicity samples. It is recommended that a siphon be employed for these grab samples to avoid disturbance and loss of the surface sediments. The overlying water in grabs intended for infaunal samples may be drained by slightly opening the jaws of the grab and allowing the water to run off, as long as all drained water is captured for screening with the sediments.

If both sample condition and penetration are acceptable in the first grab, sampling at the station will proceed. It is required that all of the grabs taken at a station be of similar sediment type and depth penetration.

If sampling success at a particular station is inconsistent, the site may be abandoned after a minimum of nine attempts. The reason for site abandonment must be documented. The station should be relocated within the radius limit and +/-10% of the depth of the target site. If a station is relocated, the new coordinates should be recorded in the field computer or on a datasheet.

1.8 Sample Processing

Sediment sample processing and handling for purposes of sediment chemical analyses, sediment toxicity, and benthic infauna assessment in support of the SQOs Part 1 assessment will be performed in accordance with procedures specified in the *Sediment Quality Assessment Technical Support Manual* (Bay et al. 2014) and the Bight Field Operations Manual (BFSLC 2018). The following information will be recorded for each grab:

- Time when the grab reaches the sediment surface
- Sediment composition (type)
- Sediment odor
- Sediment color
- Presence of shell hash (note if 50% or greater)
- Sample types produced from sediment grab

Methods for processing samples are described in the corresponding SOPs for each type of sample. Recommended conditions for sampling containers, sample handling, and storage are listed in Table 11 of the CCMRP.

1.9 Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check and ensure that the sampling procedures are in conformance with those stated in this SOP.

Standard Operating Procedure:
Sediment Chemistry Sample Processing

1 Standard Operating Procedure Acknowledgement Form

Project Number: ________________ Project Name: ____________________________________

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to processing of sediment grabs for chemical analyses. Surface sediment grab samples will be collected using a Van Veen sampler, or a similar sampling device, as appropriate for the type of sediment sample being collected, as is described in the Bight Field Operations Manual, Section 8 (BFSLC 2018) and the corresponding SOP *Surface Sediment Grab Sampling*.

1.2 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., Coordinated Compliance Monitoring and Recording Plan [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Specialized training is not required for sample processing; however, field staff will be supervised by experienced staff.

1.3 Processing Sediment Samples for Chemical Analyses

Multiple grabs may be necessary to obtain sufficient sediment for chemical analyses. Sediment samples will be collected by scooping the top 5 centimeters (cm) of the undisturbed surface material with a stainless-steel spoon into a Teflon sediment bag. Sediment within 1 cm of the metal sides of the grab will be avoided to prevent sample contamination. Once the necessary volume is acquired, the sediment will be homogenized according to revised Southern California Regional Bight Monitoring Program field methods (BFSLC 2018) by massaging, kneading, and squeezing the bag for 3 to 5 minutes with gloved hands while twisting the top of the bag to keep it closed. Once thoroughly mixed, a stainless-steel spoon will be used to transfer the sediment into sample containers (Table 1). Samples will be stored at 0 to 4 degrees Celsius. Equipment will be decontaminated prior to use at each station.

Table 1
Sample Containers and Holding Conditions

<table>
<tr><th>Parameter</th><th>Sample Size</th><th>Container Size and Type</th><th>Holding Time</th><th>Preservative</th></tr>
<tr><td colspan="5">Sediment</td></tr>
<tr><td>Total solids</td><td>10 g</td><td>8-oz glass</td><td>14 days</td><td>Cool ≤6°C</td></tr>
<tr><td>Grain size</td><td>300 g</td><td>16-oz plastic</td><td>6 months</td><td>Cool ≤6°C</td></tr>
<tr><td rowspan="2">Total organic carbon</td><td rowspan="2">10 g</td><td rowspan="2">4-oz glass</td><td>28 days</td><td>H_2SO_4; pH < 2;Cool ≤6°C</td></tr>
<tr><td>1 year, if frozen within 28 days of collection</td><td>Freeze -20°C</td></tr>
<tr><td>Total metals and</td><td>100 g</td><td>4-oz glass</td><td>6 months</td><td>None</td></tr>
</table>

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
mercury			1 year; samples must be analyzed within 14 days of thawing	Freeze -20°C[c]
Polycyclic aromatic hydrocarbons/ DDT and derivatives	500 g	Two 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
PCB congeners	500 g	Two 8-oz glass	None[1]	Cool ≤6°C
				Freeze -20°C

Notes:
Some criteria may differ from SWAMP guidance but are consistent with analytical method criteria.
Recommendations are intended as guidance only. The selection of a sample container and the amount of sample required may vary per contracted laboratory sampling requirements.
1. Volume of sediment collected must be sufficient to produce a minimum of 40 mL of porewater.
°C: degrees Celsius
DDT: dichlorodiphenyltrichloroethane
g: gram
oz: ounce
PCB: polychlorinated biphenyl
SWAMP: California Surface Water Ambient Monitoring Program

1.4 Quality Assurance/Quality Control

Quality control procedures will consist of following standard practices for the collection of water quality samples. Entries in the field forms and on sample container labels will be double checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Team Leader to periodically check and ensure that sediment chemistry sample processing procedures are in conformance with those stated in this SOP.

Field quality assurance/quality control samples to be collected are included in Table 2.

Table 2
Frequencies and Performance Criteria for Field Quality Assurance/Quality Control Sampling

Analysis Type	Field Duplicate	Field Duplicate Performance Criteria[1,2]	Field and Rinse Blank[3]	Field and Rinse Performance Criteria[4]
Total 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
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
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
DDT and derivatives	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:
1. Field duplicate RPD exceedances alone would not result in data qualification. Further evaluation into the sample collection procedures should be conducted.
2. This criteria is a slight deviation from SWAMP due to the ultra-low detection levels utilized for these studies.

DDT: dichlorodiphenyltrichloroethane
NA: not applicable
PCB: polychlorinated biphenyl
RL: recording limit
RPD: relative percent difference

Standard Operating Procedure: Sediment Toxicity Sample Processing

1 Standard Operating Procedure Acknowledgement Form

Project Number: ________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to processing of sediment grabs for toxicity analyses. Surface sediment grab sampling procedures will be collected using a Van Veen sampler or similar sampling device as appropriate for the type of sediment sample being collected, as described in the *Bight Field Operations Manual*, Section 8 (BFSLC 2018) and the corresponding SOP *Surface Sediment Grab Sampling*.

1.2 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and the corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Plan [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Specialized training is not required for sample processing; however, all field staff will be supervised by experienced staff.

1.3 Processing Sediment Samples for Toxicity Tests

Sediment will be collected for an acute amphipod toxicity test and the sediment-water interface (SWI) test. Multiple grabs may be necessary to obtain sufficient sediment for both tests. The SWI test is used to assess toxicity of solid phase sediment samples using the embryo or larval stages of marine and estuarine invertebrates.

Sediment samples will be collected by scooping the top 5 cm of the undisturbed surface material with a stainless-steel spoon into a stainless-steel bowl. Sediment within 1 cm of the metal sides of the grab will be avoided to prevent sample contamination. Sediment for both the amphipod and SWI test will be homogenized and placed into a single Teflon bag placed within a polypropylene sediment bag. Once the necessary volume is acquired, the sediment will be homogenized by massaging, kneading, and squeezing the bag for 3 to 5 minutes with gloved hands while twisting the top of the bag to keep it closed. After an appropriate volume is subsampled for chemistry (see SOP Sediment Chemistry Sample Processing), the remaining sediment will be submitted to the bioassay laboratory for the acute amphipod survival and the chronic, sub-lethal SWI toxicity tests. Samples will be stored at 0 to 4 degrees Celsius.

Equipment will be decontaminated prior to use at each station.

1.4 Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check and ensure that the sediment toxicity sample processing procedures are in conformance with those stated in this SOP.

Standard Operating Procedure: Sediment Toxicity Testing

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________________ Project Name: ____________________

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) provides a description of the sediment toxicity test methods specified under the draft Sediment Quality Objective (SQO; Bay et al. 2014) policy. It is intended to supplement published toxicity protocols by providing information on specific aspects of the methods that are used in many California monitoring programs so that future analyses will yield comparable and high-quality results.

1.2 Purpose

Sediment toxicity provides two types of information in this assessment: 1) the potential bioavailability of contaminants and 2) a measure of contaminant biological effects. Multiple toxicity tests are needed to assess toxicity because no single method exists that can capture the full spectrum of potential contaminant effects.

1.3 Procedures

Toxicity assessment under the SQO framework requires two types of tests: a short-term amphipod survival test and a sub-lethal test.

1.3.1 Species

The short-term amphipod survival test will be performed with *Eohaustorius estuarius,* except for sediments with a high percent of fines, in which case *Leptocheirus plumulosus* will be used. The sub-lethal test will consist of the sediment-water interface test (SWI) with the bivalve, *Mytilus galloprovincialis*.

1.3.2 Sample Preparation

The amphipod survival tests should be started within one month of sample collection and SWI tests within 2 weeks of sample collection in order to minimize potential changes in toxicity due to storage. Samples should be tested as soon after collection as possible in order to minimize the potential for changes in sediment quality during storage.

Sediment for the amphipod survival tests and SWI toxicity tests should be homogenized together in accordance with Bight Program protocols and press-sieved[1] in order to remove native animals that might be either predators or the same species as a test organism. Press-sieving consists of forcing the sediment through a 2-millimeter mesh screen without adding water beyond that which is already naturally associated with the sample.

[1] Press-sieving is recommended if homogenized sediments are to be used in the SWI test (Bay et al 2014).

1.3.3 Animal Acclimation

With respect to temperature and salinity, the test animals used in each method must be acclimated to test conditions within each laboratory prior to the start of testing. The acclimation period required for each species is variable.

1.3.4 Test Setup

Refer to U.S. Environmental Protection Agency (1994) and American Society for Testing and Materials (1996) methods for the amphipod survival test and Bight methods (Bay et al. 2014) for SWI test methods. Required test conditions are summarized in Table 1.

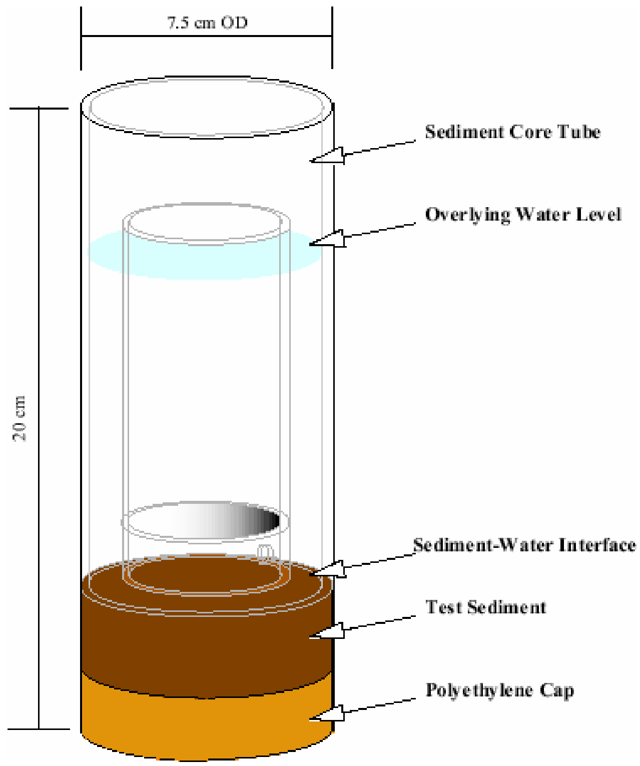
Table 1
Required Test Conditions for Sediment-Water Interface Test

Parameter	Amphipod Survival		SWI Test
	Eohaustorius estuarius	***Leptocheirus plumulosus***	***Mytilus galloprovincialis***
Temperature	15 ±1°C	25 ±1°C	15 ±1°C
Salinity	20 ±2 ppt	20 ±2 ppt	32 ±2 ppt
Luminance	500-1000 lux	500-1000 lux	500-1000 lux
Photoperiod	Continuous light	Continuous light	16:8 hours light:dark
Acclimation	2-10 days at test temperature and salinity	2-10 days at test temperature and salinity	2 days at test temperature and salinity; up to 4 weeks
Size and life stage	3 - 5 mm	2 - 4 mm, no mature animals	Newly fertilized eggs
Number of organisms/chamber	20	20	250
Number of replicates/treatment	5	5	4
Aeration	Enough to maintain 90% saturation	Enough to maintain 90% saturation	Enough to maintain 90% saturation
Feeding	None	None	None
Test duration	10 days	10 days	48 hours
Test acceptability criteria	Mean control survival of ≥90 and ≥80% survival in each replicate	Mean control survival of ≥90 and ≥80% survival in each replicate	Mean control percent normal-alive of ≥80%; meet all water quality limits
Grain size tolerance	0.6-100% sand	0-100% sand	0-100% sand
Ammonia tolerance	<60 (total, mg/L)	<60 (total, mg/L)	< 4 (total, mg/L)
Total sulfide tolerance	1.9 mg/L	Not available	< 0.09 (mg/L)

Notes:
°C: degrees Celsius
mg/L: milligrams per liter
mg: milligrams
ppt: parts per thousand
SWI: sediment-water interface (test)

The SWI test chambers should mimic the setup shown in Figure 1.

Figure 1
Sediment-Water Test Chamber



Five centimeters of homogenized sediment will be placed into test chambers (glass or polycarbonate core tube 7.5 centimeters [cm] in diameter). Then 300 mL of 32 ppt, 15 degrees Celsius seawater will be added to the test chamber. Approximately 2 cm of free space should be left at the surface to accommodate inclusion of an aerator and screen tube in the test chamber. There must be at least 8 cm between the top of the sediment and the top of the core tube in order to allow room for the screen tube that will hold the embryos for the test. A minimum of four chambers should be set up for toxicity testing from each station. At least one additional chamber should be collected for water quality measurements.

1.4 Personnel Qualifications

Laboratories will be accredited by California Environmental Laboratory Accreditation Program/National Environmental Laboratory Accreditation Program (ELAP/NELAP) for toxicological analyses. Laboratory personnel will be sufficiently trained and demonstrate proficiency in test methods.

1.5 Quality Assurance/Quality Control

A 10-day, water-only reference toxicant test using cadmium or ammonia should be performed simultaneously with each set of field samples tested. Whichever reference toxicant is chosen, each laboratory must establish a control chart consisting of at least three tests and no more than the 20 most recent tests.

The half maximal Effective Concentration (EC50) is the concentration of a toxicant that induces a response (i.e., percent mortality) that is halfway between the baseline and maximum possible effect. The EC50 for un-ionized ammonia or cadmium for each test performed should fall within two standard deviations of the mean of the previous tests on the control chart. A test falling outside two standard deviations should trigger a review of all data and test procedures to assure that the data are of good quality.

All test batches must include a negative control. The negative control should consist of sediment from the amphipod collection site or sediment with as little known contamination as possible. The control also must have previously demonstrated that it meets test control acceptability requirements. If any of the chambers within a test exceed this ammonia concentration, 50% of the overlying water in all chambers within the experiment may be changed up to twice per day until all are below the target concentration. The mean control survival for each test batch must be 90% or greater. Individually, each control replicate must have at least 80% survival. In addition, water quality parameters must be within acceptable limits, and initial size ranges for the amphipods must be followed.

Standard Operating Procedure:
Benthic Infauna Processing

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to processing of sediment grabs for benthic infauna community analyses. Surface sediment grab samples will be collected using a Van Veen sampler, or similar sampling device as appropriate for the type of sediment sample being collected, as described in the Bight Field Operations Manual, Section 8 (BFSLC 2018) and the corresponding SOP *Surface Sediment Grab Sampling*.

1.2 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and the corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Plan [CCMRP], Programmatic Quality Assurance Project Plan [PQAPP]). Specialized training is not required for sample processing; however, field staff will be trained and supervised by experienced staff.

1.3 Benthic Infaunal Sample Processing

After the sample description has been completed, the entire sediment grab sample intended for biological analysis is washed from the sampler through a 1.0-millimeter (mm) screen or sieve. The use of a sediment-washing table is recommended, but not required. The table is useful because it provides a flat, smooth surface over which to spread and wash the sample, providing a means of gently breaking up the sediment before it runs off the end of the table into the screen box. The screen box must be equipped with stainless steel mesh with 1.0-mm openings. Wire diameter should be similar to that found in the U.S. Standard 1.00-mm Sieve (i.e., 0.58 mm). The surface area of the screen should be adequate to easily accept the sample without buildup. Raw water used to wash the samples is to be filtered to prevent the introduction of surface-water organisms. Thoroughly wash the sediment from the sampler and transfer it to a sediment-washing table (or a screen box, metal sieve, etc.) for screening. An alternative sieving method for small vessels without wash water would involve semi-submerging the sieve in seawater and swirling it in the water (taking care to prevent the loss of grab organisms and/or the introduction of surface water organisms) until the sediment washes away.

All the water drained from the sampler and used to wash the sampler must be captured and subsequently processed through screening. Typically, a tub (greater than 70-liter [L] capacity) is positioned under the grab. While washing the sample, control the water pressure to avoid damaging the organisms. Minimize direct application of water from the hose to the material and organisms collecting on the screen.

Once the sample has been washed through the screen, transfer the material (debris, coarse sediment, and organisms) retained on the screen to a sample container. Label the sample container with an external label containing the station name, sample type, date, and split number (e.g., 1 of 1, 2 of 3, etc.). An internal label bearing the same information should be placed inside the infaunal samples. This label can be written in pencil or indelible ink on 100% rag paper, poly paper, or other paper of a quality suitable for wet labels. The sample container must have a screw-cap closure and be sufficiently large to accommodate the sample material with a head space of at least 30% of the container volume. A sample may be split between two or more containers. However, each container must have external and internal labels (as described above) with the appropriate split number clearly marked. Field crews should have a broad range of sample container sizes available to them, with none less than a 16-ounce (0.47-L) capacity.

Gently remove the material retained on the screen, taking care to avoid damaging the organisms. The sample container should be filled to approximately 50% to 70% of capacity with screened material. After the bulk of material has been transferred to the container, closely examine the screen for any organisms caught in the mesh. Remove any organisms with forceps and add them to the sample container. Thoroughly wash the screen box and scrub the mesh before the next sample is screened.

All infaunal samples will be treated with a relaxant solution for approximately 30 minutes prior to fixation. Either an Epsom salts ($MgSO_4$) solution or a propylene phenoxytol solution (formulations below) may be used for this purpose. Relaxant solutions may be used as the diluent water for the fixative, or may be decanted after exposure and replaced with 10% buffered formalin. If it is used as diluent water, fill the sample container to 85% to 90% of its volume, close the container, and invert it several times to distribute the solution. Leave the sample in the relaxant. After 30 minutes, top off the container with enough sodium borate buffered formaldehyde to achieve a 10% formalin solution. Close the container once again, and invert it several times to ensure mixing. Store the sample for return to the laboratory.

If the relaxant solution is not used as the diluent water, the relaxant must be removed from the sample container and replaced with 10% buffered formalin. After 30 minutes of treatment, decant the relaxant from the sample through a screen with a mesh size of 1.0 mm or less. Ensure that all organisms are removed from the screen and placed in the sample container. Fill the container with sodium borate buffered 10% formalin rather than undiluted formaldehyde, close the container, invert it several times, and store it for return to the laboratory.

Relaxant and fixative stock solution alternatives are as follows:

1) Epsom salts relaxant solution:	1.5 kilograms (kg) Epsom salts ($MgSO_4$ at $7H_2O$) per 20 L of freshwater
2) Propylene phenoxytol solution:	30 mL propylene phenoxytol to 20 L of seawater
3) Buffered formalin solution:	50 g sodium borate ($Na_2B_4O_7$) per 1 L of formalin
4) Buffered 10% formalin solution:	1 part buffered formalin to 9 parts fresh or salt water

1.4 Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check and ensure that the sampling procedures are in conformance with those stated in this SOP.

Standard Operating Procedure:
Benthic Infauna Community Analysis

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

The goal of this Standard Operating Procedure (SOP) is to provide recommendations for laboratory processing, quality assurance (QA), quality control (QC), and data analysis procedures that are recommended for assessing the condition of soft bottom benthic macroinvertebrate communities of California's bays and estuaries. It is intended to supplement protocols presently used in California with regard to methods that meet the requirements of the sediment quality assessment framework contained in the draft Sediment Quality Objectives (SQO) policy.

Benthic infauna analyses will be conducted in accordance with Sediment Quality Assessment Draft Technical Support Manual (Bay et al. 2014). Chapter 5 of the Sediment Quality Assessment Draft Technical Support Manual (Bay et al. 2014) details recommended laboratory procedures for the processing of benthic infauna samples and subsequent data analysis necessary for the SQO Part 1 assessment.

1.2 Personnel Qualifications

Personnel performing benthic sorting of organisms into major phyla will have sufficient training and experience to perform this task. Taxonomists will have a combination of education and experience to identify organisms to species level. The Quality Control/Quality Assurance (QA/QC) procedures described below shall be used to verify accuracy.

1.3 Procedures

Benthic infauna sample processing in the laboratory includes the following tasks.

1.3.1 Sample Preservation

Samples that are received from the field in formalin fixative must be washed and transferred to alcohol preservative. The removal of formalin is necessary for two reasons. Formaldehyde becomes increasingly acidic over time and prolonged exposure damages organisms with calcareous structures (e.g., shelled mollusks) which are often essential for accurate identifications. Secondly, formaldehyde is a noxious, potentially dangerous chemical. Replacing formaldehyde with ethanol makes subsequent sample handling safer. Other benefits of the washing process are the removal of excess silt from mud balls and fecal pellets that may have broken down during fixation and, in some cases, the opportunity to separate most of the organisms in a sample from inorganic debris using an elutriation process (defined below).

Samples fixed in formalin in the field should remain in formalin fixative for at least 72 hours, but no sample should remain in fixative for longer than two weeks because formalin will decalcify mollusks and echinoderms. Benthic community samples should be preserved in a 70% ethanol solution. Denatured alcohol and dyes for staining organisms are not recommended. The alcohol preservative should be buffered with marble chips, especially if the ethanol is produced by industrial distillation rather than fermentation. Ethanol is commonly purchased as a 95% ethanol solution. To prepare 1 L of 70% ethanol solution, 263 ml of purified water (i.e., filtered and de-ionized by reverse osmosis) is added to 737 ml of 95% ethanol. If samples contain a high percent of crustaceans, it is recommended to substitute some water with glycerin (i.e., 70% ethanol, 25% purified water, 5% glycerin) to help maintain exoskeleton shape.

1.3.2 Sample Sorting

Organisms that were alive at time of collection are removed from the organic and inorganic residues (debris) that compose the sample. They are then sorted into broad taxonomic categories for analysis by taxonomists. Sorting must be accurate and complete to ensure the value of subsequent steps in the sample analysis process. Quality control procedures described in the following paragraphs are used to ensure that sorting accuracy and completeness meet data quality objectives.

Several sorting techniques are used for the removal of benthic organisms from sediment. Commonly, a small amount of sample is placed in a Petri dish, and each organism is systematically sorted and removed under a dissecting microscope using forceps. The elutriation or "floating" method is an effective technique when a sample is primarily coarse sand or highly organic. Inorganic material in the sample is separated from the lighter organic debris and organisms by the following elutriation process: After washing the formalin from the sample, spread the sample material out in a shallow pan or flat tray and cover with water. Gently agitate the sample by hand to allow the lighter fraction of debris and organisms to separate from the heavier material. The densest material settles to the bottom while the less dense material, such as organic material, arthropods, and other soft-bodied organisms, becomes suspended. The solution is then poured through the sieve and sorted. The denser material (i.e., sand grains and mollusks) is covered with water, so that it is more easily sorted and removed under a dissecting microscope. The water containing the lighter material should be decanted through a sieve, repeating the process several times until no more material is observed in the decanted water. Then the material in the decanted water is collected into a small sample container, topped with preservative, and returned to the original sample container along with the balance of the sample material. The sample container should be filled with preservative and its lid tightly affixed. Both containers should be labeled properly with internal labels.

It is generally recommended that sorting be done in 70% ethanol, with care taken to ensure that the sample being sorted is always fully covered with alcohol. It is not uncommon for Ophiuroidea to be removed from the ethanol and air dried to assist with identification. Organisms removed from the sample are sorted into taxonomic groups for subsequent taxonomic analysis. Remove all individual organisms and fragments from the sample with the exception of nematodes, foraminifera, and planktonic species or life stages. All fragments, such as decapod chelae and legs, should be placed in their respective taxa groups. The number and identity of taxa groups composing the sorted sample, the number of containers used if sample is split, and the time (to the nearest one-half hour) required to sort the sample should be recorded on the sorting record form.

Aggregate the taxa groups into one or more sample containers. It is generally recommended that each sample container and taxa group be internally labeled with station name, sampling date and depth, and split number (if more than one container is used). Labels should be written in pencil or indelible ink on 100% rag paper, poly paper, or other paper suitable for permanent wet labels.

1.3.3 Taxonomic Analysis

The purpose of sorting into taxonomic groups is to facilitate taxonomic analysis by project taxonomists, with each group being analyzed by a single taxonomist. Therefore, the specifics of taxonomic groups may vary with the number of project taxonomists available and the details of their taxonomic expertise.

Organisms in samples are identified and counted, voucher specimens are prepared to document identifications, and taxonomic analysis accuracy may be evaluated by reanalyzing selected samples.

1.3.4 Data Analysis to Determine Benthic Invertebrate Community Condition

The composition of the benthic community constitutes an essential line of evidence (LOE) for sediment quality assessment. The Benthic LOE is a direct measure of the effect that sediment contaminant exposure has on the benthic biota of California's bays and estuaries. Determination of the Benthic LOE is based on four measures of benthic community condition: 1) the Index of Biotic Integrity (IBI), 2) the Relative Benthic Index (RBI), 3) the Benthic Response Index (BRI), and 4) the River Invertebrate Prediction and Classification System (RIVPACS). This chapter includes computational tools for calculating the Benthic LOE category and provides an example of the step-by-step process for its determination.

1.4 Quality Assurance/Quality Control (QA/QC)

Quality control of sorting is essential to ensure the value of all the subsequent steps in the sample analysis process. A standard sorting form is usually used for tracking the sample. It includes the name of the technician responsible, time required for sorting, comments, and re-sorting results. Re-sorting of samples is employed for QC purposes. It is a good practice to have, at a minimum, 10 to 20% of all samples re-sorted to monitor sorter performance.

There are two recommended approaches used for re-sorting: the aliquot sample method and the whole sample method. A laboratory may choose one of these two methods but, for consistency, a single method should be employed by a laboratory for all samples in a single project. The re-sort method used should be noted on the sorting form along with the re-sort results.

- **Whole Sample Method**. At least 10% of the samples processed by each sorter are completely re-sorted.
- **Aliquot Method**. A representative aliquot of at least 10% of the sample volume of every sample processed by each sorter is re-sorted.

Regardless of the method employed, an experienced sorter other than the original sorter conducts all re-sorting. Percent sorting efficiency is calculated as follows:

Whole Sample Method:

$$\% \text{ Efficiency} = 100 \cdot [\#\text{Organisms}_{\text{sorted}} \div (\#\text{Organisms}_{\text{sorted}} + \#\text{Organisms}_{\text{from Re-sort}})]$$

Aliquot Method:

$$\% \text{ Efficiency} = 100 \cdot [\#\text{Organisms}_{\text{sorted}} \div (\#\text{Organisms}_{\text{sorted}} + \#\text{Organisms}_{\text{from Re-sort}} \cdot \%_{\text{aliquot}})]$$

If sorting efficiency is greater than 95% (i.e., no more than 5% of the organisms in the original sample are missed), then no further action is required. Sorting efficiencies below 95% initiate continuous monitoring of the underperforming technician. Failure to achieve 95% sorting efficiency initiates re-sorting of all samples previously sorted by that technician. Organisms found during re-sort should be included in the results from the sample. The calculated sorting efficiency is recorded on the sorting form for each sample that is re-sorted. The laboratory responsible for sorting should retain sample debris left after sorting until cleared for disposal. The debris should be properly labeled and preserved with 70% ethanol. Specific attention should be given to nomenclature rules because this information significantly affects the efficiency of the benthic indices calculations and QA/QC procedures. Species lists provided should be strictly adhered to, and the most up-to-date taxon names and exact spelling of taxon names based on the species lists should be used. Doing so will prevent miscounting of key organisms and erroneous benthic indices calculations.

