DRAFT
SAMPLING AND ANALYSIS PLAN REPORT
BERTHS 195-200A AND 210-211 MAINTENANCE DREDGING
LOS ANGELES HARBOR

Submitted to:

Port of Los Angeles
Environmental Management Division
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1.0 INTRODUCTION

This document serves as the Sampling and Analysis Plan Report (SAPr) for the Port of Los Angeles (Port) Berth 195–200A (B195–200A) and Berth 210–211 (B210–211) Maintenance Dredging Project (Project) (Figure 1-1). The proposed Project involves dredging of sediment in Los Angeles Harbor and disposal of the dredged material at the Berths 243–245 Confined Disposal Facility (CDF) (Figure 1-2).

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was contracted by the Port to prepare a Project-specific Sampling and Analysis Plan (SAP), conduct sediment and seawater sampling at the Project site, and provide this SAPr based on results from laboratory testing. Amec Foster Wheeler prepared a SAP in October 2015 and submitted it to the Los Angeles Region Contaminated Sediments Task Force (CSTF) for review and concurrence. The specifics of the characterization program were presented to the CSTF at its monthly meeting on November 9, 2015. Based upon input from the CSTF, the SAP was revised and finalized in December 2015. The dredged material sample collection program was initiated in January 2016 and involved collection of sediment samples within the dredge footprint and site water (used to prepare elutriate samples) from each dredge site. This report provides an overview of the sediment quality within the Project dredge footprint prior to disposal at the CDF.

1.1 Project Summary

The Port is proposing to conduct maintenance dredging at two distinct dredge footprints adjacent to B195–200A and B210–211. Based upon a review of existing Port records, it appears that neither of these sites has undergone maintenance dredging in the past 30 years.

The primary disposal option being pursued for the Project is placement of the dredged material in the approved CDF, located at Berths 243–245 (Figure 1-2). Because no unconfined in-water (aquatic) disposal is being proposed as part of the Project, the sediment analyses for the dredged material characterization study (Study) were limited to physical and chemical testing (i.e., grain size, metals, chlorinated pesticides, polychlorinated biphenyl [PCB] congeners, polycyclic aromatic hydrocarbon [PAH], and other contaminants of concern). In addition to bulk sediment chemistry tests, elutriate analyses were performed on the dredged material to evaluate the potential for resuspension of contaminants in the water column during dredging operations.

1.2 Site Description

The two Study sites, B195–200A and B210–211, are located in the East Basin area in the Port's inner harbor.

B195–200A is currently occupied by Wallenius Wihelmsen Logistics (WWL) Vehicle Services Americas and B210–211 is currently occupied by SA Recycling. The latitude and longitude coordinates for sampling locations at the B195–200A and B210–211 Project sites are presented in Table 3-2.

Each of the two footprints was considered a separate composite area for this Study (i.e., one dredged material management unit per footprint) and was evaluated per the procedures outlined in the CSTF-approved SAP, the Upland Testing Manual (UTM), and the Inland Testing Manual (ITM).

1.3 Document Purpose

The purpose of this SAPr is to determine whether the Project dredged materials meet the suitability requirements for placement within the proposed CDF disposal location. All methods of analysis for this Study followed procedures outlined in the United States Environmental Protection Agency (USEPA)/United States Army Corps of Engineers (USACE) *Evaluation of Dredged Material Proposed for Discharge in Water of the U.S. – Testing Manual,* which is commonly referred to as the ITM (USEPA/USACE 1998) and the *Evaluation of Dredged Material Proposed for Disposal as Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual*, known as the Upland Testing Manual (USACE, 2003).

1.4 Roles and Responsibilities

Amec Foster Wheeler, under contract to the Port, was responsible for the sediment collection, project management, and data analysis portions of the dredge material characterization study. Key project personnel necessary for this effort are listed with their contact information in Table 1-1.

Table 1-1.
Key Project Personnel

Organization	Name	Title	Office Phone	Cellular Phone
Port	Kathryn Curtis	Project Manager	310-732-3681	NA
Amec Foster Wheeler	Barry Snyder	Amec Foster Wheeler Project Manager	858-300-4320	858-354-8340
Amec Foster Wheeler	Kimbrie Gobbi	Amec Foster Wheeler Field Collection Manager	858-300-4326	858-869-9410
Amec Foster Wheeler	Chris Stransky	QA/QC Specialist	858-300-4350	858-775-5547
Amec Foster Wheeler	Kevin Stolzenbach	Field Scientist	858-300-4342	847-650-5552
Eurofins Calscience	Carla Hollowell	Laboratory Project Manager	714-895-5494	714-895-5230
Seaventures, Inc.	Kenny Nielsen	Vessel Captain	949-637-2433	949-637-2433
Aquatic Blue	Brian Riley	Vibracore Technician	760-497-6297	NA