Standard Operating Procedure:
Fish Collection (Otter Trawl Nets)

1 Standard Operating Procedure Acknowledgement Form

Project Number: __________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection of targeted fish species via otter trawling. Fish tissue samples will be collected and analyzed for chemical contaminants of concern. Sampling, processing, and testing methods will be carried out in accordance with Bight protocols (BFSLC 2018; BCEC 2009). Necessary permits (e.g., scientific collection, incidental take) will be secured prior to fish collection.

Targeted species:

- White croaker (*Genyonemus lineatus*)
- California halibut (*Paralichthys californicus*)
- Shiner surfperch (*Cymatogaster aggregata*)

1.2 Health and Safety Warnings

Use caution when sorting through the catch. Field personnel are likely to encounter a variety of organisms that are potentially harmful. California scorpionfish (*Scorpaena guttata*) have venomous fin spines that can cause severe pain. This species should be handled with leather gloves and/or pliers. Hot water, meat tenderizer, or ammonia should be applied to any puncture wound inflicted by this fish; heat is useful in breaking down the protein in the venom. Several species of rockfishes and the spotted ratfish (*Hydrolagus colliei*) also have mildly venomous spines that can cause a burning sensation. The round sting ray (*Urobatis halleri*), the California butterfly ray (*Gymnura marmorata*), and the bat ray (*Myliobatis californica*) all have venomous spines on their tails. The wound should be immersed in hot water to break down the protein in the venom. The Pacific electric ray (*Torpedo californica*) can emit a very strong electric shock. If you must handle this species, wear rubber gloves and hold it by the tail. Do not grasp the disk with both hands. Pacific angel sharks (*Squatina californica*), spiny dogfish (*Squalus acanthias*), spotted ratfish, Pacific electric rays, and California halibut (*Paralichthys californicus*) all have sharp teeth that can result in painful bites if they are not handled properly. Care must also be taken in handling the blueleg mantis shrimp (*Hemisquilla ensigera*). This species is capable of severely cutting a person with its raptorial appendages. Care should also be taken in handling any of the large crabs and octopi.

1.3 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Plan [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection. Personnel performing species identifications will have sufficient education and project experience in marine biology and ichthyology.

1.4 Procedures

When possible, fish will be collected using a semi-balloon, 7.6-meter headrope otter trawl following the methods in the Bight Field Operations Manual (BFSLC 2018). 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), surface water ambient monitoring program (SWAMP) methods will be used (MPSL-DFG 2001).

Pre-Trawl Survey

Prior to trawling at a new station, it is important to conduct a pre-trawl survey of the trawl course. Trawl gear is likely to be lost if it becomes snagged on bottom obstructions, and replacement of nets can be costly. The trawl course at a previously unsampled station should be evaluated by use of a fathometer. This pre-trawl survey can enable the navigator to avoid uncharted reefs and other obstacles. If obstacles are encountered, resurvey a new trawl course. The Field Team Leader has the sole authority to decide whether to trawl or abandon an unknown station. This survey should always be conducted at a new sampling site to determine whether the station is acceptable or if it should be abandoned. The pre-trawl survey should follow the expected trawl course along the isobath, and the fathometer will be examined for evidence of rocks and other obstacles.

If the first run indicates that a particular site is unacceptable, another survey will be conducted within 100 meters (m) or the original location and within +/-10% of the original depth. If this attempt is unsuccessful, a third attempt will be conducted at a different location using the same protocols (within 100 m of the original location, and within +/-10% of original depth). The site will be abandoned after three unsuccessful attempts.

Net Preparation

The trawl components should be properly prepared prior to trawling so that the trawl can be deployed in an orderly and safe manner upon arrival at a station. Nets should be inspected for holes prior to deployment, and repaired as needed. The net should be laid out and stacked on the stern of the vessel in the same configuration that it will be deployed: cod-end to the stern, floats up, and foot rope down. The trawl net should be checked to make sure that the cod-end is tied correctly, the doors should be connected properly to the leg lines, and the bridles should be securely fastened to the doors and to the tow wire.

Trawling

Trawls will be towed along, rather than across, isobaths. While the vessel is underway, the net and doors will be placed in the water. It is important that the floats skim the surface and that the net is not entangled (e.g., crossed leg lines, bunched or hooked portions of the net) prior to paying out the bridles. The bridles should be paid out by personnel on either side of the net, so as to avoid becoming entangled in the rigging during deployment.

Use of the proper scope (i.e., length of hydrowire paid out versus the water depth) is important for successful trawls. After the net touches the bottom, a sufficient length of hydrowire (towing wire) should be paid out to ensure that the net is pulled from a horizontal rather than a vertical position. Insufficient scope will prevent the net from consistently fishing the bottom and will result in a no-catch or a short-catch situation. In general, the required scope declines with increasing depth because the additional weight of the hydrowire enhances the horizontal component of the towing forces (Table 1).

Table 1
Recommended Scope and Length of Wire for Trawling at Different Depths in the Southern California Bight

Water Depth (m)	Tow Wire Out (m)[1]	Approximate Scope (m)
<5	50	10.0:1
10	80	8.0:1
30	180	6.0:1
60	300	5.0:1
100	400	4.0:1
150	550	3.6:1
175	625	3.5:1
200	700	3.5:1
500	1,100	2.2:1

Notes:
1. Note that 25 m of bridle is included in this scope
m: meter

These scopes are for 1.0-centimeter (cm) (0.38-inch [in]) hydrowire. These scopes will have to be adjusted accordingly when using hydrowire of a different diameter.

Trawling is conducted at a speed-over-ground of 1.0 meter per second (m/sec) (or 1.5 to 2.0 knots). At stations of less than 200 m water depth, the net is towed for 10 minutes, measured on deck from the start to the end of the trawl (i.e., lock down of winch to start of retrieval). Under normal circumstances, this distance over ground is equivalent to 450 to 600 m. Trawl speed and distance can be determined by differential global positioning system (DGPS). In confined areas (e.g., bays and harbors) the trawl duration may be reduced to 5 minutes, or a distance over ground of 225 to 300 m.

Trawls are conducted in a similar manner at stations exceeding depths of 200 m. Archival tags will be employed at these stations to verify on-bottom duration. While 10 minutes on the bottom is the nominal target time for each trawl, a working range of 8 to 15 minutes is acceptable. Upon completion of each trawl, the archival tag information will be immediately downloaded to determine the on-bottom duration. If bottom time is less than 8 minutes, the trawl will be repeated, adjusting the deployment duration as necessary to fall as close to10 minutes as possible.

All archival tag information should be retained electronically and submitted with the other data types at the end of the project.

At the end of the prescribed trawl time, the net will be retrieved and brought on board the vessel, the cod-end will be opened, and the catch will be deposited into a tub or holding tank. The catch will subsequently be released to the scientific crew for processing.

Criteria for Accepting a Trawl

If a trawl is retrieved with little or no catch in the cod-end, its acceptability will be evaluated according to whether the trawl was conducted properly. The criteria used to evaluate the success of any trawl will include ensuring that proper depth, scope, speed, and distance (or duration) were maintained; whether the net was fouled (net tangled); and whether the catch shows evidence that it was on the bottom (e.g., rocks, benthic invertebrates, or fish). If any of the trawl procedures were not followed, if the net was fouled or torn (the tear must be sufficient to allow escapement), or if there was no evidence of contact with the bottom (downloading the archival tag information can be useful), the trawl will be considered unacceptable and the site will be re-trawled. When evaluating whether to abandon or re-trawl a station, the Field Team Leader should keep in mind that the goal is to collect the targeted species.

If a retrieved net has been sufficiently torn to allow escapement during the course of a trawl, the station will be abandoned. If the trawl hangs up on the bottom, the site will be resampled or abandoned at the discretion of the Field Team Leader. If re-trawling the station proves unsuccessful after two further attempts, the site will be abandoned.

Trawl Data Log

If for any reason the field computer stops functioning, the field crew will be responsible for keeping a trawl data log. The information recorded in the log will include water depth, length of tow wire used, and times and coordinates (latitude and longitude) for the net on the bottom and the end of the trawl (beginning of trawl retrieval). Similar information may also be recorded for when the net was deployed (net over) and when the net was retrieved (net on deck). Any anomalous conditions, such as rocky substrate, rocks in the catch, or a torn net, should also be recorded in the log.

1.5 Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that fish collection procedures are in conformance with those stated in this SOP.

Standard Operating Procedure: Fish Collection (All Other Methods)

1 Standard Operating Procedure Acknowledgement Form

Project Number: ______________ Project Name: ______________________________

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection of targeted fish species via methods other than otter trawling (i.e., lampara net, beach seine, fish trap, or hook and line). Fish tissue samples will be collected and analyzed for chemical contaminants of concern. Sampling, processing, and testing methods will be carried out in accordance with surface water ambient monitoring program (SWAMP) methods (MPSL-DFG 2001). Necessary permits (e.g., scientific collection, incidental take) will be secured prior to fish collection.

Targeted species:

- White croaker (*Genyonemus lineatus*)
- California halibut (*Paralichthys californicus*)
- Shiner surfperch (*Cymatogaster aggregata*)

1.2 Health and Safety Warnings

Use caution when sorting through the catch. Field personnel are likely to encounter a variety of organisms that are potentially harmful. California scorpionfish (*Scorpaena guttata*) have venomous fin spines that can cause severe pain. This species should be handled with leather gloves and/or pliers. Hot water, meat tenderizer, or ammonia should be applied to any puncture wound inflicted by this fish; heat is useful in breaking down the protein in the venom. Several species of rockfishes and the spotted ratfish (*Hydrolagus colliei*) also have mildly venomous spines that can cause a burning sensation. The round sting ray (*Urobatis halleri*), the California butterfly ray (*Gymnura marmorata*), and the bat ray (*Myliobatis californica*) all have venomous spines on their tails. The wound should be immersed in hot water to break down the protein in the venom. The Pacific electric ray (*Torpedo californica*) can emit a very strong electric shock. If you must handle this species, wear rubber gloves and hold it by the tail. Do not grasp the disk with both hands. Pacific angel sharks (*Squatina californica*), spiny dogfish (*Squalus acanthias*), spotted ratfish, Pacific electric rays, and California halibut (*Paralichthys californicus*) all have sharp teeth that can result in painful bites if they are not handled properly. Care must also be taken in handling the blueleg mantis shrimp (*Hemisquilla ensigera*). This species is capable of severely cutting a person with its raptorial appendages. Care should also be taken in handling any of the large crabs and octopi.

1.3 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this SOP and corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Plan [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection. Personnel performing species identifications will have sufficient education and project experience in marine biology and ichthyology.

1.4 Procedures

Fish will be collected using the appropriate gear for the desired species and existing water conditions.

Fyke or Hoop Net

Six 36-inch-diameter hoops connected with 1-inch square mesh net will be used to collect fish, primarily catfish. The net will be placed parallel to the shore with the open hoop end facing downstream. The net will be placed in areas of slow moving water. A partially opened can of cat food will be placed in the upstream end of the net. Between two and six nets will be placed at a site overnight. Upon retrieval a grappling hook will be used to pull up the downstream anchor. The hoops and net will be pulled together and placed on a 30-gallon plastic bag in the boat. With polyethylene gloves, the desired fish will be placed in a 30-gallon plastic bag and kept in an ice chest with ice until the appropriate number and size of fish are collected.

Gill Nets

A 100-yard monofilament gill net of the appropriate mesh size for the desired fish will be set out over the bow of the boat parallel to shore. The net will be retrieved after being set for 1 to 4 hours. The boat engine will be turned off and the net pulled over the side or bow of the boat. The net will be retrieved starting from the down-current end. If the current is too strong to pull in by hand, then the boat will be slowly motored forward and the net pulled over the bow. Before the net is brought into the boat, the fish will be picked out of the net, placed in another 30 gallon plastic bag, and kept in an ice chest with ice.

Beach Seines

In areas of shallow water, beach seines of the appropriate length, height, and mesh size will be used. One sampler in a wetsuit or waders will pull the beach seine out from shore. The weighted side of the seine must drag on the bottom while the float side is on the surface. The offshore sampler will pull the seine out as far as necessary, and then will pull the seine parallel to shore and then back to shore, forming a half circle. Another sampler will hold the other end on shore while this is occurring. When the offshore sampler reaches shore, the two samplers will come together with the seine. The seine will be pulled onto shore, making sure that the weighted side drags the bottom. When the seine is completely pulled onshore, the target fish will be collected with polyethylene gloves and placed in a 30-gallon plastic bag and kept in an ice chest with ice. The beach seine will be rinsed off in the ambient water and placed in the rinsed 30-gallon plastic bucket.

Cast Net

A 10- or 12-foot cast net will be used to collect fish off a pier, boat, or shallow water. The cast net will be rinsed in ambient water prior to use and stored in a covered plastic bucket. The target fish will be sampled with polyethylene gloves, placed in a 30-gallon plastic bag, and kept in an ice chest with ice.

Hook and Line

Fish will be caught off a pier, boat, or shore by hook and line. Hooked fish will be taken off with polyethylene gloves, placed in a Ziploc™ bag or a 30-gallon plastic bag, and kept in an ice chest with ice.

Spearfishing

Certain species of fish are captured more easily by SCUBA divers spearing the fish. Only appropriately trained divers following the dive safety program guidelines will be used for this method of collection. Generally, fish in the kelp beds are more easily captured by spearing. The fish will be shot in the head area to prevent the fillets from being damaged or contaminated. Spear tips will be washed with a detergent and rinsed with ambient water prior to use.

1.5 Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that fish collection procedures are in conformance with those stated in this SOP.

Standard Operating Procedure: Fish Processing

1 Standard Operating Procedure Acknowledgement Form

Project Number: ____________________ Project Name: ____

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

1.1 Scope and Application

Fish tissue samples will be collected and analyzed for chemical contaminants of concern. Sampling, processing, and testing methods will be carried out in accordance with Bight protocols (BFSLC 2018; BCEC 2009). Necessary permits (e.g., scientific collection, incidental take) will be secured prior to fish collection.

Targeted species:

- White croaker (*Genyonemus lineatus*)
- California halibut (*Paralichthys californicus*)
- Shiner surfperch (*Cymatogaster aggregata*)

1.2 Personnel Qualifications

Field personnel executing these procedures will read, be familiar with, and comply with the requirements of this Standard Operating Procedure (SOP) and corresponding documents (i.e., Coordinated Compliance Monitoring and Reporting Plan [CCMRP] and Programmatic Quality Assurance Project Plan [PQAPP]). Field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection. Personnel performing species identifications will have sufficient education and project experience in marine biology and ichthyology.

1.3 Procedures

Once the catch is onboard the vessel, the targeted species will be identified and separated for subsequent processing. At each station, 12 individuals of each fish species will be collected for further processing. There is currently no legal size limit for white croaker. An ocean fish contaminant survey was performed from 2002 to 2004 (NOAA 2007). In part, this survey sought to generate information on contaminants of concern for fish caught for sustenance in Southern California. Collection of white croaker for the Harbor Toxics TMDL study should be consistent with this survey, which recommended a minimum length of 160 millimeters (mm) (total length). Collection of California halibut that are of legal size limit is preferred. The current regulations specify at least 22 inches, or 559 mm, (total length) for California halibut (FGC 2012). 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 should be noted that field personnel may encounter bycatch that are potentially harmful while sorting for targeted species. The Bight Field Operations Manual (BFSLC 2018) and Fish Collection SOPs in Appendix A provide information on the safe handling of these organisms.

Each targeted fish kept will be tagged with a unique identification number; measured for total length, fork length, and weight; and examined for gross pathology in accordance with guidance established in the Bight Field Operations Manual (BFSLC 2018). Three composite samples per species per station will be created. A composite sample will be composed of four individuals; therefore, a total of 12 individuals per station are required. If more than 12 specimens are caught, the 12 individuals best and most closely distributed about the 75th percentile of the length distribution of all individuals will be used for the composites. The selected 12 individual fish will then be arranged by size, and the smallest four fish, the middle four fish, and the largest four fish within a species will be grouped for each composite to satisfy the 75 percent rule (the smallest individual in a composite is no less than 75 percent of the total length of the largest individual in a composite; USEPA 2000). This may permit data evaluation based on size class, if necessary. For sportfish (California halibut, white croaker, or alternate species), skin-off fillets will be used. For prey fish (surfperch, topsmelt, or alternate species), whole fish without head or internal organs will be used. Dissection and compositing methods will be performed in the analytical laboratory in accordance with U.S. Environmental Protection Agency (USEPA) guidance (USEPA 2000).

Fish tissue will be analyzed for chemical parameters, processing, and preservation according to the methods described in the Bight Field Operations Manual and Bioaccumulation Workplan (BFSLC 2018; BCEC 2009). Fish will be processed according to these steps:

1. Sacrifice fish and leave the whole body intact.
2. Blot fish dry and pack each fish in aluminum foil (shiny side out).
3. Place each packed fish in a labeled, food-grade, resalable plastic bag and store on ice.
4. Ship overnight to the analytical laboratory on wet or blue ice. If samples are held more than 24 hours, they will be packed on dry ice.

Chain-of-custody forms will be maintained. Tissue compositing will be conducted by the analytical laboratory. Recommended conditions for sampling containers, sample handling, and storage are listed in Table 11 of the CCMRP.

1.4 Quality Assurance/Quality Control

Guidance for data quality objectives (DQOs) for field measurements is derived from the surface water ambient monitoring program (SWAMP) guidance from the Bight Field Operations Manual for fish tissue parameters (BFSLC 2018). Quality objectives for parameters that will be measured in the field are presented in Table 1.

All field measurements will be made in triplicate. Each result will be recorded along with the average of the three results, the difference between the largest and smallest result, and the percent difference between the largest and smallest result. The percent difference will be calculated as follows:

Percent difference = 100*(largest-smallest)/average

Triplicate measurements, the average of the results, and percent difference will be recorded on the field data sheet. The percent difference will be compared against the precision criteria established for field measurements in Table 1, as appropriate. If precision does not meet the established criteria, the equipment should be inspected to ensure that it is working properly. Equipment will be recalibrated, if necessary, and then the triplicate measurements process will be repeated until DQOs are achieved.

Table 1
DQOs for Field Measurements

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Completeness
Fish Tissue	Fish species identification	95 percent	NA	NA	NA	NA
Fish Tissue	Fish enumeration	90 percent	NA	NA	NA	NA
Fish Tissue	Fish lengths	90 percent	90 percent	NA	NA	NA
Fish Tissue	Fish weights	90 percent	Within 0.2 kg	NA	NA	NA

Notes:
kg: kilogram
NA: not applicable

Appendix B
Field EDD 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.
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.

#station_id	coord_datum_code	x_coord	y_coord	sample_id	sample_type	sample_parent	matrix_code	sample_date	start_depth	end_depth	depth_unit	composite_yn	composite_desc	archive_yn	sampler	sampling_company	comment
#Text(20)	Text(20)	Text(20)	Text(20)	Text(40)	Text(20)	Text(40)	Text(10)	Date/Time	Numeric	Numeric	Text(15)	Text(1)	Text(255)	Text(50)	Text(50)	Text(20)	Test(2000)
#Required	**Required**	**Required**	**Required**	**Required**	**Required**	**Conditional**	**Required**	**Required**	**Conditional**	**Conditional**	**Conditional**	**Required**	**Conditional**	**Required**	**Required**	**Required**	**Optional**
#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'.	Code used to identify correct coordinate system and datum for point projection. This field's vocabulary is controlled. See 'valid coord type codes' tab.	Easting/Longitude	Northing/Latitude	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.	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.	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'.	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.	Date and time of field sample collection, time must be in 24-hour military time.	Shallowest point of the interval. Required for soil/sediment samples. Not required for composite samples.	Deepest point of the interval. Required for soil/sediment samples. Not required for composite samples.	Code used to identify depth units. This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.	'Y' for Yes if sample is a composite or 'N' for No if not.	General description of composite. Required if composite_yn is 'Y'. Should include the list of samples combined in the composite.	'N' if the sample is active, 'Y' if the sample is archive.	Initials or name of the custodian responsible for sampling.	Company responsible for field sampling.	Optional comment about sample.
#Example Data Set:																	
#OA-4-SG-20130211	NAD83CAVII	512148	284512	OA-4-SC-0-15-20130211	N		SE	2/11/2013 13:30	0	15	cm	N		N	CHS	Anchor QEA	This is an example Normal Sediment Core record.
#OA-4-SG-20130211	NAD83CAVII	512148	284512	OA-204-SC-0-15-20130211	FD	OA-4-SC-0-15-20130211	SE	2/11/2013 13:45	0	15	cm	N		N	CHS	Anchor QEA	This is an example Field Duplicate for a Sediment Core.
#OA-4-TA-20130211	NAD83CAVII	512148	284512	OA-4-WO-CM-20130211-1	N	OA-4-TA-COMP-20130211	TA	2/11/2013 14:30				N		N	CHS	Anchor QEA	This is an example individual fish specimen record.
#OA-4-TA-20130211	NAD83CAVII	512148	284512	OA-4-WO-CM-20130211-2	N	OA-4-TA-COMP-20130211	TA	2/11/2013 14:30				N		N	CHS	Anchor QEA	This is an example individual fish specimen record.
#OA-4-TA-20130211	NAD83CAVII	512148	284512	OA-4-WO-CM-20130211-3	N	OA-4-TA-COMP-20130211	TA	2/11/2013 14:30				N		N	CHS	Anchor QEA	This is an example individual fish specimen record.
#OA-4-TA-20130211	NAD83CAVII	512148	284512	OA-4-WO-CM-20130211-4	N	OA-4-TA-COMP-20130211	TA	2/11/2013 14:30				N		N	CHS	Anchor QEA	This is an example individual fish specimen record.
#OA-4-TA-20130211	NAD83CAVII	512148	284512	OA-4-WO-COMP-20130211	N		TA	2/11/2013 14:30				Y	Fish tissue composite.	N	CHS	Anchor QEA	This is an example composite fish sample record.
#Start Here:																	

#sample_id	parent_composite	measurement_date	species	specimen_length	length_unit	specimen_weight	weight_unit
#Text(40)	Text(40)	Date/Time	Text(255)	Text(255)	Text(15)	Text(255)	Text(15)
#Required	**Required**	**Required**	**Required**	**Required**	**Required**	**Required**	**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.	Points to the composite that the individual is a part of.	Date and time of sample measurement, time must be in 24-hour military time.	Common name (Genus species).	Measured fish length (nose to caudal fork).	This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.	Measured fish weight.	This field's vocabulary is controlled and must match a provided valid value. See 'valid units' tab.
#Example Data Set:							
#OA-4-WO-CM-20130211-1	OA-4-WO-COMP-20130211	2/11/2013 14:30	Chub mackerel (Scomber japonicus)	18	cm	1315.42	g
#OA-4-WO-CM-20130211-2	OA-4-WO-COMP-20130211	2/11/2013 14:30	Chub mackerel (Scomber japonicus)	17.9	cm	1224.7	g
#OA-4-WO-CM-20130211-3	OA-4-WO-COMP-20130211	2/11/2013 14:30	Chub mackerel (Scomber japonicus)	19	cm	1406.14	g
#OA-4-WO-CM-20130211-4	OA-4-WO-COMP-20130211	2/11/2013 14:30	Chub mackerel (Scomber japonicus)	19.2	cm	1451.5	g
#Start Here:							

Sample IDs are structured like the following:

[Waterbody]-[Station]-[Media]-[Depth]-[Date]

Waterbody or Other Area Codes		Station Number		Media Codes		Organism (Common Name)		Depth (if applicable)		Date of Collection	
Area	**Code**	**Station**	**Code**	**Media**	**Code**	**Organism**	**Code**	**Depth**	**Format**	**Date**	**Format**
OuterHarbor-LA	OA	1	1	Surface Sediment	SS	White Croaker	WC	0-15 cm	0-15	1-Jul-13	20130701
OuterHarbor-LB	OB			Sediment Core	SC	Top smelt	TS	15-60 cm	15-60		
InnerHarbor -LA	IA			Overlying Water	OW	Queenfish	QF	1-2 ft	1-2		
InnerHarbor -LB	IB			Mid Water	MW	California Halibut	CH				
Consolidated Slip	CS			Surface Water	SW	Chub Mackerel	CM				
Fish Harbor	FH			Porewater	PW	Barred Sand Bass	BS				
Cabrillo Marina	CM			Stormwater	SW	Kelp Bass	KB				
Cabrillo Beach	CB			Whole Organism	WO						
San Pedro Bay	SP			Fish Fillet skin off (muscle)	FF						
Dominguez Channel	DC			Other Tissue	OT						
Cabrillo Pier	CP			Field Blank	FB						
				Equipment rinsate blank	EB						

Code	Description
GCSNAD83	GCS North American Datum 1983 latitude/longitude
GCSWGS84	GCS World Geodetic System 1984 latitude/longitude
NAD27WAN	NAD 1927 StatePlane Washington North FIPS 4601 (US Feet)
NAD27WAS	NAD 1927 StatePlane Washington South FIPS 4602 (US Feet)
NAD27WISTM	NAD 1927 Wisconsin TM (Meters)
NAD83CAIII	NAD 1983 StatePlane California III FIPS 0403 (US Survey Feet)
NAD83CAIV	NAD 1983 StatePlane California IV FIPS 0404 (US Survey Feet)
NAD83CAV	NAD 1983 StatePlane California V FIPS 0405 (US Survey Feet)
NAD83LAS	NAD 1983 StatePlane Louisiana South FIPS 1702 (US Survey Feet)
NAD83MAML	NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 (US Feet)
NAD83MISPIFT	NAD 1983 State Plane Michigan South FIPS 2113 (International Feet)
NAD83MISSE	NAD 1983 StatePlane Mississippi East FIPS 2301 (US Survey Feet)
NAD83NH	NAD 1983 StatePlane New Hampshire FIPS 2800 (US Survey Feet)
NAD83NJ	NAD 1983 StatePlane New Jersey FIPS 2900 (US Survey Feet)
NAD83NYC	NAD 1983 StatePlane New York Central FIPS 3102 (US Survey Feet)
NAD83NYLI	NAD 1983 StatePlane New York Long Island FIPS 3104 (US Survey Feet)
NAD83ORN	NAD 1983 StatePlane Oregon North FIPS 3601 (International Feet)
NAD83ORNF	NAD 1983 StatePlane Oregon North FIPS 3601 (US Survey Feet)
NAD83ORNH	NAD 1983 HARN StatePlane Oregon North FIPS 3601 (International Feet)
NAD83TN	NAD 1983 StatePlane Tennessee
NAD83TXSC	NAD 1983 StatePlane Texas South Central FIPS 4204 (US Survey Feet)
NAD83UTM10N	NAD 1983 UTM Zone 10N (Meters)
NAD83UTM11N	NAD 1983 UTM Zone 11N (Meters)
NAD83UTM15N	NAD 1983 UTM Zone 15N (Meters)
NAD83UTM19N	NAD 1983 UTM Zone 19N (Meters)
NAD83WAN	NAD 1983 StatePlane Washington North FIPS 4601 (US Survey Feet)
NAD83WANH	NAD 1983 HARN StatePlane Washington North FIPS 4601 (US Survey Feet)
NAD83WAS	NAD 1983 StatePlane Washington South FIPS 4602 (US Survey Feet)
NAD83WASH	NAD 1983 HARN StatePlane Washington South FIPS 4602 (US Survey Feet)
NAD83WISC	NAD 1983 StatePlane Wisconsin Central FIPS 4802 (US Survey Feet)

Code	Description
AB	Ambient Conditions Blank
EB	Equipment Blank
FB	Field Blank
FD	Field Duplicate Sample
FI	Field Individual
FM	Field Measurement
FS	Field Spike
KD	Known (External Reference Material) Duplicate
MN	Normal Non-project Environmental Sample used for QC purposes
MS	Lab Matrix Spike
MSD	Lab Matrix Spike Duplicate
MTB	Material Blank
N	Normal Environmental Sample
RB	Material Rinse Blank
RD	Regulatory Duplicate
RM	Known (External Reference Material) Rinsate
SRM	Standard Reference Material
TB	Trip Blank

Code	Description
AIR	Air
BM	Bank Debris (or Bank Material)
LF	Floating/Free Product on Groundwater Table
OIL	Oil
PC	Paint Chip
PR	Product
SA	Sand
SE	Sediment
SH	Solid Waste Containing greater than or equal to 0.5% Dry Solids
SL	Sludge
SM	Water Filter (Solid Material used to filter Water)
SN	Miscellaneous Solid Materials - Building Materials
SO	Soil
SPMD	Semipermeable membrane device
ST	Solid Waste
STRAP	Sediment Trap
STS	Stormwater Solids
TA	Animal Tissue
TP	Plant Tissue
TQ	Tissue Quality Control Matrix
TS	Treated Sediment
WCD	Dewatering Water (construction)
WD	Well Development Water
WE	Estuary Water
WG	Ground Water
WH	Equipment Wash Water, i.e., Water used for Washing
WIPE	Swab or Wipe
WL	Leachate (synonymous with Elutriate)
WO	Ocean Water
WOFL	Outfall
WP	Drinking Water
WQ	Water Quality Control Matrix
WR	River Water
WS	Surface Water
WSP	Seep Water
WST	Storm Water
WW	Waste Water
WX	Porewater

Code	Description
cfu/100mL	colony forming units per 100 milliliters
cm	centimeters
counts/sample	number of individuals per sample
deg C	degrees celsius
deg F	degrees fahrenheit
deg K	degrees Kelvin
dpm/g	disintegrations per minute per gram (radiochem)
each	each
ft	feet
ft bgs	ft below ground surface
ft/sec	feet per second
g	grams
g/cm3	grams per cubic centimetre
g/g	grams per gram
g/kg	grams per kilogram
g/L	grams per liter
g/mL	grams per milliliter
gal/day	gallons per day
gal/hr	gallons per hour
gal/min	gallons per minute
gal/sec	gallons per second
in	inches
in ags	total inches above ground surface
L	liter
L/day	liters per day
L/hr	liters per hour
L/min	liters per minute
L/sec	liters per second
lb/ft3	pounds per ft3
lbs	pounds
m	meter
meq/100g	milliequivalents per 100 grams (measure of valence)
mg	milligrams
mg/flt	milligrams per filter
mg/g	milligrams per gram
mg/kg	milligrams per kilogram
mg/kg-OC	milligrams per kilogram organic carbon
mg/L	milligrams per liter
mg/L-OC	mg/l organic carbon normalized
mg/m3	milligrams per cubic meter
mg/mL	milligrams per milliliter
mg/res	mg residue
min	minutes
mL	milliliter
mL/L	milliliter per liter
mm	millimeter
mmhos/cm	millimhos per centimeter (millisiemens per centimeter)
mmol/kg	micromoles per kilogram
mpn/100mL	most probable number per 100 ml
mrem/yr	millirems/year

Code	Description
ms/cm	milliseimens per centimeter
mV	millivolt
NA	Not applicable. Used for calcs, ie. pMax.
ng/cart	nanograms per cartridge
ng/g	nanograms per gram
ng/kg	nanogram per kilogram
ng/L	nanogram per liter
ng/m3	nanogram per cubic meter
ng/mL	nanograms per milliliter
no/100mL	number per 100 ml (coliform)
none	no unit of measure
NTU	Nephelometric turbidity units
ORPUnit	Place holder for ORP units
pcf	pounds per cubic foot
pci/g	picocuries per gram
pci/L	picocuries per liter
pci/mg	picocuries per milligram
pci/mL	picocuries per milliliters
pct	percent
pctv/v	percent by volume
pg/g	picogram per gram
pg/kg	picograms per kilogram
pg/L	picogram per liter
pg/wipe	picogram per wipe
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
ppmv	parts per million by volume
ppt	NULL
ppth	part per thousand
pptr	parts per trillion
psf	pounds per square foot
psi	pounds per square inch
ratio	ratio
sec	second
su	standard unit
TU	Toxicity unit
ug	micrograms
ug/100cm2	micrograms per 100 square centimeters
ug/cm2	micrograms per square centimeters
ug/filter	micrograms per filter
ug/g	micrograms per gram
ug/kg	micrograms per killogram
ug/kg-OC	ug/kg organic carbon normalized
ug/L	micrograms/liter
ug/L-OC	ug/l organic carbon normalized
ug/m3	micrograms per cubic meter
ug/samp	micrograms per sample
ug/wipe	micrograms per wipe
uL	microliter

Code	Description
um	micrometer
um/sec	micrometer per second
umhos/cm	umhos per centimeter (microsiemens per centimeter)
umol/g	micromoles per gram
umol/g foc	umol/g foc (For SEM-AVS ratio)
unitless	unitless
unk	unknown unit
US Survey feet	US Survey feet
uS/cm	microsiemens per centimeter
wipe	per wipe
yd	yard
yr	year

Appendix C

Laboratory Data EDD File Specifications

ADR Electronic Data Deliverable (EDD) File Specifications

The ADR EDD consists of three separate, comma-delimited ASCII text files or Excel CSV files (two, if instrument calibration information is not required by the project). Each file corresponds to a table in the ADR application. These tables are identified as the Analytical Results Table (A1), Laboratory Instrument Table (A2), and Sample Analysis Table (A3). Each file follows the naming convention of using the Laboratory Reporting Batch ID (SDG Number or some other identifier for the EDD) followed by the table identifier (A1, A2, or A3), and then a ".txt" or ".csv" extension. For example, the EDD file names for a laboratory reporting batch identified as SDG001 that includes instrument calibration data would be as follows.

SDG001A1.txt or SDG001A1.csv
SDG001A2.txt or SDG001A2.csv (A2 file is optional)
SDG001A3.txt or SDG001A3.csv

Analytical Results Table (A1 File)

The Analytical Results table contains analytical results and related information on an analyte level for field samples and associated laboratory quality control samples (excluding calibrations and tunes). Field QC blanks and laboratory method blanks must report a result record for each analyte reported within a method. The method target analyte list is matrix dependent and specified in the project library. Laboratory control samples (LCS and LCSD) and matrix spike samples (MS and MSD) must report a result record for every analyte specified as a spiked analyte in the project library. The project library is a reference table ADR uses for both EDD error checking and automated data review. The project library is populated with information from the project QAPP. Refer to the User Manual for detailed information on project libraries. Table 1 in this document lists all field names and their descriptions for the Analytical Results Table (A1).

Laboratory Instrument Table (A2 File)

The Laboratory Instrument table contains results and related information on an analyte level for instrument initial calibration standards, initial calibration verification standards, continuing calibration standards, and GC/MS tunes. A record must exist for each target analyte reported in a method (specified in the project library), for every calibration type (the field named QCType) associated to samples reported in the EDD. Initial calibrations, initial calibration verifications, and associated samples are linked to each other using a unique Run Batch ID for every distinct initial calibration within a method. Continuing calibrations and associated samples are linked to each other using a unique Analysis Batch ID for every distinct continuing calibration within a method. GC/MS tunes are linked to initial and continuing calibrations (and hence samples) using the Run Batch and Analysis Batch IDs respectively. The Laboratory Instrument Table (A2) is optional. Depending on the level of validation required by the data user, the Laboratory Instrument table may not be requested in the deliverable. Table 2 in this document lists field names and descriptions for the Laboratory Instrument Table (A2).

Sample Analysis Table (A3 File)

The Sample Analysis table contains information on a sample level for field samples and laboratory quality control analyses (excluding calibrations and tunes). A sample record exists for each sample/method/matrix/analysis type combination. Table 3 in this document lists field names and descriptions for the Sample Analysis Table (A3).

EDD Field Properties

Tables 1, 2, and 3 in this document specify the EDD field properties for each file. These include the field name and sequence, field name description, data type and length for each field, and whether or not a particular field requires a standard field. Field elements in the EDD must be sequenced according to the order they appear in Tables 1, 2, and 3. For example, in the Analytical Result table (the A1 file), the field "ClientSampleID" will always be the first piece of information to start a new line of data (or database record), followed by the fields "LabAnalysisRefMethodID", "AnalysisType", and so on.

Table 4 in this document lists standard values for those fields that hold standard values. Required field constraints depend on the combination of sample, matrix, method, analyte type, and calibration or QC type information reported in a record. Tables 5 through 9 in this document indicate required fields for each EDD file (table) according to the method category, matrix, analyte type, sample, and QC or calibration type reported in a record.

When creating an EDD as a text file, use the ASCII character set in a file of lines terminated by a carriage return and line feed. No characters are allowed after the carriage return and line feed. Enclose each data set in double quotes (") and separate each field by a comma (comma delimited). Data fields with no information (null) may be represented by two consecutive commas. For example, in the Sample Analysis table, since the "Collected", "ShippingBatchID", and "Temperature" fields do not apply to laboratory generated QA/QC samples, the record for a Laboratory Control Sample by Method 8270C would be entered as follows. Note that the first two fields ("ProjectNumber" and "ProjectName") are omitted in this example.

…"LCSW100598",,"AQ","LCSW100598","LCS",,"8270C",… (and so on)

Do not pad fields with leading or trailing spaces if a field is populated with less than the maximum allowed number of characters. In the above example, although the "MatrixID" field can accommodate up to 10 characters, only 2 characters were entered in this field.

The EDD can be constructed within Excel and saved as .csv file for import into the application. Be sure to format all cells as text beforehand, otherwise Excel will reformat entered values in some cases.

Table 1
Field Descriptions for the Analytical Results Table (A1 file)

Contains laboratory test results and related information for field and QC samples (excluding instrument calibrations) on an analyte level for environmental chemistry including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
ClientSampleID	Client or contractor's identifier for a field sample as reported on the chain-of-custody If a sample is analyzed as a laboratory duplicate, matrix spike, or matrix spike duplicate, append suffixes DUP, MS and MSD respectively to the Client Sample ID with no intervening spaces or hyphens (i.e. MW01DUP, MW01MS, and MW01MSD). For Method Blanks, LCS, and LCSD enter the unique LaboratorySampleID into this field Do not append suffixes to the ClientSampleID for dilutions, reanalyses, or re-extracts (the AnalysisType field is used for this distinction). For example, MW01DL and MW01RE are not allowed Parent sample records must exist for each MS and MSD. If an MS/MSD is shared between two EDDs, records for the MS/MSD and its parent sample must exist in the Analytical Results table for both EDDs.	Text	25	NO
LabAnalysisRefMethodID	Laboratory reference method ID. The method ID may be an EPA Method number or a Lab Identifier for a method such as a SOP Number, however; method ID is specified by the project. The method ID must be entered into the standard list.	Text	25	YES (specified in project plan)
AnalysisType	Defines the analysis type (i.e., Dilution, Reanalysis, etc.). This field provides distinction for sample result records when multiple analyses are submitted for the same sample, method, and matrix; for example dilutions, re-analyses, and re-extracts.	Text	10	YES (See Table 4)
LabSampleID	Laboratory tracking number for field samples and lab generated QC samples such as method blank, LCS, and LCSD. There are no restrictions for the LabSampleID except for field length and that the LabSampleID must be distinct for a given field sample or lab QC sample and method. Suffixes may be applied to the LabSampleID to designate dilutions, reanalysis, etc.	Text	25	NO
LabID	Identification of the laboratory performing the analyses.	Text	7	NO
ClientAnalyteID	CAS Number or unique client identifier for an analyte or isotope. If a CAS Number is not available, use a unique identifier provided by the client or contractor. The ClientAnalyteID for a particular target analyte or isotope should be specified by the project and must exist in the standard value tables for Analytes. For the LCS, LCSD, MS, and MSD, it is only necessary to report the compounds designated as spikes in the library (and surrogates for organic methods.) For TICs from GC/MS analyses, enter the retention time in decimal minutes as the Client Analyte ID.	Text	12	YES (specified by project)

Table 1
Field Descriptions for the Analytical Results Table (A1 file)

Contains laboratory test results and related information for field and QC samples (excluding instrument calibrations) on an analyte level for environmental chemistry including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
AnalyteName	Chemical name for the analyte or isotope. The project specifies how an analyte or isotope is named. The analyte name must be associated to a ClientAnalyteID in the standard values table for Analytes (excluding compounds designated as TIC's).	Numeric	60	YES (specified by project)
Result	Result value for the analyte or isotope. Entries must be numeric. For non-detects of target analytes or isotopes and spikes, do not enter "ND" or leave this field blank. If an analyte or spike was not detected, enter the reporting limit value corrected for dilution and percent moisture as applicable. Do not enter "0"	Text	10	NO
ResultUnits	The units defining how the values in the Result, DetectionLimit, and ReportingLimit fields are expressed. For radiochemistry this also includes how the value in the Error field is expressed.	Text	10	YES (specified by project in the library)
LabQualifiers	A string of single letter result qualifiers assigned by the lab based on client-defined rules and values. The "U" Lab Qualifier must be entered for all non-detects. Other pertinent lab qualifiers may be entered with the "U" qualifier. Order is insignificant. Lab qualifiers other than those listed in the standard values table may be used. If so, these must be added to the standard value table in the application.	Text	7	YES (See Table 4)
DetectionLimit	For radiochemistry methods, the minimum detectable activity for the isotope being measured. For all other methods: The minimum detection limit value for the analyte being measured. **For DoD QSM enter the Limit of Detection (LOD)**	Numeric	10	NO
DetectionLimitType	Specifies the type of detection limit (i.e., MDA, MDL, IDL, etc.).	Text	10	YES (See Table 4)
RetentionTime or Error	For radiochemistry methods only, enter the 2 Sigma Counting Error. The units for error are entered in the ResultUnits field. For GC/MS methods only, enter the time expressed in decimal minutes between injection and detection for GC/MS TICs only For target analytes in all other methods, leave this field blank. Note: GC retention times are not evaluated at this time.	Text	5	NO
AnalyteType	Defines the type of result, such as tracer, surrogate, spike, or target compound.	Text	7	YES (See Table 4)

Table 1
Field Descriptions for the Analytical Results Table (A1 file)

Contains laboratory test results and related information for field and QC samples (excluding instrument calibrations) on an analyte level for environmental chemistry including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
PercentRecovery	For radiochemistry methods: The tracer yield, if applicable. For all other analytical methods: The percent recovery value of a spiked compound or surrogate. If the spike or surrogate was not recovered because of dilution, enter "DIL". If a spike or surrogate was not recovered because of matrix interference, enter "INT". If a spike or surrogate was not recovered because it was not added to the sample, enter "NS".	Numeric	5	NO
RelativePercentDifference	The relative percent difference (RPD) of two QC results, such as MS/MSD, LCS/LCSD, and Laboratory Duplicates. Report RPD in Laboratory Duplicate, LCSD, and MSD records only.	Numeric	5	NO
ReportingLimit	Reporting limit value for the measured analyte or isotope Factor in the dilution factor and percent moisture correction, if applicable. The Reporting Limit for each analyte and matrix in a given method is specified in the project library or QAPP. **For DoD QSM enter the Limit of Quantitation (LOQ)**	Numeric	10	NO
ReportingLimitType	Specifies the type of reporting limit (i.e., CRQL, PQL, SQL, RDL, etc). The Reporting Limit Type for each method and matrix is specified in the project library or QAPP.	Text	10	YES (specified by the project)

Table 1
Field Descriptions for the Analytical Results Table (A1 file)

Contains laboratory test results and related information for field and QC samples (excluding instrument calibrations) on an analyte level for environmental chemistry including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
ReportableResult	This field indicates whether or not the laboratory chooses an individual analyte or isotope result as reportable. Enter "YES" if the result is reportable. Enter "NO" if the result is not reportable. This field applies to target analytes only. If only one analysis is submitted for a particular sample and method, enter "YES" for all target compounds (where Analyte Type = TRG). For GC/MS methods enter yes for tentatively identified compounds (where Analyte Type = TIC). If two or more analyses are submitted for a particular sample and method (i.e. initial analysis, reanalysis and/or dilutions), enter "YES" from only <u>one</u> of the analyses for each target compound. For example: a sample was run a second time at dilution because benzene exceeded the calibration range in the initial, undiluted analysis. All target analytes are reported in each analysis. For the initial analysis, (Analysis Type = RES), enter "NO" for benzene and enter "YES" for all other compounds. For the diluted analysis (Analysis Type = DL), enter "YES" for benzene and enter "NO" for all other compounds. For TICs (Analyte Type = TIC), if more than one analysis is submitted for a particular sample and method, choose only one of the analyses where Reportable Result = YES for <u>all</u> TICs. For example, a sample was run a second time because one or more target compounds exceeded the calibration range in the undiluted analysis. Choose a particular analysis and enter "YES" for all TICS. In the other analysis enter "NO" for all TICs. Note that it is not necessary to report the full target analyte list for the initial result, dilution, re-analysis, or re-extraction. However, each target analyte must be reported YES once and once only in the case of multiple analyses for a given sample, method, and matrix. In the case of organics, all surrogates must be reported for all analyses submitted for a given sample, method, and, matrix.	Text	3	YES (See Table 4)
MDL_DoD	This field is not part of the standard ADR EDD format. **For DoD QSM enter the MDL, otherwise leave blank. (ADR does not perform error checks on this field)**	Numeric	10	NO

Table 2
Field Descriptions for the Laboratory Instrument Table (A2 file)

Contains related to laboratory instrument calibration on an analyte level and GC/MS Tune information. This table is optional depending on project requirements. Do not report Table A2 for radiochemistry methods.

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
InstrumentID	Laboratory instrument identification.	Text	15	NO
QCType	Type of instrument QC (i.e., Instrument_Performance_Check or type of calibration standard).	Text	10	YES (See Table 4)
Analyzed	Analysis date/time for BFB, DFTPP, initial calibration verification standards, calibration verification standards, and continuing calibration standards. For the initial calibration, enter date and time of the last standard analyzed. Also, see comments about initial calibrations in the Alternate_Lab_Analysis_ID field name description.	Date/ Time	*	NO
AlternateLab_AnalysisID	Common laboratory identification used for standards (i.e., VOA STD50, CCAL100, BFB50, etc). For initial calibration, enter ICAL. Information from the initial calibration is entered as one record for each analyte that summarizes the results of the initial calibration (i.e. %RSD, correlation coefficient, and avg RF). Records are not entered for each individual standard within the initial calibration.	Text	12	NO
LabAnalysisID	Unique identification of the raw data electronic file associated with the calibration standard or tune (i.e., 9812101MS.DV). Leave this field blank for the initial calibration. See comments about initial calibrations in the Alternate_Lab_Analysis_ID field description. This field is only applicable where an electronic instrument file is created as part of the analysis.	Text	15	NO
LabAnalysisRefMethodID	Laboratory reference method ID (i.e., 8260B, 8270C, 6010B, etc.). The method ID is specified by the project. The LabAnalysisRefMethodID must be in the standard value list for Method IDs.	Text	25	YES (specified by the project)
ClientAnalyteID	CAS number or unique client identifier for an analyte. If a CAS number is not available, use a unique identifier provided by the client. The unique identifier for a particular analyte should be specified by the project and must exist in the standard value list for ClientAnalyteID. Records for each calibration must report the full target analyte list including surrogates as applicable. The target analyte list is specified for each method and matrix in the project	Text	12	YES (specified by the project)
AnalyteName	The chemical name for the analyte. The project specifies how an analyte is named. The AnalyteName must be associated to a ClientAnalyteID in the standard values.	Text	60	YES (specified by the project)

Table 2
Field Descriptions for the Laboratory Instrument Table (A2 file)

Contains related to laboratory instrument calibration on an analyte level and GC/MS Tune information. This table is optional depending on project requirements. Do not report Table A2 for radiochemistry methods.

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
RunBatch	Unique identifier for a batch of analyses performed on one instrument under the control of one initial calibration and initial calibration verification. The Run Batch ID links both the initial calibration and initial calibration verification to subsequently analyzed and associated continuing calibrations, field samples, and QC analyses. For GC/MS methods, the Run_Batch ID also links a BFB or DFTPP tune and the initial calibration and initial calibration verification standards to associated samples and method QC analyses. A new and unique Run Batch ID must be used with every new initial calibration.	Text	12	NO
AnalysisBatch	Unique laboratory identifier for a batch of analyses performed on one instrument and under the control of a continuing calibration or continuing calibration verification. The Analysis Batch ID links the continuing calibration or calibration verification to subsequently analyzed and associated field sample and QC analyses. For GC/MS methods, the Analysis Batch ID also links the BFB or DFTPP tune. A new and unique Analysis Batch ID must be used with every new continuing calibration or continuing calibration verification. For GC methods, only report opening standards, do not include closing standards (unless the closing standard functions as the opening standard for a subsequent set of analyses, in which case a new and unique Analysis Batch ID is assigned). When dual or confirmation columns/detectors are used, enter results from the primary column/detector only (this is similar to CLP Pesticide reporting).	Text	12	NO
LabReportingBatch	Unique laboratory identifier for a batch of samples including associated calibrations and method QC, reported as a group by the lab (i.e., lab work order #, log-in #, or SDG). Links all instrument calibrations, samples, and method QC reported as a group or SDG.	Text	12	NO
PercentRelativeStandard Deviation	The standard deviation relative to the mean used to evaluate initial calibration linearity. Organic methods may use either %RSD or Correlation Coefficient. If applicable, enter the %RSD. Leave this field blank if the Correlation Coefficient is used.	Numeric	5	NO
CorrelationCoefficient	The correlation coefficient resulting from linear regression of the initial calibration. For metals by ICAP, enter '1.0' if a two-point initial calibration was analyzed. Organic methods may use either %RSD or Correlation Coefficient. If applicable, enter the Correlation Coefficient. Leave this field blank if the %RSD is used	Numeric	5	NO
RelativeResponseFactor	This field applies to GC/MS only. For continuing calibration enter the relative response factor. For initial calibration enter the average relative response factor. Refer to comments about initial calibration records in the field description for Alternate_Lab_Analysis_ID.	Numeric	5	NO

Table 2
Field Descriptions for the Laboratory Instrument Table (A2 file)

Contains related to laboratory instrument calibration on an analyte level and GC/MS Tune information. This table is optional depending on project requirements. Do not report Table A2 for radiochemistry methods.

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
Percent_Difference (or Percent Recovery)	For organic methods, this field is the difference between 2 measured values expressed as a percentage. If %RSD is reported, enter the % difference between the average response factor of the initial calibration (IC) and the response factor of the initial calibration verification (ICV) or continuing calibration (CCV). If correlation coefficient is used, enter the % difference between the true value and the measured value. The Percent_Difference is expressed as a negative or positive value. Do not express Percent_Difference as an absolute value. Use a negative value if the CCV or ICV response factor is less than the IC average response factor or, in the case of correlation coefficient, the CCV or ICV measured value is less than the true value. Use a positive value if the CCV or ICV response factor is greater than the IC average response factor, or in the case of correlation coefficient, the CCV or ICV measured value is greater than the true value. For inorganic methods, this field is the recovery of an analyte expressed relative to the true amount (i.e., %R for a metal in the continuing calibration or initial calibration verification by Method 6010B).	Numeric	5	NO
PeakID01	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 50, for DFTPP enter 51.	Numeric	10	NO
PercentRatio01	For BFB enter the relative percent abundance of m/z 50 measured relative to the raw abundance of m/z 95. For DFTPP enter the relative percent abundance of m/z 51 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID02	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 75, for DFTPP enter 68.	Numeric	10	NO
PercentRatio02	For BFB enter the relative percent abundance of m/z 75 measured relative to the raw abundance of m/z 95. For DFTPP enter the relative percent abundance of m/z 68 measured relative to the raw abundance of m/z 69.	Numeric	10	NO
PeakID03	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 95, for DFTPP enter 69.	Numeric	10	NO
PercentRatio03	For BFB enter the ion abundance of m/z 95 as 100 percent. For DFTPP enter the relative percent abundance of m/z 69 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID04	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 96, for DFTPP enter 70.	Numeric	10	NO

Table 2
Field Descriptions for the Laboratory Instrument Table (A2 file)

Contains related to laboratory instrument calibration on an analyte level and GC/MS Tune information. This table is optional depending on project requirements. Do not report Table A2 for radiochemistry methods.

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
PercentRatio04	For BFB enter the relative percent abundance of m/z 96 measured relative to the raw abundance of m/z 95. For DFTPP enter the relative percent abundance of m/z 70 measured relative to the raw abundance of m/z 69	Numeric	10	NO
PeakID05	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 173, for DFTPP enter 127.	Numeric	10	NO
PercentRatio05	For BFB enter the relative percent abundance of m/z 173 measured relative to the raw abundance of m/z 174. For DFTPP enter the relative percent abundance of m/z 127 measured relative to the raw abundance of m/z 198	Numeric	10	NO
PeakID06	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 174, for DFTPP enter 197.	Numeric	10	NO
PercentRatio06	For BFB enter the relative percent abundance of m/z 174 measured relative to the raw abundance of m/z 95. For DFTPP enter the relative percent abundance of m/z 197 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID07	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 175, for DFTPP enter 198.	Numeric	10	NO
PercentRatio07	For BFB enter the relative percent abundance of m/z 175 measured relative to the raw abundance of m/z 174. For DFTPP enter the ion abundance of m/z 198 as 100 percent.	Numeric	10	NO
PeakID08	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 176, for DFTPP enter 199.	Numeric	10	NO
PercentRatio08	For BFB enter the relative percent abundance of m/z 176 measured relative to the raw abundance of m/z 174. For DFTPP enter the relative percent abundance of m/z 199 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID09	Identifies individual m/z ions for GC/MS tuning compounds. For BFB enter 177, for DFTPP enter 275.	Numeric	10	NO
PercentRatio09	For BFB enter the relative percent abundance of m/z 177 measured relative to the raw abundance of m/z 176. For DFTPP enter the relative percent abundance of m/z 275 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID10	Identifies individual m/z ions for GC/MS tuning compounds. For BFB leave blank, for DFTPP enter 365.	Numeric	10	NO

Table 2

Field Descriptions for the Laboratory Instrument Table (A2 file)

Contains related to laboratory instrument calibration on an analyte level and GC/MS Tune information. This table is optional depending on project requirements. Do not report Table A2 for radiochemistry methods.

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
PercentRatio10	For BFB leave blank. For DFTPP enter the relative percent abundance of m/z 365 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID11	Identifies individual m/z ions for GC/MS tuning compounds. For BFB leave blank, for DFTPP enter 441.	Numeric	10	NO
PercentRatio11	For BFB leave blank. For DFTPP the percent abundance of m/z 441 measured relative to the raw abundance of m/z 443	Numeric	10	NO
PeakID12	Identifies individual m/z ions for GC/MS tuning compounds. For BFB leave blank, for DFTPP enter 442.	Numeric	10	NO
PercentRatio12	For BFB leave blank. For DFTPP enter the relative percent abundance of m/z 442 measured relative to the raw abundance of m/z 198.	Numeric	10	NO
PeakID13	Identifies individual m/z ions for GC/MS tuning compounds. For BFB leave blank, for DFTPP enter 443.	Numeric	10	NO
PercentRatio13	For BFB leave blank. For DFTPP enter the relative percent abundance of m/z 443 measured relative to the raw abundance of m/z 442.	Numeric	10	NO

* Date/time format is: MM/DD/YYYY hh:mm where MM = month, DD = day, YYYY = four digits of the year, hh = hour in 24 hour format, and mm = minutes.