Notes:
NA = not available; QA/QC = Quality Assurance and Quality Control

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Project Vicinity
Berths 195-200A and 210-211
Maintenance Dredging
Port of Los Angeles

FIGURE 1-1

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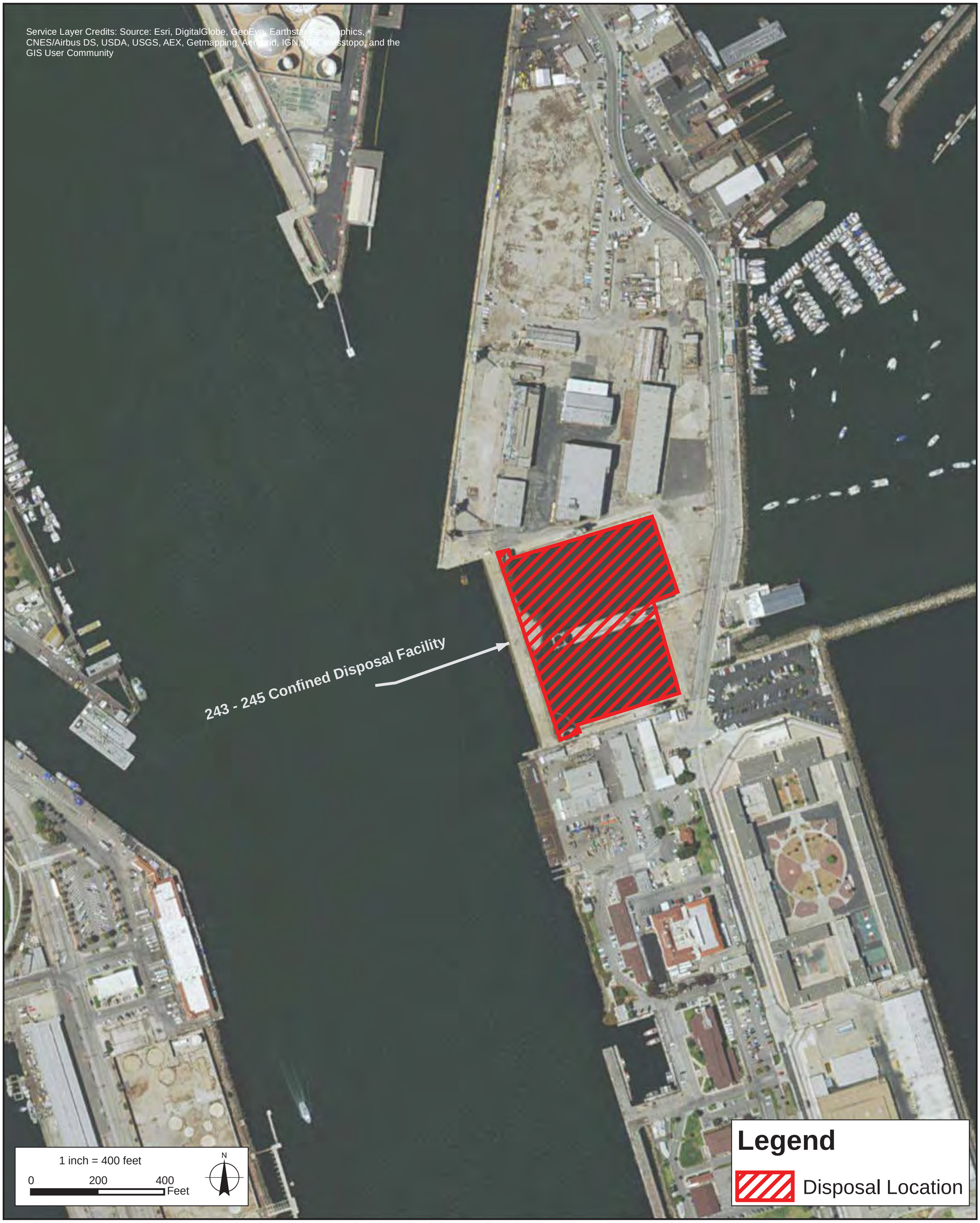

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Disposal Location
243-245 Confined Disposal Facility
(Berths 243 - 245)

FIGURE
1-2

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Certain services were provided by the following subcontractors:

- Seaventures, Inc. (Seaventures)[1]—Vessel operation and station positioning services;
- Aquatic Blue Environmental (Aquatic Blue)—Vibracore equipment and operation; and
- Eurofins Calscience