Table 3
Field Description for the Sample Analysis (A3 file)

This table contains information related to analyses of field samples and laboratory QC samples (excluding calibrations and tunes) on a sample level for environmental chemical analyses including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
ProjectNumber	Project number assigned by the client.	Text	30	YES (specified by project)
ProjectName	Project name assigned by the client.	Text	90	YES (specified by project)
ClientSampleID	Client or contractor's identifier for a field sample If a sample is analyzed as a laboratory duplicate, matrix spike, or matrix spike duplicate, append suffixes DUP, MS and MSD respectively to the Client Sample ID with no intervening spaces or hyphens (i.e. MW01DUP, MW01MS, and MW01MSD). For Method Blanks, LCS, and LCSD enter the unique LaboratorySampleID into this field Do not append suffixes to the ClientSampleID for dilutions, reanalyses, or re-extracts (the Analysis_Type field is used for this distinction). For example, MW01DL and MW01RE are not allowed Parent sample records must exist for each MS and MSD. If an MS/MSD is shared between two EDDs, records for the MS/MSD and its parent sample must exist in the Sample Analysis table for both EDDs.	Text	25	NO
Collected	For radiochemistry methods the Date of sample collection. Refer to the date format for radiochemistry methods at the end of this table. For all other methods the Date and Time of sample collection. Refer to the date/time format at the end of this table. Leave this field blank for Method Blank, LCS, and LCSD	Date/ Time	16*	NO
MatrixID	Sample matrix (i.e., AQ, SO, etc.)	Text	10	YES (See Table 4)
LabSampleID	Laboratory tracking number for field samples and lab generated QC samples such as method blank, LCS, and LCSD. There are no restrictions for the LabSampleID except field length and that the LabSampleID must be unique for a given field sample or lab QC sample and method.	Text	25	NO
QCType	This record identifies the type of quality control sample QC (i.e., Duplicate, LCS, Method Blank, MS, or MSD). For regular samples, leave this field blank.	Text	10	YES (See Table 4)
ShippingBatchID	Unique identifier assigned to a cooler or shipping container used to transport client or field samples. Links all samples to a cooler or shipping container. No entry for method blanks, LCS, and LCSD. This field is optional.	Text	25	NO
Temperature	Temperature (in centigrade degrees) of the sample as received. This field is not required for radiochemistry methods.	Numeric	10	NO

Table 3
Field Description for the Sample Analysis (A3 file)

This table contains information related to analyses of field samples and laboratory QC samples (excluding calibrations and tunes) on a sample level for environmental chemical analyses including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
LabAnalysisRefMethodID	Laboratory reference method ID. The method ID may be an EPA Method number or laboratory identifier for a method such as a SOP number, however; values used for Laboratory Method IDs are specified by the project and must in the in standard value list for method IDs.	Text	25	YES (Specified by the project)
PreparationType	Preparation Method Number (i.e., 3010A, 3510C, 3550C, 5030B, etc.) For analytical procedures that do not have a specific preparation method number, use "Gen Prep".	Text	25	YES (See Table 4)
AnalysisType	Defines the type of analysis such as initial analysis, dilution, re-analysis, etc. This field provides distinction for sample records when multiple analyses are submitted for the same sample, method, and matrix, for example: dilutions, re-analyses, and re-extracts.	Text	10	YES (See Table 4)
Prepared	For radiochemistry leave this field blank. For all other methods enter the date and time of sample preparation or extraction. Refer to the date/time format at the end of this table.	Date/ Time	16*	NO
Analyzed	For radiochemistry methods the date of sample analysis. Refer to the date format for radiochemistry methods at the end of this table. For all other methods the date and time of sample analysis. Refer to the date and time format at the end of this table.	Date/ Time	*	NO
LabID	Identification of the laboratory performing the analysis.	Text	7	NO
QCLevel	The level of laboratory QC associated with the analysis reported in the EDD. If only the Analytical Results Table (A1) and the Sample Analysis Table (A3) information are submitted for the sample, enter "COA". If the Laboratory Instrument Table (A2) information is also submitted for the sample, enter "COCAL"	Text	6	YES (See Table 4)
ResultBasis	Indicates whether results associated with this sample records are reported as wet or percent moisture corrected. This field is only required for soils and sediments. Enter "WET" if results are not corrected for percent moisture. Enter "DRY" if percent moisture correction is applied to results.	Text	3	YES (See Table 4)
TotalOrDissolved	This field indicates if the results related to this sample record are reported as a total or dissolved fraction. This field is only required for metal methods. For all other methods leave this field blank.	Text	3	YES (See Table 4)
Dilution	Dilution of the sample aliquot. Enter "1" for method blanks, LCS, and LCSD, or if the field samples was analyzed without dilution.	Numeric	10	NO
HandlingType	Indicates the type of leaching procedure, if applicable (i.e., SPLP, TCLP, WET). Leave this field blank if the sample analysis was not performed on a leachate.	Text	10	YES (See Table 4)

Table 3
Field Description for the Sample Analysis (A3 file)

This table contains information related to analyses of field samples and laboratory QC samples (excluding calibrations and tunes) on a sample level for environmental chemical analyses including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
HandlingBatch	Unique laboratory identifier for a batch of samples prepared together in a leaching procedure (i.e., SPLP, TCLP, or WET preparation). The HandlingBatch links samples with leaching blanks. Leave this field blank if the sample analysis was not performed on a leachate	Text	12	NO
LeachateDate	Date and time of leaching procedure (i.e., date for SPLP, TCLP, or WET preparation). Refer to the date and time format at the end of this table. Leave this field blank if the sample analysis was not performed on a leachate	Date /Time	16*	NO
Percent_Moisture	Percent of sample composed of water. Enter for soil and sediment samples only.	Numeric	10	NO
MethodBatch	Unique laboratory identifier for a batch of samples of similar matrices analyzed by one method and treated as a group for matrix spike, matrix spike duplicate, or laboratory duplicate association The method batch links the matrix spike and/or matrix spike duplicate or laboratory duplicates to associated samples. Note, the MethodBatch association may coincide with the PreparationBatch association. The MethodBatch is specifically used to link the MS/MSD and/or DUP to associated samples.	Text	12	NO
PreparationBatch	Unique laboratory identifier for a batch of samples prepared together for analysis by one method and treated as a group for method blank, LCS and LCSD association. The PreparationBatch links method blanks and laboratory control samples (blank spikes) to associated samples. Note, the PreparationBatch association may coincide with the MethodBatch association but the PreparationBatch specifically links the Method Blank and LCS to associated samples.	Text	12	NO
RunBatch	For radiochemistry methods leave this field blank. For all other methods the RunBatch is the unique identifier for a batch of analyses performed on one instrument under the control of one initial calibration and initial calibration verification. The RunBatch links both the initial calibration and initial calibration verification to subsequently analyzed and associated continuing calibrations, field samples, and QC analyses. For GC/MS methods, the RunBatch also links a BFB or DFTPP tune. A distinct RunBatch must used with every new initial calibration within a method The value entered in this field links a particular sample/method/analysis type record to a set of associated initial calibration and initial calibration verification records from Table A2. This field is only required if the A2 table is included with the EDD.	Text	12	NO

Table 3
Field Description for the Sample Analysis (A3 file)

This table contains information related to analyses of field samples and laboratory QC samples (excluding calibrations and tunes) on a sample level for environmental chemical analyses including radiochemistry

Field Name	Field Name Description	Field Type	Field Length	Standard Value List
AnalysisBatch	For radiochemistry methods leave this field blank. For all other methods the AnalysisBatch is the unique identifier for a batch of analyses performed on one instrument and under the control of a continuing calibration or continuing calibration verification. The AnalysisBatch links the continuing calibration or calibration verification to subsequently analyzed and associated field sample and QC analyses. For GC/MS methods, the AnalysisBatch also links the BFB or DFTPP tune. A distinct AnalysisBatch must be used with every new continuing calibration or continuing calibration verification within a method The value entered in this field links a particular sample/method/analysis type record to a set of associated continuing calibration records in the Laboratory Instrument table. This field is only required if the A2 table is included with the EDD.	Text	12	NO
LabReportingBatch	Unique laboratory identifier for the EDD. This is equivalent to the sample delivery group, lab work number, login ID, etc. The LabReportingBatch links all records in the EDD reported as one group. The value entered in this field must be the same in all records.	Text	12	NO
LabReceipt	Date and time the sample was received in the lab. A time value of 00:00 may be entered. Refer to the date/time format at the end of this table.	Date/ Time	16*	
LabReported	Date and time hard copy reported delivered by the lab. A time value of 00:00 may be entered. Refer to the date/time format at the end of this table.	Date/ Time	16*	

* For radiochemistry methods format Date as MM/DD/YYYY (where MM = two digit month, DD = two digit day, and YYYY = four digit year)

For all other methods format Date and Time as MM/DD/YYYY hh:mm YYYY (where MM = two digit month, DD = two digit day, and YYYY = four digit year, hh = hour in 24 hour format, and mm = minutes)

Table 4
Standard Value List

Field Name	Standard Value	Standard Value Description
Analysis_Type	DL	Dilution of the original sample
	DL2	Second dilution of the original sample
	DL3	Third dilution of the original sample
	DL4	Fourth dilution of the original sample
	RE	Reanalysis/re-extraction of sample
	RE2	Second reanalysis/re-extraction of sample
	RE3	Third reanalysis/re-extraction of sample
	RE4	Fourth reanalysis/re-extraction of the original sample
	RES	The initial or original sample.
Analyte_Name	Refer to QAPP and Project Library	Analyte names are specified by the project and entered into the library for each method and matrix. Analyte Names used in project libraries must first exist in the standard value table. The same holds true for the ClientAnalyteID
Analyte_Type	IS	Internal standard as defined per CLP usage
	SPK	Spiked analyte
	SURR	Surrogate as defined as per CLP usage
	TIC	Tentatively identified compound for GC/MS analysis
	TRG	Target compound
Detection_Limit_Type [1]	CRDL	Contract required detection limit
	IDL	Instrument detection limit
	MDA	Minimum detectable activity
	MDL	Method detection limit
Handling_Type [2]	WET	Wet leaching procedure
	SPLP	Synthetic Precipitation Leaching Procedure
	TCLP	Toxicity Characteristic Leaching Procedure
Lab_Analysis_Ref_Method_ID	Refer to QAPP and Project Library	Method IDs are specified by the project and entered into the library. Methods used in project libraries must first exist in the standard value table
Lab_Qualifiers [3]	*	INORG: Duplicate analysis was not within control limits
	*	ORG: Surrogate values outside of contract required QC limits
	+	INORG: Correlation coefficient for the method of standard additions (MSA) was less than 0.995
	A	ORG: Tentatively identified compound (TIC) was a suspected aldol-condensation product
	B	INORG: Value less than contract required detection limit, but greater than or equal to instrument detection limit
	B	ORG: Compound is found in the associated blank as well as in the sample
	C	ORG: Analyte presence confirmed by GC/MS
	D	Result from an analysis at a secondary dilution factor
	E	INORG: Reported value was estimated because of the presence of interference
	E	ORG: Concentrations exceed the calibration range of the instrument
	H	Analysis performed outside method or client-specified holding time requirement
	J	Estimated value
	M	INORG: Duplicate injection precision was not met
	N	INORG: Spiked sample recovery was not within control limits
	N	ORG: Presumptive evidence of a compound
	P	ORG: Difference between results from two GC columns unacceptable (>25% Difference)
	S	Reported value was determined by the method of standard additions (MSA)
	U	Compound was analyzed for, but not detected. Analyte result was below the Reporting Limit.
	W	INORG: Post digestion spike was out of control limits
	X	Reserved for a lab-defined data qualifier
	Y	Reserved for a lab-defined data qualifier
	Z	Reserved for a lab-defined data qualifier
Matrix_ID	AIR	Air
	AQ	Water
	ASH	Ash

Table 4
Standard Value List

Field Name	Standard Value	Standard Value Description
Matrix_ID (continued)	BIOTA	Biological matter
	FILTER	Filter
	LIQUID	Non-aqueous liquid
	OIL	Oil
	SED	Sediment
	SLUDGE	Sludge
	SO	Soil
	SOLID	Non-soil/sediment solid
	TISSUE	Tissue
	WASTE	Waste
	WIPE	Wipe
Preparation_Type [4]	3005A	Acid Digestion of Waters for Total Recoverable or Dissolved Metals by FLAA or ICP
	3010A	Acid of Aqueous Samples and Extracts for Total Metals by FLAA or ICP
	3015	Microwave Assisted Acid Digestion of Aqueous Samples and Extracts
	3020A	Acid Digestion of Aqueous Samples and Extracts for Total Metals by GFAA
	3031	Acid Digestion of Oils for Metals Analysis by AA or ICP
	3050B	Acid Digestion of Sediments, Sludges, and Soils
	3051	Microwave Assisted Acid Digestion of Sediments, Sludges, Soils and Oils
	3052	Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices
	3060A	Alkaline Digestion for Hexavalent Chromium
	3510C	Separatory Funnel Liquid-Liquid Extraction
	3520C	Continuous Liquid-Liquid Extraction
	3535	Solid Phase Extraction
	3540C	Soxhlet Extraction
	3541	Automated Soxhlet Extraction
	3545	Pressurized Fluid Extraction
	3550B	Ultrasonic Extraction
	3560	Supercritical Fluid Extraction of Total Recoverable Petroleum Hydrocarbons
	5030B	Purge and Trap for Aqueous Samples
	5035	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples
	7470A	Acid digestion of waters for Mercury analysis
	7471A	Acid digestion of soils and solids for Mercury analysis
	Gen Prep	Generic preparation type when a preparation method ID does not exist (used mostly for general chemistry methods)
QC_Level	COA	Certificate of Analysis (accuracy and precision, no calibration)
	COACAL	Certificate of Analysis (accuracy and precision including calibration)
QC_Type	MB	Analytical control consisting of all reagents and standards that is carried through the entire procedure (Method Blank)
	CV	(Calibration Verification) Analytical standard run at a specified frequency to verify the calibration of the analytical system
	CCV	(Continuing Calibration Verification) Analytical standard run every 12 hours to verify the calibration of the GC/MS system
	DUP	A second aliquot of a sample that is treated the same as the original aliquot to determine the precision of the method
	IC	(Initial Calibration) Analysis of analytical standards for a series of different specified concentrations
	ICV	(Initial Calibration Verification) Analytical standard run at a specified frequency to verify the accuracy of the initial calibration of the analytical system
	IPC	(Instrument Performance Check) Analysis of DFTPP or BFB to evaluate the performance of the GC/MS system
	LCS	(Laboratory Control Sample) A control sample of known composition
	LCSD	(Laboratory Control Sample Duplicate) A duplicate control sample of known composition
	MS	(Matrix Spike) Aliquot of a matrix spiked with known quantities and subjected to the entire analytical procedure to measure recovery
	MSD	(Matrix Spike Duplicate) A second aliquot of the same matrix as the matrix spike that is spiked in order to determine the precision of the method
Reporting_Limit_Type [1]	CRDL	Contract-required detection limit
	CRQL	Contract-required quantitation limit

Table 4
Standard Value List

Field Name	Standard Value	Standard Value Description
Reporting_Limit_Type (continued)	PQL	Practical quantitation limit
	SQL	Sample quantitation limit
	RDL	Reportable detection limit
Result_Basis	DRY	Result was calculated on a dry weight basis
	WET	Result was calculated on a wet weight basis
Result_Units [5]	ug/L	Micrograms per liter
	mg/L	Milligrams per liter
	ug/Kg	Micrograms per kilogram
	mg/Kg	Milligrams per kilogram
	pg/L	Picograms per liter
	ng/Kg	Nanograms per kilogram
Total_Or_Dissolved	DIS	Dissolved
	TOT	Total

1 **Additional Detection Limit Types and Reporting Limit Types may be used. These must be added to the application standard values.**
2 **Additional Handling Types (leachate procedures) may be used. These must be added to the application standard values**
3 **Additional Lab Qualifiers may be used, or listed Lab Qualifiers may be used in a different manner than described in this table. New lab qualifiers must be added to the application standard value tables. NOTE: The "U" Lab Qualifier must be used for all non-detects.**
4 **Additional Preparation Types may be used. These must be added to the application standard value tables.**
5 **Additional Result Units may be used. The project library specifies the reporting limit used for each method and matrix**

Note: If new standard values are used then these standard values must be entered in the software standard values for both the lab and contractor. The application will automatically update the standard values tables if an importing library contains standard values (method, client analyte ID, and analyte name) that do not exist in the software importing the new library.

Table 5
Required Fields in the Analytical Results Table for GC/MS, GC, and HPLC Methods

	GC/MS Methods			GC and HPLC Methods		
Field	**Regular Sample***	**MS/MSD**	**Method Blank, LCS/LCSD**	**Regular Sample***	**MS/MSD**	**Method Blank, LCS/LCSD**
Client_Sample_ID	X	X	X	X	X	X
Lab_Analysis_Ref_Method_ID	X	X	X	X	X	X
Analysis_Type	X	X	X	X	X	X
Lab_Sample_ID	X	X	X	X	X	X
Lab_ID	X	X	X	X	X	X
Client_Analyte_ID	X	X	X	X	X	X
Analyte_Name	X	X	X	X	X	X
Result	X	X	X	X	X	X
Result_Units	X	X	X	X	X	X
Lab_Qualifiers	Q	Q	Q	Q	Q	Q
Detection Limit	X	X	X	X	X	X
Detection_Limit_Type	X	X	X	X	X	X
Retention_Time	T		T			
Analyte_Type	X	X	X	X	X	X
Percent_Recovery	S	R	R	S	R	R
Relative_Percent_Difference		D	D		D	D
Reporting_Limit	X	X	X	X	X	X
Reporting_Limit_Type	X	X	X	X	X	X
Reportable_Result	X	X	X	X	X	X

Key

- X Required Field
- D Required field for spiked compounds in the LCSD and MSD only
- Q Required field if laboratory has qualified result. The “U” qualifier MUST be entered if the result is non-detect.
- R Required field if Analyte_Type = “SPK” or “SURR”
- S Required field for surrogate compounds only
- T Required field for tentatively identified compounds by GC/MS only
- * Also includes Equipment Blanks, Field Blanks, and Trip Blanks

Table 6
Required Fields in the Analytical Results Table for ICAP, AA, and IC Methods

	ICAP and AA Methods			IC and Wet Chemistry Methods		
Field	**Regular Sample***	**Sample Duplicate, MS/MSD**	**Method Blank, LCS/LCSD**	**Regular Sample***	**Sample Duplicate MS/MSD**	**Method Blank, LCS/LCSD**
Client_Sample_ID	X	X	X	X	X	X
Lab_Analysis_Ref_Method_ID	X	X	X	X	X	X
Analysis_Type	X	X	X	X	X	X
Lab_Sample_ID	X	X	X	X	X	X
Lab_ID	X	X	X	X	X	X
Client_Analyte_ID	X	X	X	X	X	X
Analyte_Name	X	X	X	X	X	X
Result	X	X	X	X	X	X
Result_Units	X	X	X	X	X	X
Lab_Qualifiers	Q	Q	Q	Q	Q	Q
Detection Limit	X	X	X	X	X	X
Detection_Limit_Type	X	X	X	X	X	X
Retention_Time						
Analyte_Type	X	X	X	X	X	X
Percent_Recovery		S	S		S	S
Relative_Percent_Difference		R	R		R	R
Reporting_Limit	X	X	X	X	X	X
Reporting_Limit_Type	X	X	X	X	X	X
Reportable_Result	X	X	X	X	X	X

<u>Key</u>

- X Required field
- Q Required field if laboratory has qualified result. The "U" qualifier MUST be entered if the result is non-detect
- R Required field for spiked compounds in LCSD or MSD, or target compounds in the Sample Duplicate only
- S Required field if Analyte_Type = "SPK"
- * Also includes Trip Blanks, Equipment Blanks, and Field Blanks

Table 7
Required Fields in the Laboratory Instrument Table

Field	GC/MS Tunes		Initial Calibration				Initial Calibration Verification				Calibration Verification, Continuing Calibration
Field	**VOA**	**SVOA**	**GC/MS**	**GC HPLC**	**ICP/AA**	**IC***	**GC/MS**	**GC HPLC**	**ICP/AA**	**IC***	**ALL METHODS**
Instrument_ID	X	X	X	X	X	X	X	X	X	X	X
QC_Type	X	X	X	X	X	X	X	X	X	X	X
Analyzed	X	X	X	X	X	X	X	X	X	X	X
Alternate_Lab_Analysis_ID	X	X	X	X	X	X	X	X	X	X	X
Lab_Analysis_ID	X	X					X	X	X	X	X
Lab_Analysis_Ref_Method_ID	X	X	X	X	X	X	X	X	X	X	X
Client_Analyte_ID	X	X	X	X	X	X	X	X	X	X	X
Analyte_Name	X	X	X	X	X	X	X	X	X	X	X
Run_Batch	X	X	X	X	X	X	X	X	X	X	X
Analysis_Batch	C	C									X
Lab_Reporting_Batch	X	X	X	X	X	X	X	X	X	X	X
Percent_Relative_Standard_Deviation			X	X							
Correlation_Coefficient			B	B	X	X					
Relative_Response_Factor			X				X				M
Percent_Difference							X	X	X	X	X
Peak_ID_01	X	X									
Percent_Ratio_01	X	X									
Peak_ID_02	X	X									
Percent_Ratio_02	X	X									
Peak_ID_03	X	X									
Percent_Ratio_03	X	X									
Peak_ID_04	X	X									
Percent_Ratio_04	X	X									
Peak_ID_05	X	X									
Percent_Ratio_05	X	X									
Peak_ID_06	X	X									
Percent_Ratio_06	X	X									
Peak_ID_07	X	X									
Percent_Ratio_07	X	X									
Peak_ID_08	X	X									
Percent_Ratio_08	X	X									
Peak_ID_09	X	X									
Percent_Ratio_09	X	X									
Peak_ID_10		X									
Percent_Ratio_10		X									
Peak_ID_11		X									
Percent_Ratio_11		X									
Peak_ID_12		X									
Percent_Ratio_12		X									
Peak_ID_13		X									
Percent_Ratio_13		X									

Key

X Required field (some fields are not applicable to some General (Wet) Chemistry tests)

B Required field if reporting best fit

C Required field if BFB or DFTPP associated with a continuing calibration only

M Required field for GC/MS continuing calibration only

*IC Includes Ion Chromatography and Classical or Wet Chemistry methods. Methods such as pH, Conductivity, and others do not use traditional calibration procedures~~,~~; therefore, some fields marked as a required field under the "IC" column do not apply for these methods.

Table 8
Required Fields in the Sample Analysis Table

Field	GC, GC/MS, HPLC Methods		ICAP and AA Methods		IC and Wet Chemistry Methods	
	Method Blanks, LCS/LCSD	Regular Samples*, Sample Duplicate, MS/MSD	Method Blanks, LCS/LCSD	Regular Samples*, Sample Duplicate, MS/MSD	Method Blanks, LCS/LCSD	Regular Samples*, Sample Duplicate, MS/MSD
Client_Sample_ID	X	X	X	X	X	X
Collected		X		X		X
Matrix_ID	X	X	X	X	X	X
Lab_Sample_ID	X	X	X	X	X	X
QC_Type	X	Q	X	Q	X	X
Shipping_Batch_ID		X		X		X
Temperature		X				X
Lab_Analysis_Ref_Method_ID	X	X	X	X	X	X
Preparation_Type	X	X	X	X	X	X
Analysis_Type	X	X	X	X	X	X
Prepared	A	A	X	X	N	N
Analyzed	X	X	X	X	X	X
Lab_ID	X	X	X	X	X	X
QC_Level	X	X	X	X	X	X
Results_Basis		S		S		S
Total_Or_Dissolved			W	W		
Dilution	X	X	X	X	X	X
Handling_Type	L	L	L	L	L	L
Handling_Batch	L	L	L	L	L	L
Leachate_Date	L	L	L	L	L	L
Percent Moisture		S		S		S
Method_Batch	X	X	X	X	X	X
Preparation_Batch	X	X	X	X	X	X
Run_Batch	C	C	C	C	C	C
Analysis_Batch	C	C	C	C	C	C
Lab_Reporting_Batch	X	X	X	X	X	X
Lab_Receipt		X		X		X
Lab_Reported	X	X	X	X	X	X

Key

X Required field
A Required field for samples prepared by methanol extraction
C Required field if Instrument Calibration Table (A2) is included in EDD
L Required field if analysis performed on SPLP, TCLP, or WET extracts
N Required field only for samples that require preparation before analysis
Q Required field for Sample Duplicate, MS, and MSD only
S Required field if “Matrix_ID” = “SO” or “SED”
W Required field for aqueous samples only
* Includes Trip Blanks, Equipment Blanks, and Field Blanks

Appendix D
Technical Memoranda

April 2, 2019

Deborah Smith
Executive Officer
Los Angeles Regional Water Quality Control Board
320 West 4th Street, Suite 200
Los Angeles, California 90013

Re: Proposed Modifications in Support of Compliance Monitoring and Reporting for the Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters

Dear Ms. Smith,

The Greater Harbor Waters Regional Monitoring Coalition (RMC) has been conducting compliance monitoring to assess water, sediment, and fish tissue quality as part of the Total Maximum Daily Load for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (Harbor Toxics TMDL) compliance monitoring and reporting program since 2014. At our request, our contractor, Anchor QEA, LLC, has evaluated the analytical results and identified modified approaches to the water quality and fish tissue quality components of the monitoring program. These modified approaches will result in a more efficient compliance monitoring program while maintaining the integrity and objectives of the program. The objectives of the modified approaches are as follows:

- Reduce the overall number of water quality monitoring stations and the number of vertical water column samples (for total suspended solids [TSS]) based on statistically similar spatial patterns in the analytical results.
- Align fish tissue collections with the current sediment quality schedule to facilitate data interpretation. This will reduce the overall number of fish tissue sampling events from once every other year (i.e., five times in a 10-year period) to twice in a 5-year period (i.e., four times in a 10-year period). This modification is based on the similarity of the statistical power to detect trends in fish tissue concentrations between the current sampling and proposed modification to the sampling schedule.

This letter presents a summary of the data that support these recommendations. The RMC requests that the RWQCB review and approve the following modified approaches to the water quality and fish tissue quality components of the Harbor Toxics TMDL compliance monitoring program. Please note that the RMC is not requesting modifications to the existing sediment quality monitoring program at this time.

Water Quality Monitoring

The Greater Harbor Waters is an extremely complex hydrodynamic system comprising estuarine and coastal waters receiving discharges from major rivers and numerous storm drains. Hydrodynamic features vary among estuarine areas, small basins, and deep harbor channels. Estuarine areas such as the Consolidated Slip and Los Angeles River Estuary are relatively shallow and receive the bulk of river and storm drain runoff. Here, hydrodynamic conditions are very dynamic due to runoff with typically stratified flows between the surface and bottom. Small basins in the Greater Harbor Waters such as Fish Harbor and Cabrillo Marina are hydrodynamically inactive areas and have shallower water depths compared to other areas of the Greater Harbor Waters. These small basins receive less runoff than estuarine areas and may have some stratified flows during wet weather. The main channels and outer Port of Los Angeles and Port of Long Beach harbors and Eastern San Pedro Bay areas are deeper and more uniformly well-mixed, particularly during dry weather conditions. Inner areas of the Greater Harbor Waters may have some temporary surface stratification due to wet weather conditions, which decreases toward the outer harbor areas.

Data Analysis

Water quality monitoring results have consistently shown detectable chemical concentrations that are well below water quality criteria in both wet and dry seasons, except for dissolved copper. Water column TSS concentrations have also been found to be similar across all water column depths and across stations for all sampling events.

Water column compliance data were further analyzed to determine if there was a more efficient sampling program that could be implemented to reduce redundancy in the data being collected, while retaining the same spatial coverage and station representativeness across the Greater Harbor Waters. To evaluate the spatial coverage, Tukey's test was conducted to compare the copper concentrations between stations within the Greater Harbor Waters. For this comparison, the copper concentrations at each RMC water quality monitoring station were tested. Table 1 shows the TMDL Waterbody and RMC monitoring station for each paired comparison, as well as the results of the statistical comparison and the group that each station was assigned to based on the statistical differences between locations. Statistical differences resulting from the Tukey's test comparisons of each set of paired stations are indicated by p-values <0.05 in Table 1. The stations were then divided into groups that differ slightly from the Harbor Toxics TMDL waterbodies. Long Beach Inner Harbor was split into two groups (Groups 7 and 8) because there was a statistical difference between Station 12 compared with Stations 13, 14, and 15. Likewise, East San Pedro Bay was split into two groups (Groups 10 and 11) based on the statistical difference between Station 18 compared with Stations 19 and 20. However, given the lack of statistical difference (p-values >0.05) between Los Angeles Outer Harbor Inner Cabrillo Beach (Station 11) and the Inside Breakwater areas (Stations 8 and 9), these stations and waterbodies were combined into one group (Group 5). The copper concentrations at stations within all other Harbor Toxics TMDL waterbodies were not statistically different (Table 1), so these areas were maintained, with one exception—the southern portion of Los Angeles Inner Harbor (Station 5) was split off as Group 3 from the northern portion (Stations 2, 3, 4, and 6), which was assigned to Group 2. The resulting groups are shown in Figure 1.

Table 1
Results of Tukey's Test of Copper Concentrations Between Harbor Stations

TMDL Waterbody	RMC Station	Group Number	TMDL Waterbody	RMC Station	Group Number	P-Value
Los Angeles Inner Harbor	2	2	Consolidated Slip	1	1	0.39
	3	2		1	1	0.09
	4	2		1	1	0.16
	6	2		1	1	**<0.05**
	3	2	Los Angeles Inner Harbor	2	2	1.00
	4	2		2	2	1.00
	6	2		2	2	0.93
	4	2		3	2	1.00
	6	2		3	2	1.00
	6	2		4	2	1.00
	6	2		5	3	0.99
	5	3	Consolidated Slip	1	1	**<0.05**
	5	3	Los Angeles Inner Harbor	2	2	0.32
	5	3		3	2	0.85
	5	3		4	2	0.63
Fish Harbor	7	4	Consolidated Slip	1	1	0.99
	7	4	Los Angeles Inner Harbor	2	2	0.97
	7	4		3	2	0.64
	7	4		4	2	0.81
	7	4		5	3	**<0.05**
	7	4		6	2	0.22
Los Angeles Outer Harbor (Inside Breakwater)	8	5	Consolidated Slip	1	1	**<0.05**
	9	5		1	1	**<0.05**
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		1	1	**<0.05**
Los Angeles Outer Harbor (Inside Breakwater)	8	5	Los Angeles Inner Harbor	2	2	**<0.05**
	9	5		2	2	0.46
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		2	2	0.93
Los Angeles Outer Harbor (Inside Breakwater)	8	5		3	2	0.34
	9	5		3	2	0.93
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		3	2	1.00
Los Angeles Outer Harbor (Inside Breakwater)	8	5		4	2	0.16
	9	5		4	2	0.77
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		4	2	1.00

TMDL Waterbody	RMC Station	Group Number	TMDL Waterbody	RMC Station	Group Number	P-Value
Los Angeles Outer Harbor (Inside Breakwater)	8	5		5	3	1.00
	9	5		5	3	1.00
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		5	3	1.00
Los Angeles Outer Harbor (Inside Breakwater)	8	5		6	2	0.74
	9	5		6	2	1.00
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		6	2	1.00
Los Angeles Outer Harbor (Inside Breakwater)	8	5	Fish Harbor	7	4	**<0.05**
	9	5		7	4	**<0.05**
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		7	4	0.23
Los Angeles Outer Harbor (Inside Breakwater)	9	5	Los Angeles Outer Harbor (Inside Breakwater)	8	5	1.00
Los Angeles Outer Harbor – Inner Cabrillo Beach Area	11	5		8	5	0.79
	11	5		9	5	1.00
	11	5	Los Angeles Inner Harbor – Cabrillo Marina	10	5	**<0.05**
Los Angeles Inner Harbor – Cabrillo Marina	10	6	Consolidated Slip	1	1	**<0.05**
	10	6	Los Angeles Inner Harbor	2	2	**<0.05**
	10	6		3	2	**<0.05**
	10	6		4	2	**<0.05**
	10	6		5	3	**<0.05**
	10	6		6	2	**<0.05**
	10	6	Fish Harbor	7	4	**<0.05**
	10	6	Los Angeles Outer Harbor (Inside Breakwater)	8	5	**<0.05**
	10	6		9	5	**<0.05**
Long Beach Inner Harbor	13	8	Long Beach Inner Harbor	12	7	**<0.05**
	14	8		12	7	**<0.05**
	15	8		12	7	**<0.05**
	14	8		13	8	0.86
	15	8		13	8	0.95
	15	8		14	8	1.00
Long Beach Outer Harbor (Inside Breakwater)	16	9		12	7	**<0.05**
	17	9		12	7	**<0.05**
	16	9		13	8	0.68
	17	9		13	8	0.94
	16	9		14	8	1.00
	17	9		14	8	1.00

TMDL Waterbody	RMC Station	Group Number	TMDL Waterbody	RMC Station	Group Number	P-Value
	16	9		15	8	0.99
	17	9		15	8	1.00
	17	9	Long Beach Outer Harbor (Inside Breakwater)	16	9	0.99
East San Pedro Bay	19	11	East San Pedro Bay	18	10	**<0.05**
	20	11		18	10	**<0.05**
	20	11		19	11	0.99
Los Angeles River Estuary (Queensway Bay)	22	12	Los Angeles River Estuary (Queensway Bay)	21	12	0.80

Note:
Bold: significantly different

Figure 2 shows the results of the copper evaluation that was conducted separately for the wet and dry seasons. The spatial groupings are indicated with different colors, which all have statistically similar copper concentrations in distinct Greater Harbor Waters subareas regardless of the season.

An evaluation of whether there were statistical differences in TSS concentrations across the three depths sampled for both wet and dry season events was conducted, and results are presented in Table 2. At most stations and events, TSS was not statistically different among different water column depths; however, in some cases, the mid and shallow water depths showed statistically lower concentrations than those at bottom depths.

Table 2
Kruskal-Wallis ANOVA Results for TSS Comparison by Depth

Event	Season Type	ANOVA P-Value	Pairs Comparison (P ≤ 0.05)		
			Shallow	Mid	Bottom
Fall 2014	Wet	0.96	A	A	A
Fall 2015	**Wet**	**0.03**	**A**	**A**	**B**
Fall 2016	Wet	0.57	A	A	A
Summer 2014	**Dry**	**<0.05**	**A**	**B**	**C**
Summer 2015	**Dry**	**<0.05**	**A**	**AB**	**B**
Summer 2016	**Dry**	**<0.05**	**A**	**A**	**B**
Winter 2015	Wet	0.412	A	A	A
Winter 2016	**Wet**	**<0.05**	**A**	**A**	**B**

Notes:
Bold: significant depth effect at $\alpha \leq 0.05$
Depths with different letters were significantly different. AB indicates mean TSS is not significantly different to either A or B; B indicates higher mean TSS than A; and C indicates higher mean TSS than B.
ANOVA: analysis of variance

The complex hydrodynamic conditions can be illustrated by salinity data collected throughout the Greater Harbor Water from 2005 to 2011 (Figure 3). These data were used for the Port of Long Beach and Port of Los Angeles' Water Resource Action Plan (WRAP) hydrodynamic and sediment transport model development as part of the mixing and transport calibration. During dry weather, there is little difference in salinity throughout the water column in all areas, except for Group 10 near the Los Angeles River Estuary (there is no stratification, and the water is well-mixed throughout the water column). During wet weather, stratification is evident in the water column in areas designated as Groups 1, 2, and 10. These areas are directly influenced by major watershed inputs from Dominguez Channel and Los Angeles River and show that during wet weather the water column is generally divided into two layers: a fresh (i.e., less saline) top layer and a rather uniformly mixed bottom layer with greater salinity.

Modified Approach

For the reasons stated above, the modified approach proposed for water quality monitoring includes the following:

- Reduce the number of water quality monitoring stations from the 22 Harbor Toxics TMDL-specified locations to 12 that are representative of the range of conditions across the Greater Harbor Waters.
- Reduce the number of vertical water quality samples from three (surface, mid-water column, and bottom) to two (surface and bottom) that are representative of the range of conditions within the water column.

Based on the statistical analyses presented above, the Greater Harbor Waters may be divided into 12 distinct groups (Figure 1) based on similarities in surface water chemistry (specifically, dissolved copper concentrations that tend to exceed water quality criteria). The proposed modification would limit the number of water quality monitoring stations to 12—one per group—per monitoring event. During each monitoring event, samples would only be collected at one monitoring station per group. This station may be selected randomly or may simply alternate between stations. Furthermore, based on the statistical analyses and WRAP model output also presented above, at each of the 12 monitoring stations sampled per event, the proposed modification would limit the number of water samples for TSS to two (surface and bottom).

The RMC does not propose any modifications to the number of events collected per year (two wet weather and one dry weather), the locations of the 22 Harbor Toxics TMDL-specified monitoring stations, or the suite of chemical parameters analyzed for each sample.

Fish Tissue Monitoring

Fish tissue total polychlorinated biphenyl (PCB) and DDX concentrations have shown very similar results across sampling events, indicating that the rate of recovery is slow; therefore, a more efficient sampling may be possible while continuing to provide the power to detect changes in fish tissue concentrations. In addition, synoptically collected fish tissue and sediment quality data provides benefits in data interpretation and a more sustainable field collection program.

Data Analysis

Fish tissue data collection efforts were evaluated to determine if efficiencies could be gained without reducing the ability to measure statistically significant reductions in fish tissue concentrations as fish tissue recover over time. Current compliance monitoring requires biennial fish tissue sampling, which is not in alignment with sediment sampling requirements that involve two events within a 5-year period. To determine if there was a more efficient sampling program that would provide the necessary power to detect anticipated changes in fish tissue over time, fish tissue temporal trends for PCBs were evaluated using regression analysis and concentrations in future years estimated from the existing dataset. The rate of decline for PCBs in the target fish (white croaker, California halibut, and Shiner surfperch) is variable throughout the Greater Harbor Waters (Figures 4a, 4b, and 4c). Given the most data were available for white croaker collected from Los Angeles Outer Harbor, the rate of decline rate, 5% per year on a wet-weight basis, was used for this evaluation. This rate of decline was used to simulate PCB concentrations for future sampling events that would be collected every 2 years (i.e., consistent with the current program) or twice every 5 years (i.e., consistent with the sediment sampling program schedule) over the next 20 years. To simulate future sampling events, samples were selected from existing data collected between 2011 and 2016, separately from each monitoring area and species, 1,000 times. The rate of decline was then calculated from each simulation and tested to determine whether the rate was significant. The number of significant declines over the 1,000 simulations provides the power to detect a significant decline for both the current and proposed programs. The details and results of this evaluation are provided in Table 3. As shown, the reduced sampling program results in only marginal differences.

Table 3
Simulation of Future Fish Tissue Sampling Events

Species	Harbor Area	Sample Count	Sample Average (µg/kg wet-weight	Sample Deviation (µg/kg wet-weight)	Coefficient of Variation	Power (Current Program: 10 sampling events in 20 years)	Power (Proposed Approach: 8 sampling events in 20 years)
White croaker	Los Angeles Outer Harbor	44	46.7	40.3	0.9	25.5	23.9
White croaker	Long Beach Outer Harbor	34	80.4	85.2	1.1	33	24.1
White croaker	Consolidated Slip	20	400.3	610.8	1.5	35	29.3
White croaker	Eastern San Pedro Bay	6	170.0	80.6	0.5	86.3	76.2

Species	Harbor Area	Sample Count	Sample Average (µg/kg wet-weight	Sample Deviation (µg/kg wet-weight)	Coefficient of Variation	Power (Current Program: 10 sampling events in 20 years)	Power (Proposed Approach: 8 sampling events in 20 years)
Halibut	Los Angeles Outer Harbor	26	9.1	5.5	0.6	14.7	16.8
Halibut	Long Beach Outer Harbor	12	9.7	3.9	0.4	96.9	92.1
Halibut	Consolidated Slip	12	39.9	54.9	1.4	40	34.6
Halibut	Eastern San Pedro Bay	6	10.2	5.5	0.5	80.9	72.9
Surfperch	Los Angeles Outer Harbor	14	102.3	102.8	1.0	65.9	55.8
Surfperch	Long Beach Outer Harbor	3	142.3	76.5	0.5	97.5	92.5
Surfperch	Consolidated Slip	9	614.6	126.9	0.2	100	100
Northern anchovy	Eastern San Pedro Bay	3	23.0	6.2	0.3	100	100

Notes:
2011 to 2016 wet-weight based data used.
Northern anchovy data were used as a surrogate for surfperches in Eastern San Pedro Bay because surfperch data are not available.
Halibut includes California halibut and California lizardfish.
Fillet preparations used for white croaker and halibut. Whole body preparations used for surfperch.
High value of California halibut at Los Angeles Outer Harbor (OH5_FFF_1CH) was excluded.

The differences shown in Table 3 are negligible in light of the known PCB concentration variability associated with different analytical laboratories and occurring among individual fishes. Therefore, to improve efficiencies in the sampling program, it is recommended that the fish tissue sampling efforts be conducted synoptically with sediment. Based on the data provided, this will not change the power to observe differences in fish tissue contaminants over time and will allow for paired analyses of sediment and fish, when warranted.

In addition, the proposed modification to the fish tissue monitoring schedule provides greater flexibility to coordinate with the Southern California Bight Regional Monitoring Program (Bight Program). The current fish tissue monitoring schedule does not always align with the Bight Program.

Modified Approach

For the reasons stated above, the modified approach proposed for fish tissue monitoring is as follows:

- Reduce the number of fish tissue sampling events from once every other year (i.e., five times in a 10-year period) to twice in a 5-year period (i.e., four times in a 10-year period) based on the statistical power to detect trends in fish tissue concentrations across a long-term monitoring program.

The RMC does not propose any modifications to the locations of the four Harbor Toxics TMDL-specified fish tissue monitoring areas, the number of composite samples, or the suite of chemical parameters analyzed for each sample.

Summary

The RMC appreciates the RWQCB's consideration of the proposed modifications to the Harbor Toxics TMDL compliance monitoring and reporting program. As we have documented, the proposed approaches maintain the integrity and objectives of the compliance monitoring program while providing greater efficiency in monitoring activities to the responsible parties.

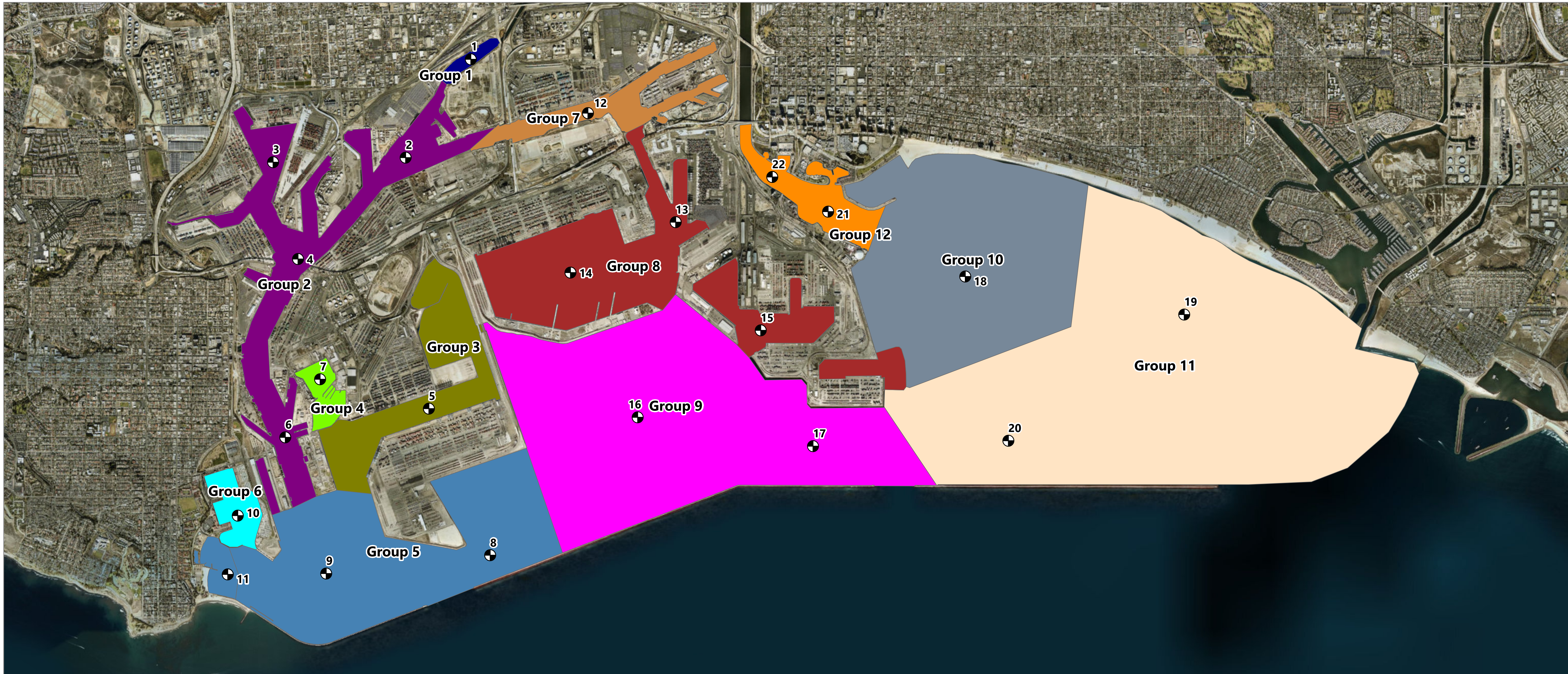
Sincerely,

James Vernon
Manager of Water Quality, Port of Long Beach
Chairperson, Greater Harbor Waters Regional Monitoring Coalition

cc: City of Bellflower
City of Lakewood
City of Long Beach
City of Los Angeles
City of Paramount
City of Rancho Palos Verdes
City of Rolling Hills
City of Rolling Hills Estates
City of Signal Hill
Los Angeles County
Los Angeles County Flood Control District
Port of Los Angeles

Attachments

Figure 1	Proposed Station Groups for Alternative Water Quality Monitoring Approach
Figure 2	Copper Concentrations (All Seasons) by Station
Figure 3	Salinity Profiles for Similar Water Quality Monitoring Groups within the Greater Harbor Waters



LEGEND:

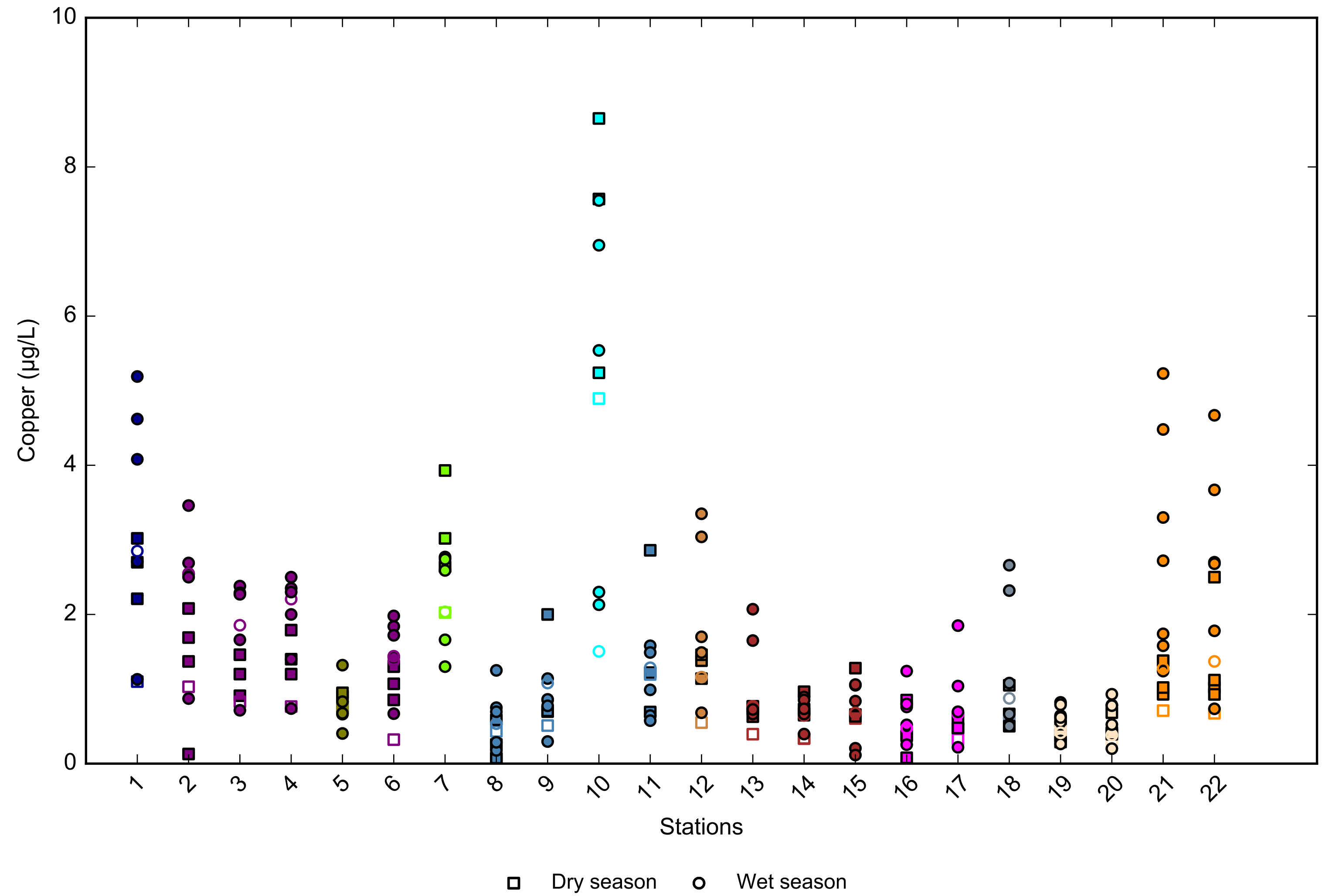
- Water Quality Monitoring Stations
- Group 1: Consolidated Slip
- Group 2: Inner Los Angeles Harbor
- Group 3: Seaplane Lagoon
- Group 4: Fish Harbor
- Group 5: Outer Los Angeles Harbor
- Group 6: Cabrillo Marina
- Group 7: Inner Long Beach Harbor
- Group 8: Middle Long Beach Harbor
- Group 9: Outer Long Beach Harbor
- Group 10: Eastern San Pedro Bay (Inner)
- Group 11: Eastern San Pedro Bay (Outer)
- Group 12: Los Angeles River Estuary

0 5,000
Feet

Publish Date: 2019/03/29, 3:13 PM | User: ckiblinger
Filepath: \\orcas\gis\Jobs\GatewayWaterMgmtAuth_1205\RegionalMonitoring\Analysis\2018_03_Copper_Waterbodies\POLALB_Copper_Waterbody_Regions.mxd

ANCHOR QEA

Figure 1
Proposed Station Groups for Modified Water Quality Monitoring Approach
Modified Sampling Approach
Harbor Toxics TMDL Compliance Monitoring and Reporting

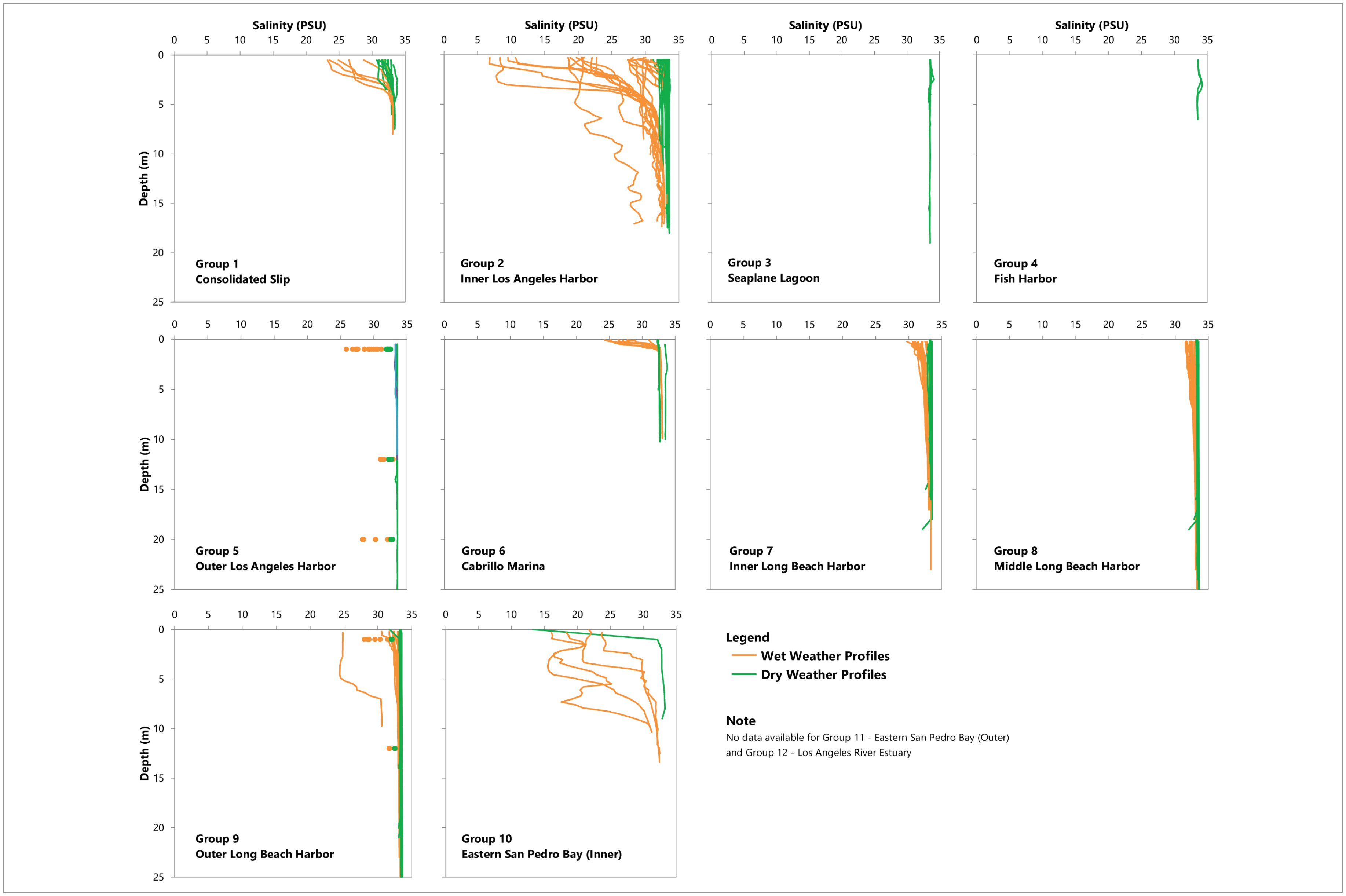


Non-detect samples were set at half detected values, depicted with open symbols.
Different colors indicate stations found in relative proximity to one another with results that are not significantly different within LA Harbor, LB Harbor, LARE, or E. San Pedro Bay.

Publish Date: 04/02/2019 11:10 AM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Lead_Copper_Analysis_v3.py

ANCHOR QEA

Figure 2
Copper Concentrations (All Seasons) by Station
Modified Sampling Approach
Harbor Toxics TMDL Compliance Monitoring and Reporting



Filepath: S:\PROJECTS\GWMA\RMC_Compliance Monitoring(141205-01.01)_Project_Management\Correspondence\Alternate Sampling Approach\Figure 3.docx

ANCHOR QEA

Figure 3
Salinity Profiles for Similar Water Quality Monitoring Groups within the Greater Harbor Waters
Modified Sampling Approach
Harbor Toxics TMDL Compliance Monitoring and Reporting

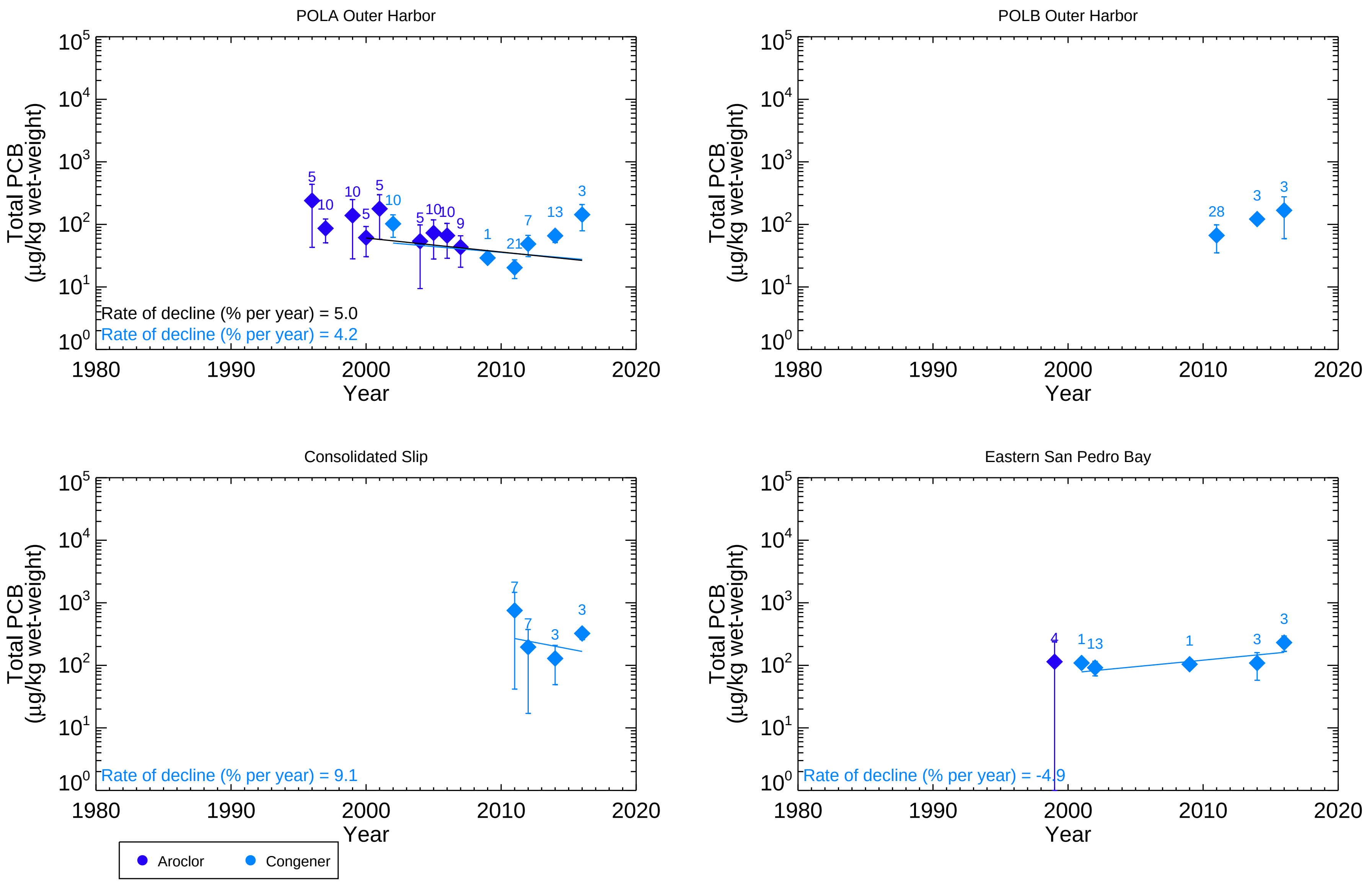


Figure 4a

Temporal Patterns in Total TPCB Concentration in White Croaker

Field duplicates were averaged. Fillet (all types) preparations are used. Totals are calculated as sum of detected congeners or aroclors.
Points are means +/- 2 standard errors. Congener data plotted when paired aroclors and congeners are available.

Modified Sampling Approach
Harbor Toxics TMDL Compliance Monitoring and Reporting

MM - \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Fish\lalb_fish_temporal_by_tmdlarea.pro Mon Jan 21 13:30:39 2019

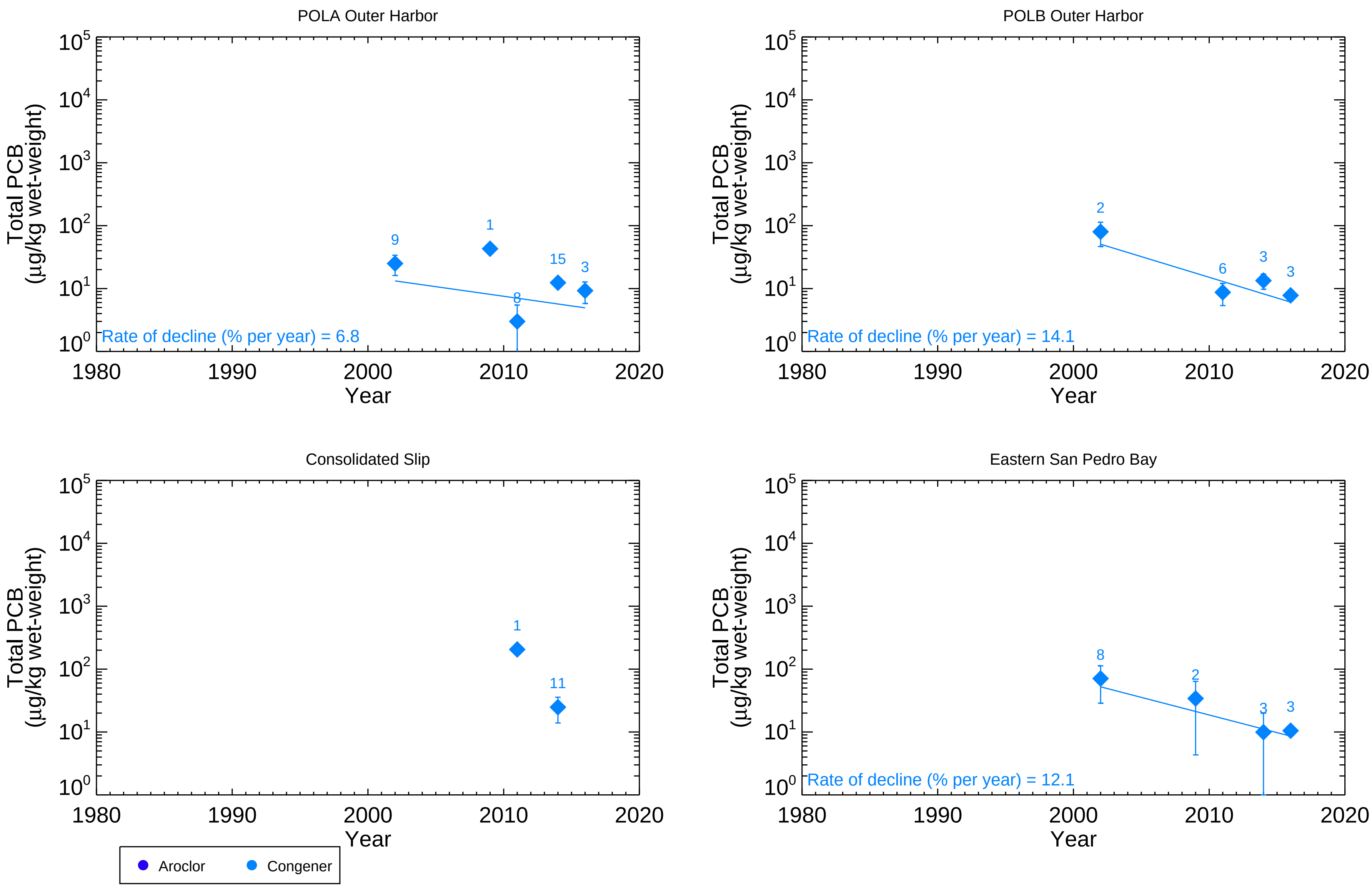


Figure 4b

Temporal Patterns in Total TPCB Concentration in Halibut

Field duplicates were averaged. Fillet (all types) preparations are used. Totals are calculated as sum of detected congeners or aroclors. Points are means +/- 2 standard errors. Congener data plotted when paired aroclors and congeners are available.

Modified Sampling Approach
Harbor Toxics TMDL Compliance Monitoring and Reporting

MM - \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Fish\lalb_fish_temporal_by_tmdlarea.pro Mon Jan 21 13:30:39 2019

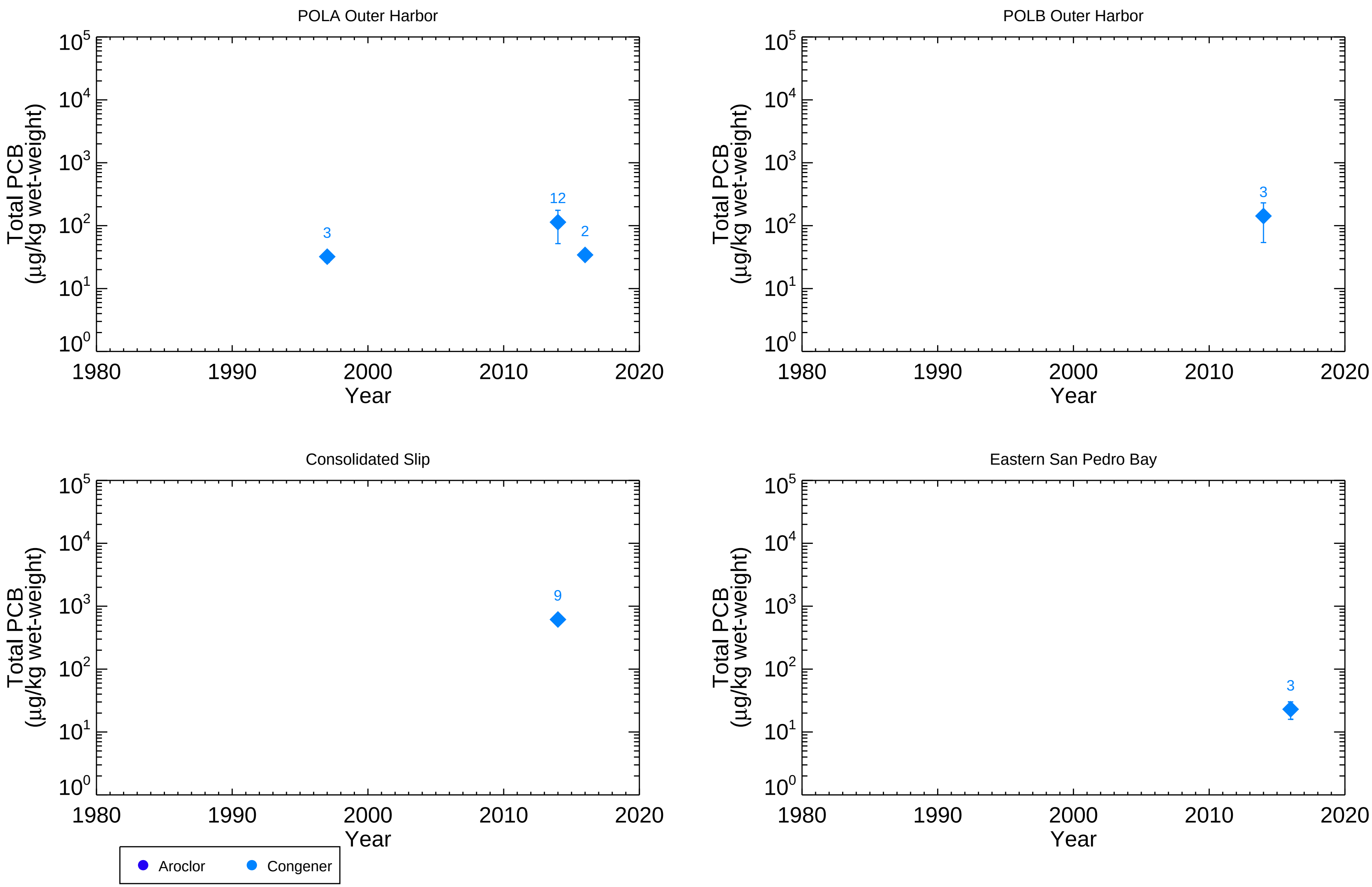


Figure 4c

Temporal Patterns in Total TPCB Concentration in Surfperch

Field duplicates were averaged. Fillet (all types) preparations are used. Totals are calculated as sum of detected congeners or aroclors. Points are means +/- 2 standard errors. Congener data plotted when paired aroclors and congeners are available. Surfperch include Shiner Surperch, White Surfperch, Northern anchovy (in ESP Bay) and Topsmelt (in ESP Bay).

Modified Sampling Approach

Harbor Toxics TMDL Compliance Monitoring and Reporting

MM - \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Fish\lalb_fish_temporal_by_tmdlarea.pro Mon Jan 21 13:30:39 2019

9700 Research Drive
Irvine, California 92618
949.347.2780

ANCHOR QEA

Memorandum

July 9, 2019

To: Thanhloan Nguyen and LB Nye, Regional Water Quality Control Board

From: Andrew Martin and Beth Lamoureux, Anchor QEA, LLC

cc: Andrew Jirik and Kat Prickett, Port of Los Angeles, and James Vernon, Port of Long Beach

Re: Harbor Toxics TMDL Modified Sampling Approach – Analysis of Additional Water Quality Parameters

The purpose of this memorandum is to address a concern raised by the Regional Water Quality Control Board during our May 28, 2019 meeting to discuss a modified sampling approach for Harbor Toxics Total Maximum Daily Load (TMDL) compliance monitoring. The concern was that the statistical comparison of water column data across stations, conducted to evaluate a more efficient water quality monitoring program, was limited to dissolved copper. To address that concern, we evaluated the spatial distribution of the concentrations of the other dissolved metals, total DDX, and total polychlorinated biphenyls (PCBs). Then, if the other chemicals demonstrated a spatial distribution that differed from that of dissolved copper, we repeated the analysis of variance (ANOVA) and Tukey analysis for that chemical.[1] These results are described below.

The spatial distribution of the concentrations of the other dissolved metals, total DDX, and total PCBs are presented as box plots in Figures 1 through 7. The water quality threshold value was posted on the plot, and where possible (i.e., if data were within range of the water quality threshold), the value was plotted as a horizontal dashed line. Additionally, the total number of samples and number of samples below the detection limit at each station were listed at the top of the plot.

For many of the chemicals, including dissolved cadmium, dissolved chromium, dissolved mercury, total DDX, and total PCBs, there were little or no spatial patterns in the concentrations between stations. It was clear that there was no statistical difference in the concentrations between stations based on visual observation. Thus, a statistical evaluation was not necessary for these chemicals. Further, for all these chemicals, except total DDX, the concentrations in the existing dataset were well below their water quality thresholds. For total DDX, while there are individual samples above the threshold, the mean concentrations at all stations were at or below the thresholds.

In contrast, dissolved lead and dissolved zinc did exhibit spatial patterns. The pattern for dissolved zinc was similar to dissolved copper; therefore, the station groupings that were developed based on

[1] A cluster analysis was suggested as a means of evaluating whether the other dissolved metals and total DDX and total PCBs have sources similar to that of dissolved copper to ensure that the spatial distribution of dissolved copper adequately represents the spatial distribution of all monitored chemicals. However, considering the lack of spatial distribution, a cluster analysis was unlikely to show meaningful results. Furthermore, cluster analyses are typically designed to identify sources using the spatial distribution of contaminants, which does not align with the objective of this data review.

the distribution and statistical evaluation of dissolved copper data will also capture the spatial distribution of dissolved zinc. The spatial pattern for dissolved lead was different than dissolved copper; however, it is important to note the dissolved lead concentrations were well below the threshold value, suggesting less of a concern that elimination of a station may result in the failure to detect an exceedance. Nonetheless, to verify that the modified sampling program would be able to adequately capture the variability in dissolved lead concentrations, we repeated the ANOVA and Tukey test for dissolved lead and found no statistical differences between any stations throughout the Harbor (Table 1).

In summary, through evaluation of the spatial distribution of all monitored chemicals as well as supplemental statistical tests, we have determined that the modified sampling program as originally proposed in our letter on April 2, 2019, will capture the variability of each chemical and is unlikely to result in the failure to identify the exceedance of a threshold within a TMDL waterbody.

Table

Table 1

Results of Tukey's Test of Dissolved Lead Concentrations Between Harbor Stations, with TMDL Waterbodies and Assigned Groups Indicated

TMDL Waterbody	Group Number 1	Station 1	TMDL Waterbody	Group Number 2	Station 2	P-Value
Los Angeles Inner Harbor	2	02	Consolidated Slip	1	01	0.97
Los Angeles Inner Harbor	2	03	Consolidated Slip	1	01	0.78
Los Angeles Inner Harbor	2	04	Consolidated Slip	1	01	1.00
Los Angeles Inner Harbor	2	06	Consolidated Slip	1	01	0.82
Los Angeles Inner Harbor	2	03	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Inner Harbor	2	04	Los Angeles Inner Harbor	2	02	0.96
Los Angeles Inner Harbor	2	06	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Inner Harbor	2	04	Los Angeles Inner Harbor	2	03	0.75
Los Angeles Inner Harbor	2	06	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Inner Harbor	2	06	Los Angeles Inner Harbor	2	04	0.78
Los Angeles Inner Harbor	2	06	Los Angeles Inner Harbor	3	05	1.00
Los Angeles Inner Harbor	3	05	Consolidated Slip	1	01	0.70
Los Angeles Inner Harbor	3	05	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Inner Harbor	3	05	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Inner Harbor	3	05	Los Angeles Inner Harbor	2	04	0.66
Fish Harbor	4	07	Consolidated Slip	1	01	0.97
Fish Harbor	4	07	Los Angeles Inner Harbor	2	02	1.00
Fish Harbor	4	07	Los Angeles Inner Harbor	2	03	1.00
Fish Harbor	4	07	Los Angeles Inner Harbor	2	04	0.96
Fish Harbor	4	07	Los Angeles Inner Harbor	3	05	1.00
Fish Harbor	4	07	Los Angeles Inner Harbor	2	06	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Consolidated Slip	1	01	0.53
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Consolidated Slip	1	01	0.54
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Consolidated Slip	1	01	0.91
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	2	04	0.48
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	2	04	0.50

Table 1

Results of Tukey's Test of Dissolved Lead Concentrations Between Harbor Stations, with TMDL Waterbodies and Assigned Groups Indicated

TMDL Waterbody	Group Number 1	Station 1	TMDL Waterbody	Group Number 2	Station 2	P-Value
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	2	04	0.89
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	3	05	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	3	05	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	3	05	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	2	06	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	2	06	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	2	06	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	08	Los Angeles Inner Harbor	4	07	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Inner Harbor	4	07	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor	4	07	1.00
Los Angeles Outer Harbor (Inside Breakwater)	5	09	Los Angeles Outer Harbor (Inside Breakwater)	5	08	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Outer Harbor (Inside Breakwater)	5	08	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Outer Harbor (Inside Breakwater)	5	09	1.00
Los Angeles Outer Harbor - Inner Cabrillo Beach Area	5	11	Los Angeles Inner Harbor - Cabrillo Marina	5	10	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Consolidated Slip	1	01	0.76
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Inner Harbor	2	02	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Inner Harbor	2	03	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Inner Harbor	2	04	0.72
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Inner Harbor	3	05	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Inner Harbor	2	06	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Fish Harbor	4	07	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Outer Harbor (Inside Breakwater)	5	08	1.00
Los Angeles Inner Harbor - Cabrillo Marina	6	10	Los Angeles Outer Harbor (Inside Breakwater)	5	09	1.00
Long Beach Inner Harbor	8	13	Long Beach Inner Harbor	7	12	0.99
Long Beach Inner Harbor	8	14	Long Beach Inner Harbor	7	12	1.00
Long Beach Inner Harbor	8	15	Long Beach Inner Harbor	7	12	0.94
Long Beach Inner Harbor	8	14	Long Beach Inner Harbor	8	13	0.97
Long Beach Inner Harbor	8	15	Long Beach Inner Harbor	8	13	1.00
Long Beach Inner Harbor	8	15	Long Beach Inner Harbor	8	14	0.89

Table 1

Results of Tukey's Test of Dissolved Lead Concentrations Between Harbor Stations, with TMDL Waterbodies and Assigned Groups Indicated

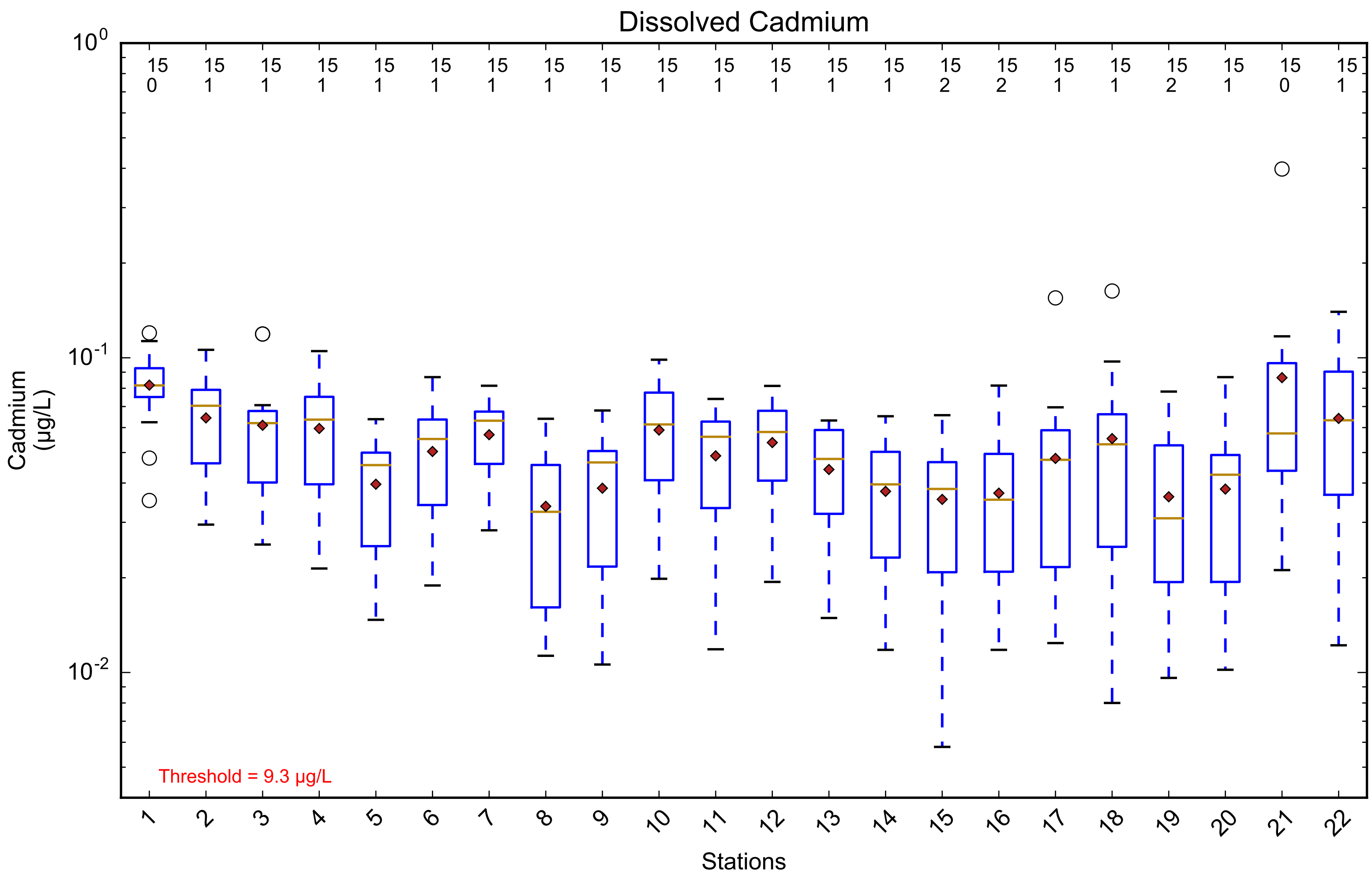
TMDL Waterbody	Group Number 1	Station 1	TMDL Waterbody	Group Number 2	Station 2	P-Value
Long Beach Outer Harbor (Inside Breakwater)	9	16	Long Beach Inner Harbor	7	12	1.00
	9	17		7	12	1.00
	9	16		8	13	0.89
	9	17		8	13	0.99
	9	16		8	14	1.00
	9	17		8	14	1.00
	9	16		8	15	0.75
	9	17		8	15	0.95
	9	17	Long Beach Outer Harbor (Inside Breakwater)	9	16	1.00
East San Pedro Bay	11	19	East San Pedro Bay	10	18	0.82
	11	20		10	18	1.00
	11	20		11	19	0.83
Los Angeles River Estuary (Queensway Bay)	12	22	Los Angeles River Estuary (Queensway Bay)	12	21	0.96

Notes:

Statistical differences resulting from the Tukey's test comparisons of each set of paired stations are indicated by p-values <0.05.

TMDL: Total Maximum Daily Load

Figures



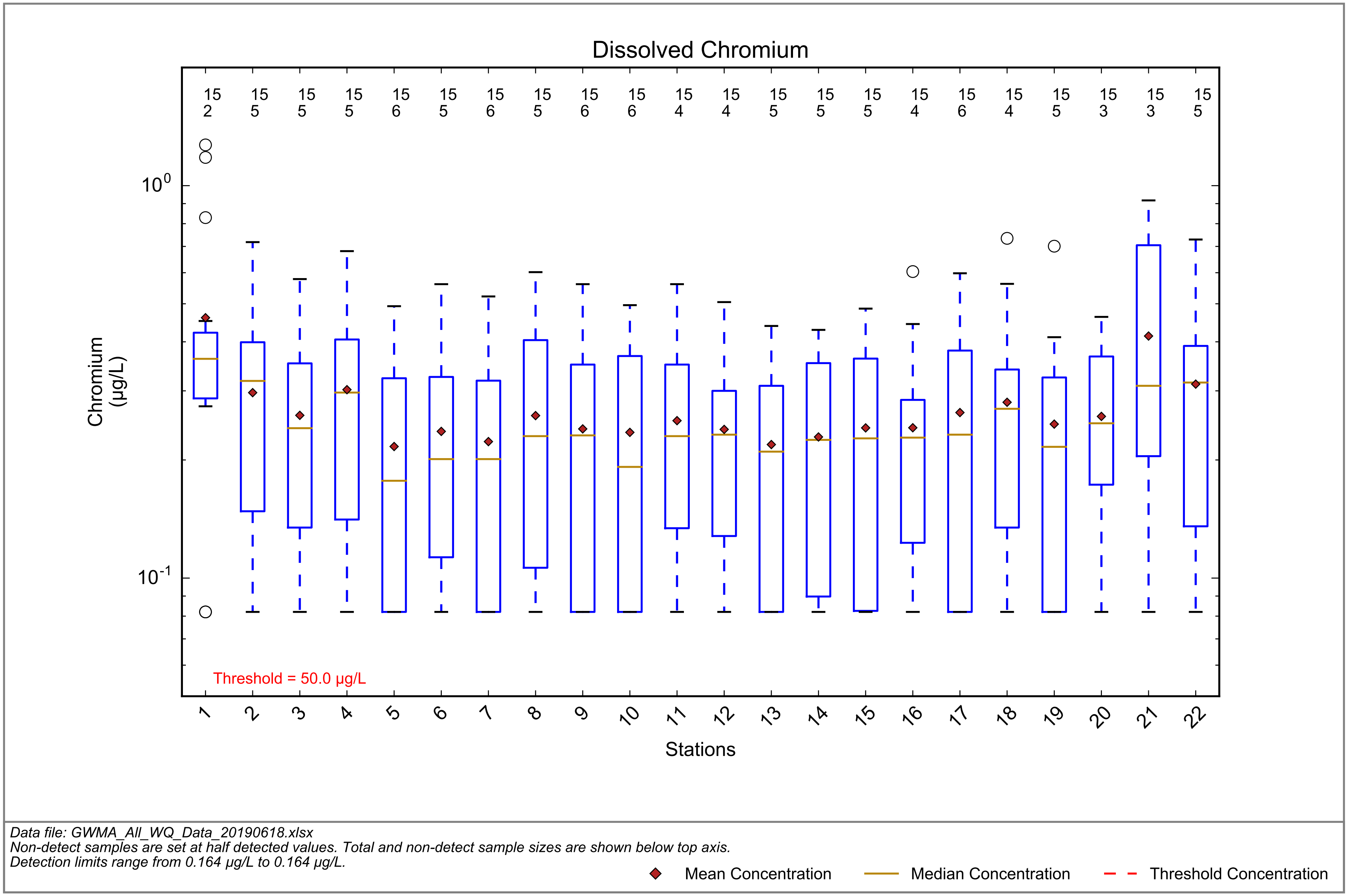
Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 0.00567 µg/L to 0.00567 µg/L.

Mean Concentration | Median Concentration | Threshold Concentration

Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 1
Dissolved Cadmium Concentrations (All Seasons) by Station



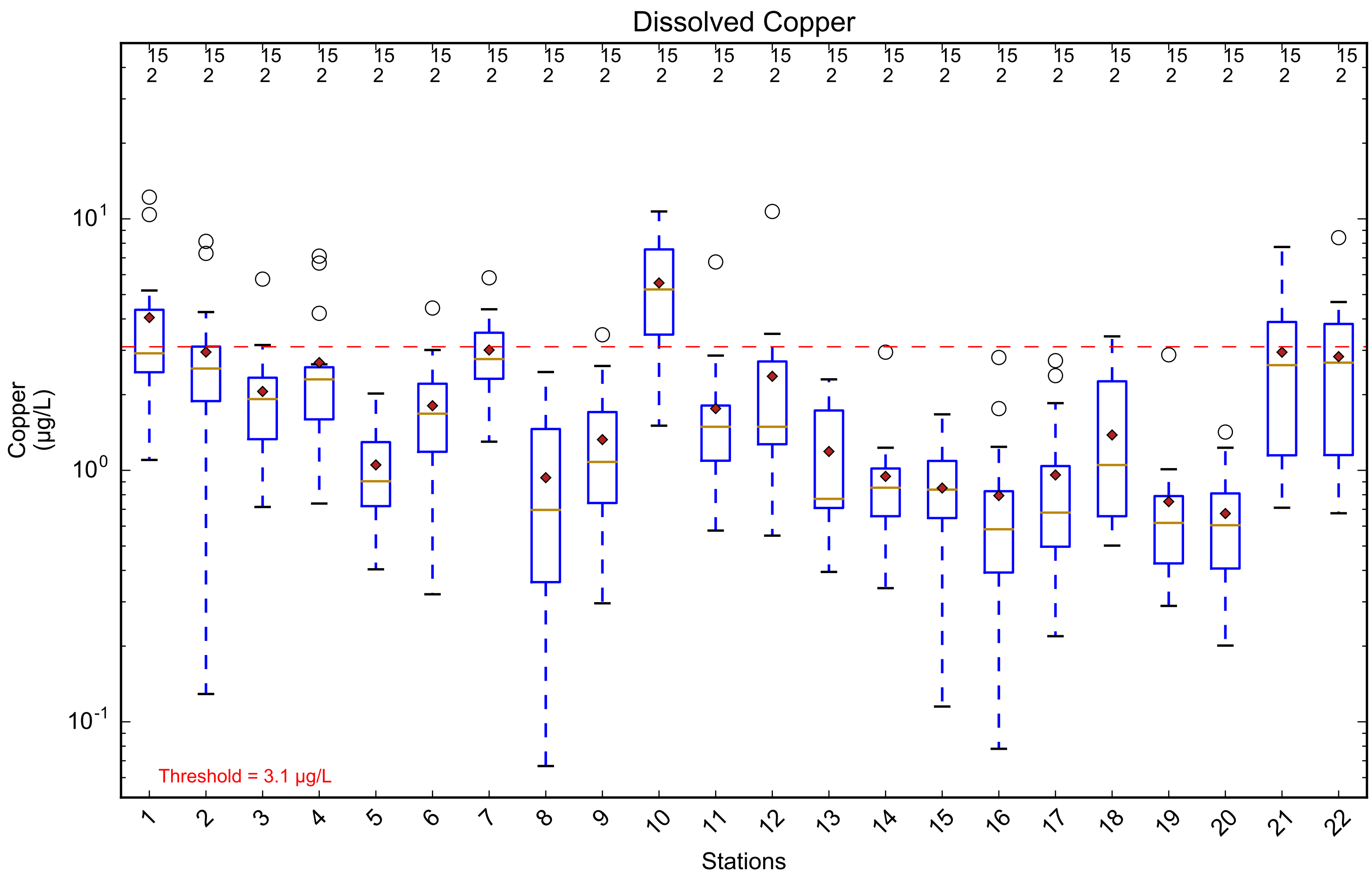
Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 0.164 µg/L to 0.164 µg/L.

Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 2
Dissolved Chromium Concentrations (All Seasons) by Station

Harbor Toxics TMDL Compliance Monitoring and Reporting



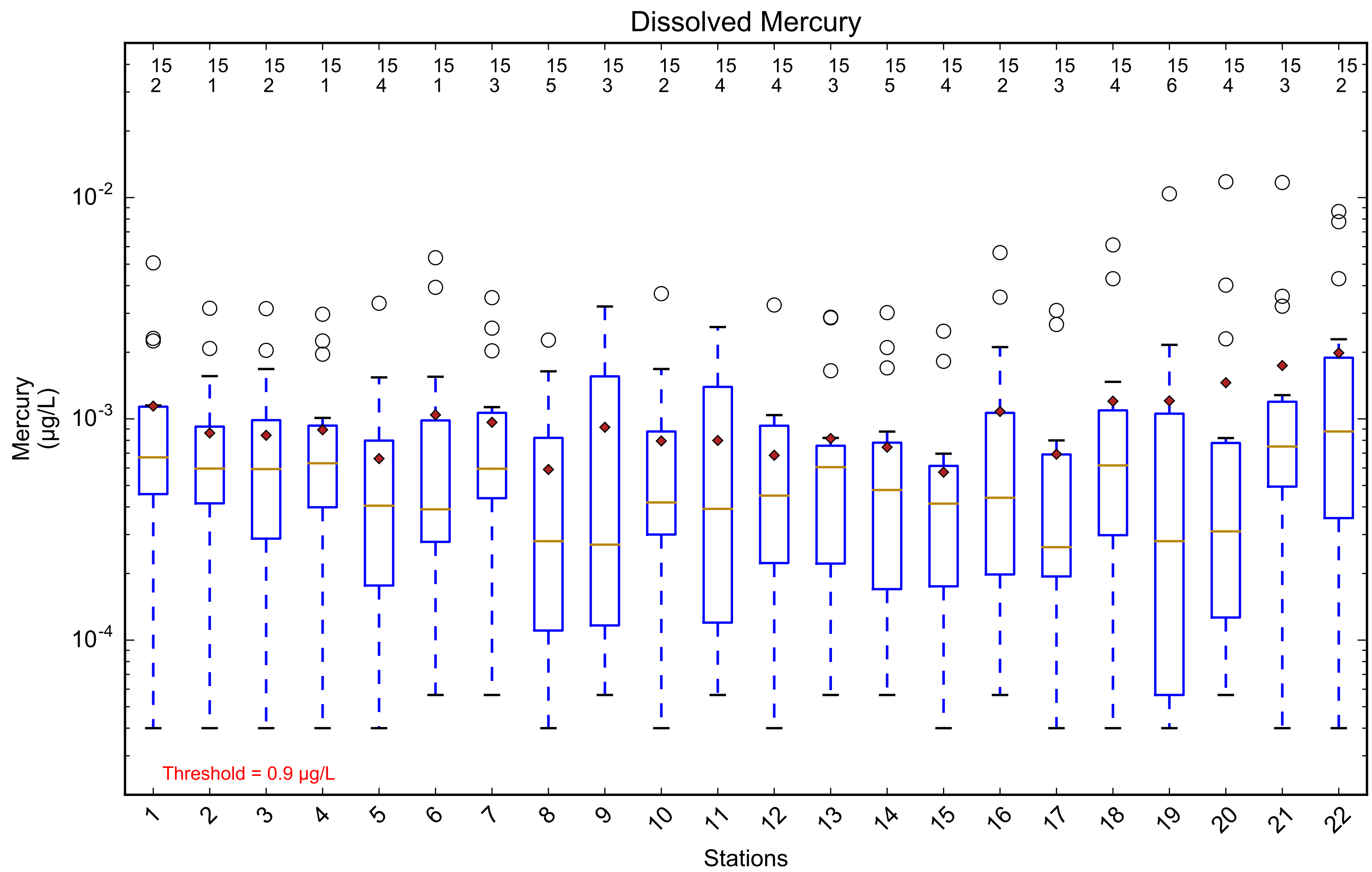
Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 0.00898 µg/L to 0.00898 µg/L.

Mean Concentration — Median Concentration — Threshold Concentration

Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 3
Dissolved Copper Concentrations (All Seasons) by Station



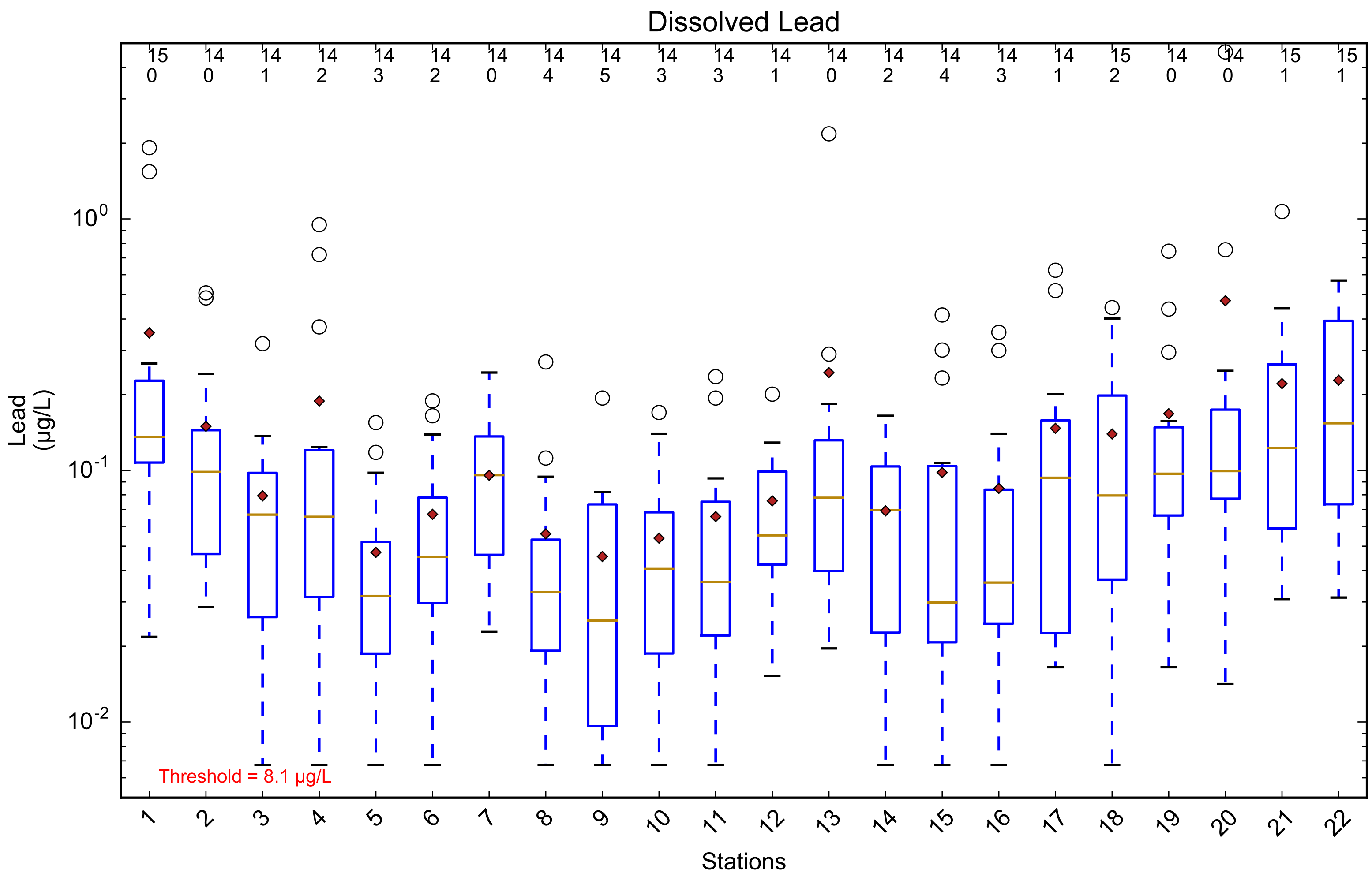
Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 8e-05 µg/L to 0.000146 µg/L.

Mean Concentration | Median Concentration | Threshold Concentration

Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 4
Dissolved Mercury Concentrations (All Seasons) by Station



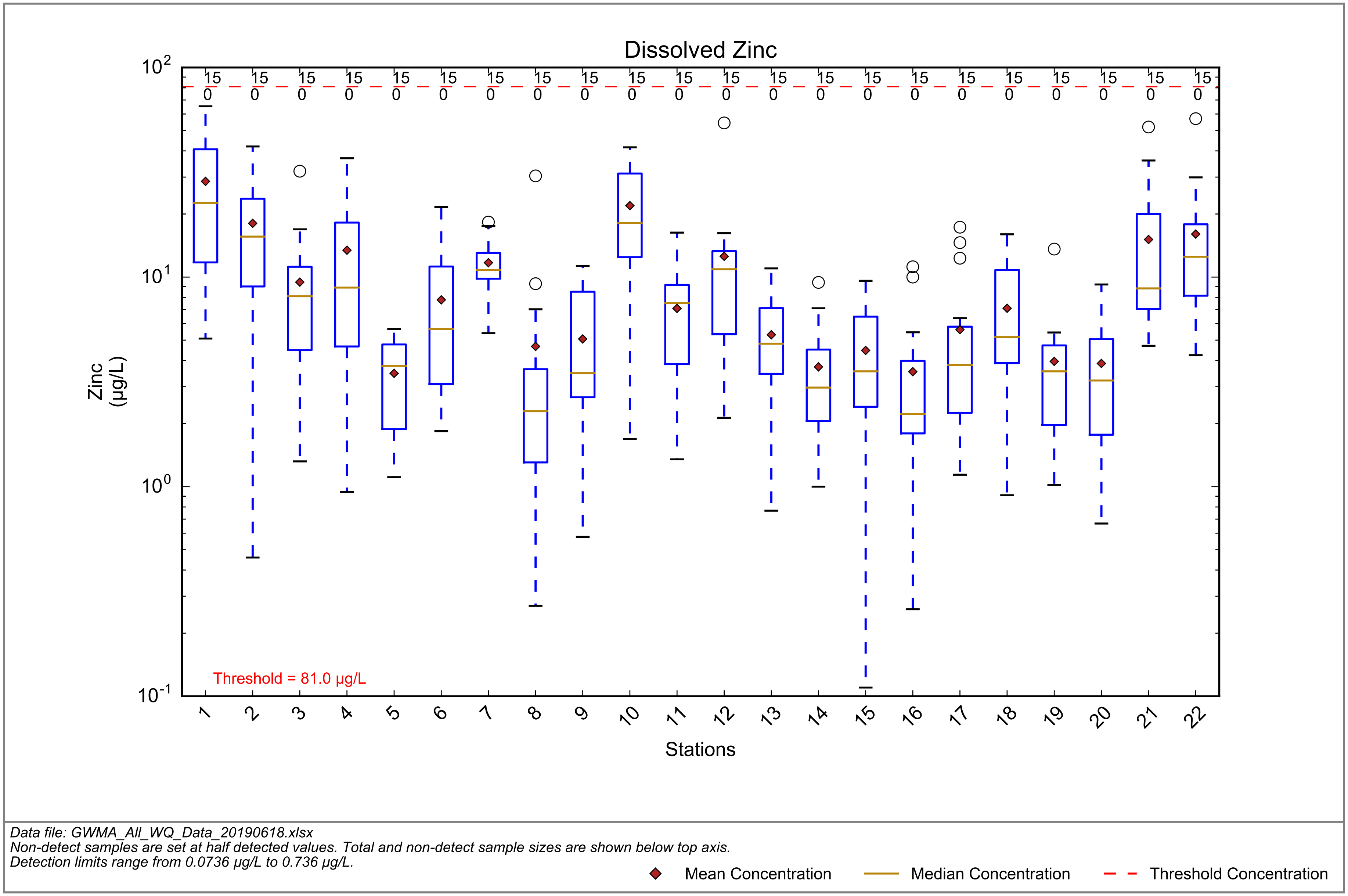
Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 0.0135 µg/L to 0.0135 µg/L.

Mean Concentration — Median Concentration — Threshold Concentration

Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

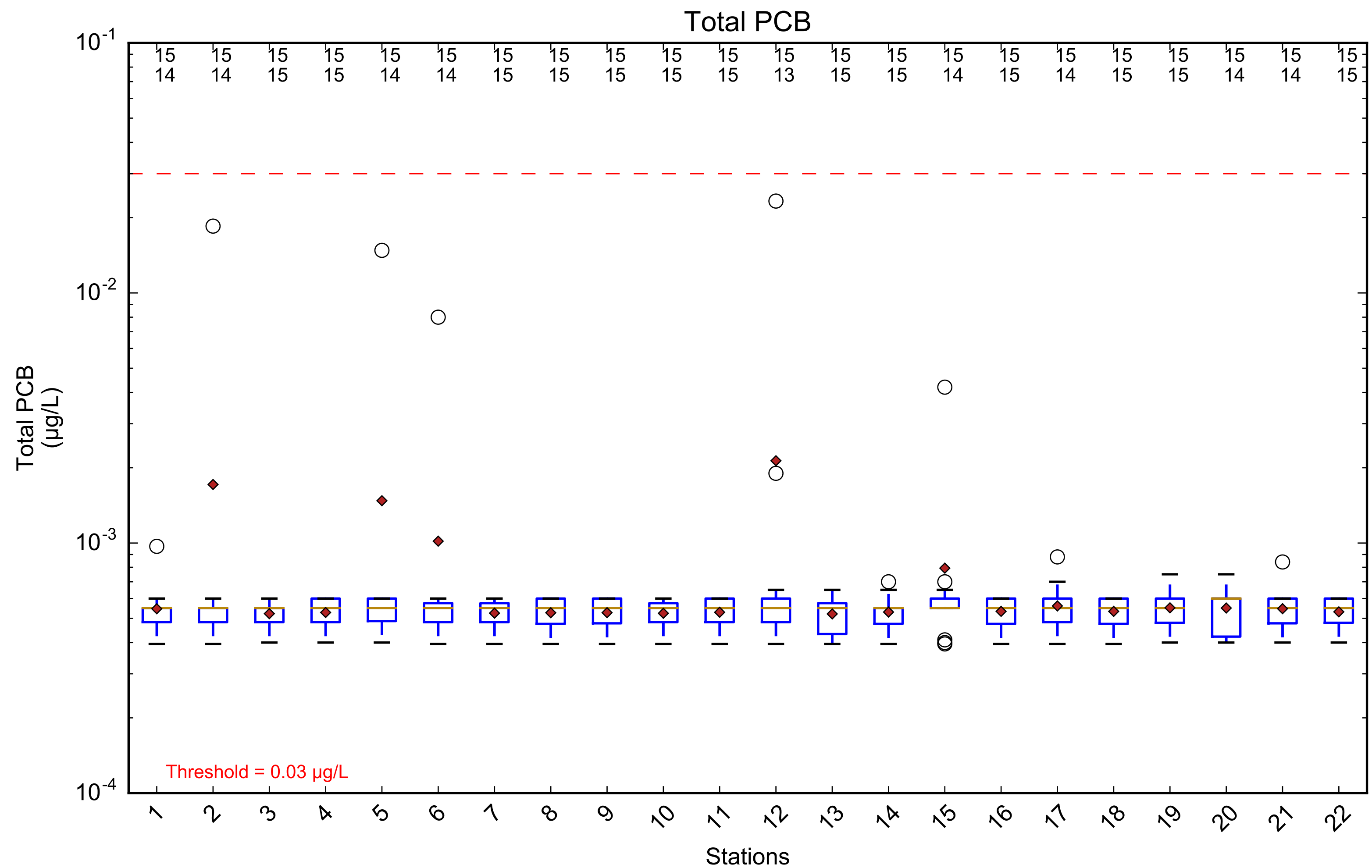
Figure 5
Dissolved Lead Concentrations (All Seasons) by Station



Publish Date: 06/18/2019 17:20 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 6
Dissolved Zinc Concentrations (All Seasons) by Station



Data file: GWMA_All_WQ_Data_20190618.xlsx
Non-detect samples are set at half detected values. Total and non-detect sample sizes are shown below top axis.
Detection limits range from 0.00079 μg/L to 0.0015 μg/L.

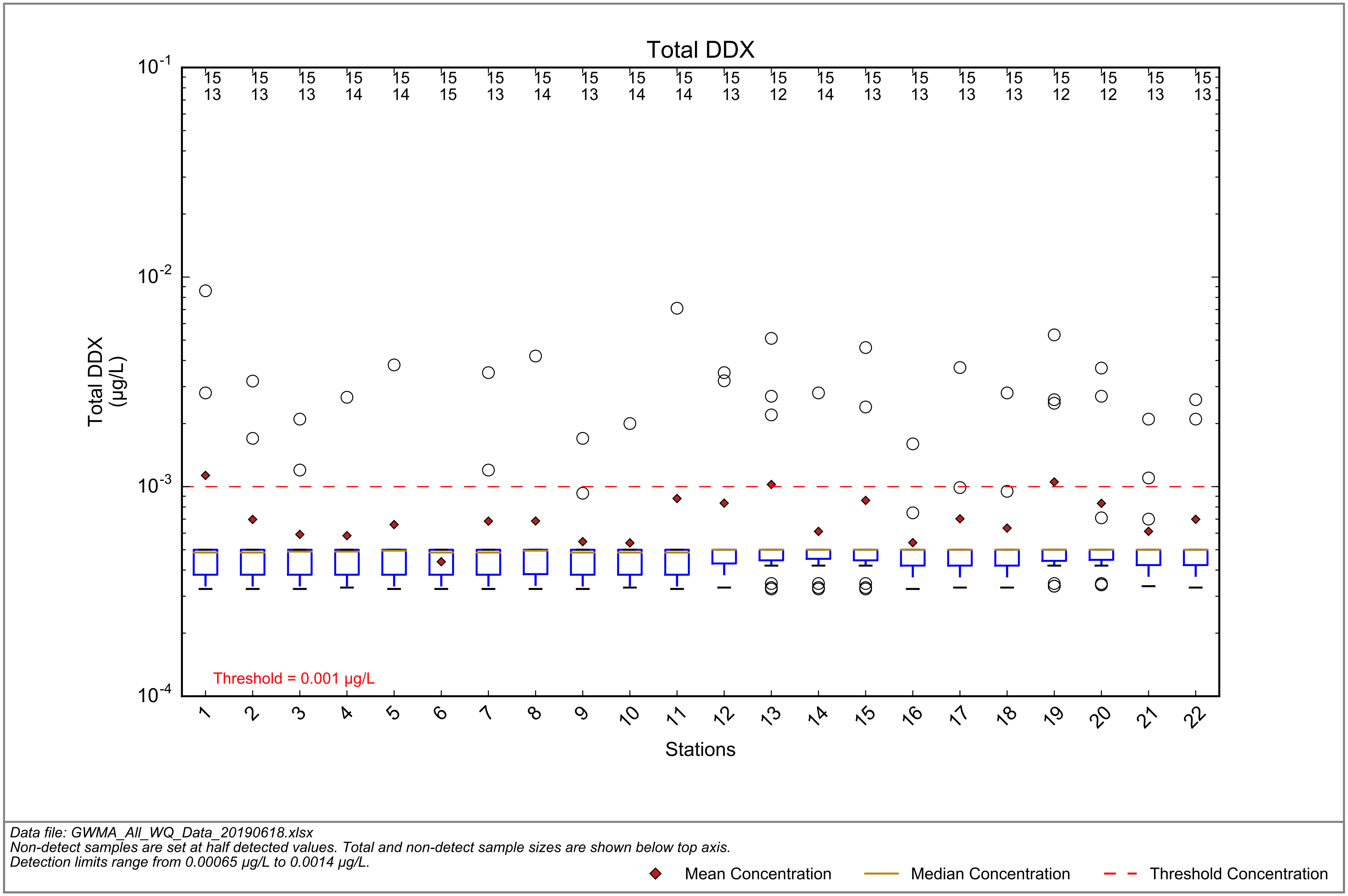
Mean Concentration — Median Concentration — Threshold Concentration

Publish Date: 06/18/2019 17:21 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 7
Total PCB Concentrations (All Seasons) by Station

Harbor Toxics TMDL Compliance Monitoring and Reporting



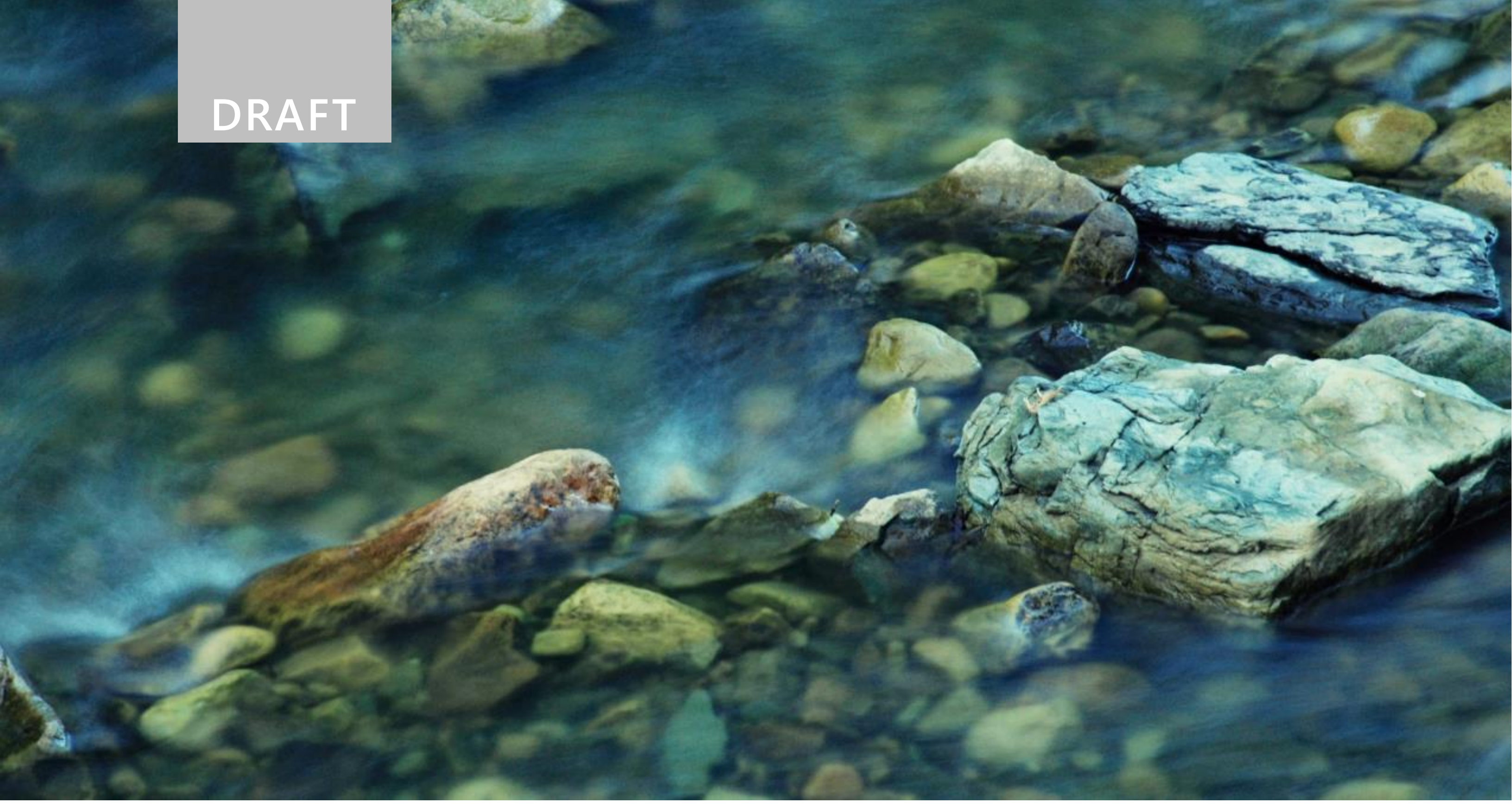
Publish Date: 06/18/2019 17:21 PM | User: WCL-MMAT
File Path: \\IRIS\Woodcliff\Projects\PoLAPoLB_TMDL_2012\2012-2015_TMDL_Contract_(120343-01)\Analysis\Water\Water_boxplot_bystation.py

ANCHOR QEA

Figure 8
Total DDX Concentrations (All Seasons) by Station

Attachment B
Programmatic Quality Assurance Project Plan

DRAFT



June 2018

Compliance Monitoring and Special Studies Related to the Harbor Toxics TMDL

ANCHOR QEA

Draft Programmatic Quality Assurance Project Plan

Prepared for Port of Long Beach and Port of Los Angeles

DRAFT

June 2018
Compliance Monitoring and Special Studies Related to the Harbor Toxics TMDL

Draft Programmatic Quality Assurance Project Plan

Prepared for
Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802

Prepared by
Port of Los Angeles
425 S. Palos Verdes Street
San Pedro, California 90731

Project Number: 141205-01.03

DRAFT

Document Title

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

Lead Organizations

Port of Los Angeles, Environmental Management Division
Port of Long Beach, Environmental Planning Division

Primary Contacts

Matt Arms
Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802
Phone: (562) 590-4160
Email: matthew.arms@polb.com

Kathryn Curtis
Port of Los Angeles
425 S. Palos Verdes Street
San Pedro, California 90731
Phone: (310) 732-3681
Email: kcurtis@portla.org

Andrew Jirik
Port of Los Angeles
425 S. Palos Verdes Street
San Pedro, California 90731
Phone: (310) 732-3681
Email: ajirik@portla.org

DRAFT

Approvals

Project Manager Matt Arms, Port of Long Beach	Date
Project Manager Kathryn Curtis, Port of Los Angeles	Date
Project Manager Andrew Jirik, Port of Los Angeles	Date
TMDL Study Project Manager Steve Cappellino, Anchor QEA, LLC	Date
Quality Assurance Manager Joy Dunay, Anchor QEA, LLC	Date

TABLE OF CONTENTS

TABLES

FIGURES

DRAFT

APPENDICES

ABBREVIATIONS

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	Final Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Load
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 was initiated in 2014 and continues 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 2017), U.S. Environmental Protection Agency (USEPA) SW-846 (USEPA 2014), and USEPA National Functional Guidelines data validation criteria (USEPA 2016, 2017a, 2017b), 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, 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 EQuIS 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

Figures 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 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 surface sediment at 0 to 5 centimeters, Station 54 from Outer Harbor – Los Angeles on July 31, 2018:

OA-SS-54-0-5-20180731

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

EB-20180731

An example sample identifier for a surface sediment at 0 to 5 centimeters, Station 54 from Outer Harbor – Los Angeles on July 31, 2018, that is a field duplicate:

OA-SC-1054-0-5-20180731

An example sample identifier for a white croaker fish fillet skin off, station number 23 from Inner Harbor – Long Beach on July 31, 2018:

IH-FF-WC-23-20180731

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 2017). 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 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

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 hand-written 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 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 2017). 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 2017). 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 at the MDL. In some cases, non-detects may be reported at the calibration level (typically the MRL) or LOD, whichever is lower.

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 2017) and are identified in Table 10.

4.3 Performance Criteria

Applicable quantitative goals for precision, accuracy, and completeness are derived from SWAMP guidance (SWRCB 2017) 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), including raw data should be included in all full (Level 4) data packages.

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 laboratory EDDs will be submitted to the Ports' data manager by the laboratory 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. A validation EDD will provided by the data manager to the Ports contractor to capture validation qualifiers and qualifier reason codes.

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. 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 2016, 2017a, 2017b), 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 (USEPA 2016, 2017a, 2017b). 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://www.ceden.org/ceden_datatemplates.shtml.

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 Resource Control Board), 2009. *Water Quality Control Plan for Enclosed Bays and Estuaries.* August 25, 2009.

SWRCB, 2017. *Surface Water Ambient Monitoring Program Quality Assurance Program Plan.* Final Draft. May 2017.

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.

USEPA, 2014. Status Tables for SW-846, Third Edition. Final Updates I, II, IIA, IIB, III, IIIA, IIIB, IV and Update V Plus Other New and Revised SW-846 Methods at the ORCR Methods Web Site. Revised July 2014. Available at: https://www.epa.gov/sites/production/files/2015-10/documents/method-status-table.pdf.

USEPA, 2016. *National Functional Guidelines for High Resolution Superfund Methods Data Review.* EPA 542-B-16-001. April 2016.

USEPA, 2017a. *National Functional Guidelines for Inorganic Superfund Methods Data Review.* Office of Superfund Remediation and Technology Innovation. EPA-540-R-2017-001. January 2017.

USEPA, 2017b. *National Functional Guidelines for Organic Superfund Methods Data Review.* Office of Superfund Remediation and Technology Innovation. EPA-540-R-2017-002. January 2017.

Tables

Table 1
SWAMP-EPA-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 quality assurance officer	X	
A1.7	Includes signature block for Port program managers	X	
A1.8	Includes signature block for Water Board quality assurance officer	N/A	N/A
A2.	**Table of Contents**		
A2.1	Lists QA Project Plan 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 quality assurance project plan, 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 quality assurance project plan	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

Table 1

SWAMP-EPA-QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
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
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 quality assurance project plan, 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

Table 1
SWAMP-EPA-QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
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 *Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California*		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

Table 1
SWAMP-EPA-QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
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		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
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)		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 (RLs) or method detection limits (MDLs)	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

Table 1
SWAMP-EPA-QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
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		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**		
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	

Table 1
SWAMP-EPA-QAPP Review Checklist

SWAMP Element Number	Element Name and Review Aspect	PQAPP	Compliance Monitoring Plans, Sampling and Analysis Plans, or Other Documents
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	POLA Project Manager	Port of Los Angeles Environmental Management Division	310-732-3681	kcurtis@portla.org	425 S. Palos Verdes Street San Pedro, California 90731
Matt Arms	POLB Project Manager	Port of Long Beach Environmental Planning Division	562-590-4160	matthew.arms@polb.com	925 Harbor Plaza Long Beach, California 90802
Steve Cappellino	TMDL Study Project Manager	Anchor QEA	949-347-2780	scappellino@anchorqea.com	27201 Puerta Real, Suite 350 Mission Viejo, California 92691
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_2SO_4
Sulfide	20 g	4-oz glass	7 days	Zinc acetate, 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	14 days	Cool ≤6°C
			1 year	Freeze -20°C
Grain size	300 g	16-oz plastic	None established	Ambient
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 H2SO4 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
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
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
Turbidity	100 mL	125 mL HDPE	48 hours	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		

Table 3
Sample Containers, Holding Times, and Preservation Methods

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
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.

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. 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.

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

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									
Scientific Name	*Genyonemus lineatus*	*Cymatogaster aggregata*	*Atherinops affinis*	*Seriphus politus*	*Paralichthys californicus*	*Scomber japonicus*	*Paralabrax clathratus*	*Mytilus spp.*	*Polychaeta*
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:

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.

NA: not applicable

PCB: polychlorinated biphenyl

RL: reporting limit

RPD: relative percent difference

SWAMP: California Surface Water Ambient Monitoring Program

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 9030B / SM 4500-S^{2-} D	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
(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 /8270D - SIM	--
alpha-Chlordane (cis-chlordane)	USEPA 8081A / 8270C /8270D - SIM	0.5
gamma-Chlordane (trans-chlordane)	USEPA 8081A / 8270C /8270D - SIM	0.5
Oxychlordane	USEPA 8081A / 8270C /8270D - SIM	0.5

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
cis-Nonachlor	USEPA 8081A / 8270C /8270D - SIM	0.5
trans-Nonachlor	USEPA 8081A / 8270C /8270D - SIM	0.5
Dieldrin[f]	USEPA 8081A / 8270C /8270D - SIM	0.02
Toxaphene[f]	USEPA 8081A / 8270C /8270D - SIM	0.10
2,4′-DDD	USEPA 8081A / 8270C /8270D - SIM	1.0
2,4′-DDE	USEPA 8081A / 8270C /8270D - SIM	1.0
2,4′-DDT	USEPA 8081A / 8270C /8270D - SIM	1.0
4,4′-DDD	USEPA 8081A / 8270C /8270D - SIM	1.0
4,4′-DDE	USEPA 8081A / 8270C /8270D - SIM	1.0
4,4′-DDT	USEPA 8081A / 8270C /8270D - SIM	1.0
DDMU	USEPA 8081A / 8270C /8270D - SIM	1.0
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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-185	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)[g] - 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
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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
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

Table 6
Sediment Analytical Methods and Target Reporting Limits

Parameter[a,b]	Analytical Method[c]	Target Reporting Limit[d]
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.

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 equivalent methods as long as the QA/QC elements identified in this PQAPP 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 136) but will vary per instrument by MDL study.

e. Total chlordane is calculated using the following compounds: alpha-Chlordane (cis-chlordane), gamma-Chlordane (trans-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.

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

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
Turbidity	SM 2130 B	
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
2,4′-DDT	USEPA 1699	0.50
4,4′-DDD	USEPA 1699	0.50

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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-185	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
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

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 7

Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 7
Water Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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.

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

b. Laboratories may use equivalent methods as long as the QA/QC elements identified in this PQAPP 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 136) but will vary per instrument by MDL study.

d. Hardness is calculated from individual results for calcium and magnesium analyzed by methods 6010, 6020, or 200.8.

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

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

g. PCB congener high resolution reporting limits are based on a 2 liter sample size. Results should be reported to the EDL.

µg/L: microgram per liter

EDL: estimated detection limit

MDL: method detection limit

mg/L: milligram per liter

ng/L: nanogram per liter

PCB: polychlorinated biphenyl

pg/L: picogram per liter

RL: reporting limit

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

Table 8

Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
CL7-PCB-180	USEPA 8270C / 8270D	0.4
CL7-PCB-183	USEPA 8270C / 8270D	0.4
CL7-PCB-185	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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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
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

Table 8
Tissue Analytical Methods and Target Reporting Limits

Parameter[a]	Analytical Method[b]	Target Reporting Limit[c]
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 writing Sampling and Analysis Plans.

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

b. Laboratories may use equivalent methods as long as the QA/QC elements identified in this PQAPP 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 (cis-chlordane), gamma-Chlordane (trans-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.

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

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 CRM[c]	Replicates[d]	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[e]	N/A[e]	1 per 20 samples	N/A[e]	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

Table 10
Frequencies for Laboratory Quality Assurance/Quality Control Samples

Analysis Type	Initial Calibration[a,b]	Continuing Calibration Verification	LCS or CRM[c]	Replicates[d]	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes	Internal Standard
Organochlorine pesticides by high resolution method	As needed	Every 12 hours	1 per 20 samples	N/A	N/A[e]	N/A[e]	1 per 20 samples	N/A[e]	Every sample

Notes:

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. An LCS may be analyzed in lieu of a CRM.

d. A matrix spike duplicate may be analyzed in lieu of a sample replicate.

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

LCS: laboratory control sample

N/A: not applicable

CRM: certified reference material

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

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, turbidity	± 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:

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 criteria.

b. Laboratory control sample 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. 2014).

d The accuracy goal for certified reference materials is 70 to 130% R.

CRM: certified reference material

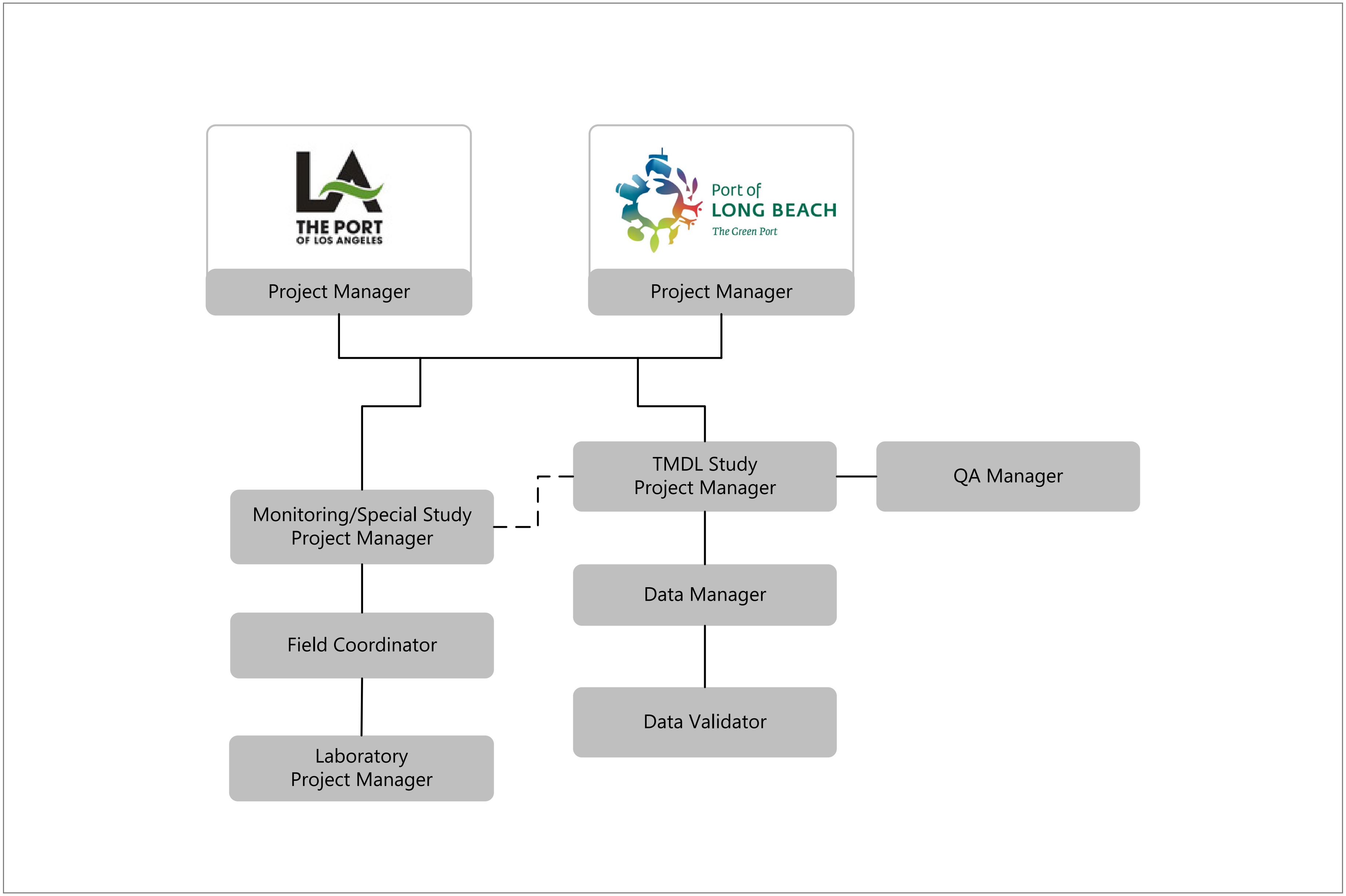
PCB: polychlorinated biphenyl

R: recovery

RPD: relative percent difference

Bay, S.M., D.J. Greenstein, J.A. Ranasinghe, D.W. Diehl, and A.E. Fetscher, 2014. *Sediment Quality Assessment Technical Support Manual.* Southern California Coastal Water Research Project. Technical Report 777. January 2014.

Figures

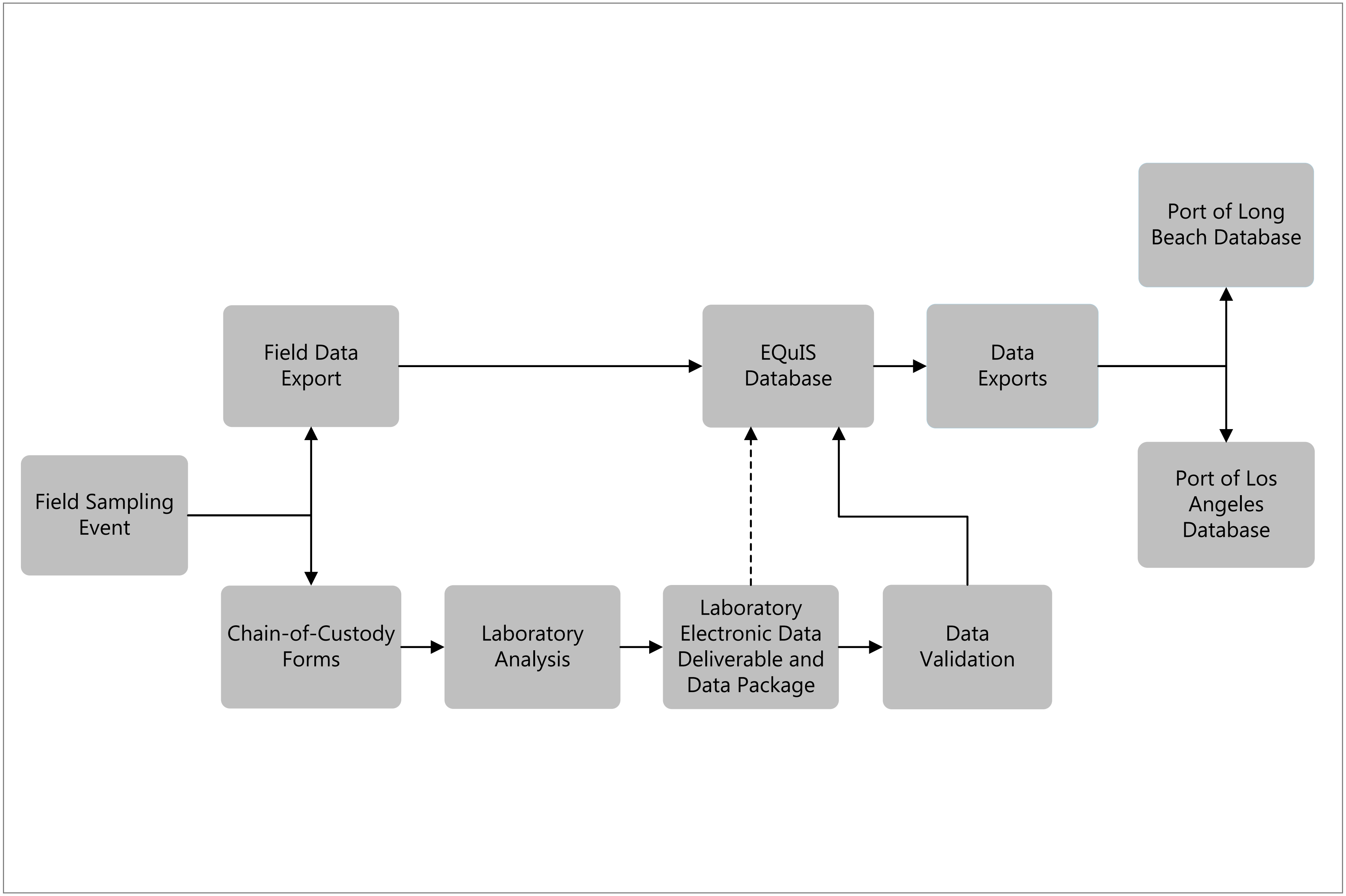


DRAFT

Filepath: S:\PROJECTS\Ports_LA-LB\Harbor_Toxics_TMDL\PQAPP\Deliverables\Figures\Figure 1_ts.docx

ANCHOR QEA

Figure 1
Organizational Chart
Draft Programmatic Quality Assurance Project Plan
Compliance Monitoring and Special Studies Related to the Harbor Toxics TMDL



Filepath: S:\PROJECTS\Ports_LA-LB\Harbor_Toxics_TMDL\PQAPP\Deliverables\Figures\Figure 2_ts.docx

ANCHOR QEA

Figure 2
Data Flow Diagram
Draft Programmatic Quality Assurance Project Plan
Compliance Monitoring and Special Studies Related to the Harbor Toxics TMDL

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-
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
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_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.
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*	

Table A-1
SMP File Structure and Type Descriptions

Field Name	Description	Format	Valid Values	Example	Comments
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	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	*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	
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	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	
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

Table A-3
RES File Structure and Type Descriptions

Field Name	Description	Format	Valid Values	Example	Comments
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)			
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).

Table A-3
RES File Structure and Type Descriptions

Field Name	Description	Format	Valid Values	Example	Comments
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. Must be reported in the same units as the result_value.
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).
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	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.
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.

Attachment C

Field Forms

Beaufort Wind Force Scale

Number	Wind speed		Description	Wave height		Sea Conditions	Land Conditions
	mph	kts		m	ft		
0	<1	<1	Calm	0	0	Flat	Calm. Smoke rises vertically.
1	1-3	1-2	Light air	0.1	0.33	Ripples without crests.	Wind motion visible in smoke.
2	3-7	3-6	Light breeze	0.2	0.66	Small wavelets. Crests of glassy appearance, not breaking	Wind felt on exposed skin. Leaves rustle.
3	8-12	7-10	Gentle breeze	0.6	2	Large wavelets. Crests begin to break; scattered white caps	Leaves and smaller twigs in constant motion.
4	13-17	11-15	Moderate breeze	1	3.3	Small waves.	Dust and loose paper raised. Small branches begin to move.
5	18-24	16-20	Fresh breeze	2	6.6	Moderate (1.2 m) longer waves. Some foam and spray.	Branches of a moderate size move. Small trees begin to sway.
6	25-30	21-26	Strong breeze	3	9.9	Large waves with foam crests and some spray.	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	31-38	27-33	High wind, moderate gale, near gale	4	13.1	Sea heaps up and foam begins to be blown in streaks in wind direction.	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	39-46	34-40	Fresh gale	5.5	18	Moderately high waves with breaking crests forming spindrift. Streaks of foam.	Twigs broken from trees. Cars veer on road.
9	47-54	41-47	Strong gale	7	23	High waves (6-7 m) with dense foam. Wave crests start to roll over. Considerable spray.	Larger branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	55-63	48-55	Whole gale, storm	9	29.5	Very high waves. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.	Trees are broken off or uprooted, saplings bent and deformed, poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	64-72	56-63	Violent storm	11.5	37.7	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.	Widespread vegetation damage. More damage to most roofing surfaces, asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	≥73	≥64	Hurricane force	≥14	≥46	Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.	Considerable and widespread damage to vegetation, a few windows broken, structural damage to mobile homes and poorly constructed sheds and barns. Debris may be hurled about.

Chain of Custody Record & Laboratory Analysis Request

ANCHOR QEA

Laboratory Number:

Date:
Project Name: **GWMA-TMDL Compliance Monitoring**
Project Number: **141205-01.01**
Project Manager: **Andy Martin**
Phone Number: **(949) 334 9630**
Shipment Method:

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters: % Lipids	% Moisture	PCB Congeners	Organochlorine Pesticides	Archive	Comments/Preservation
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

- For halibut and croaker, skin-off fillets from fish within a labeled bag should be composited. Do not include ribs and stomach tissue in the fillet.
- For white perch and pacific pompano, whole fish within a labeled bag should be composited (this differs from the SAP) due to the lack of mass necessary for analysis of fillet composites.
- When creating a composite, composite ALL individuals (or their fillets- see above for details) included in a labeled composite sample bag and ensure that each sample has been homogenized to a consistent color and texture prior to subsampling for analyses. After subsampling, freeze (to at least – 20°C) and archive the remaining homogenized tissue from each composite. Please contact Anchor QEA prior to disposal of archived, frozen tissue homogenates or frozen tissue archives.

Relinquished By:	Anchor QEA
Signature/Printed Name	Date/Time

Received By:	Company:
Signature/Printed Name	Date/Time:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Daily Log

Anchor QEA, LLC
27201 Puerta Real, Suite 350
Mission Viejo, California 92691
Phone 949.347.2780

PROJECT NAME: ______________________ **DATE:** ______________

SITE ADDRESS: ______________________ **PERSONNEL:** ______________

WEATHER: **WIND FROM:**

N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
SUNNY		CLOUDY		RAIN						

TEMPERATURE: ° F ° C
[Circle appropriate units]

TIME	COMMENTS

Signature: ______________________

Fish Processing Log

Job: GWMA-TMDL Compliance Monitoring
Job No: 141205-01.01
Waterbody:
Collection Date:
Collection Start Time:
Field Staff:
Collection End Time:
Collection Method Trawl Longline Other:
Start Coordinates:
Weather:
End Coordinates:
Wind Speed and Direction (see Beaufort scale):

Total # of fish collected at station:

Fish #	Time	Species	Fish Length (mm)		Whole fish wet weight (blotted; g)	Composite #[1]	Notes
			Standard	Fork			

Sample Containers:

Analyses:

Fish Sampling Log

Job: GWMA TMDL Compliance Monitoring Date:

Job No. 141205-01.01

Processing Staff:

Wind Speed and Direction (See Beaufort Scale):

Target Area	Station ID	Collection Method	Start Date/Time	Stop Date/Time	Start Coordinates Long/Lat	End Coordinates Long/Lat

Notes: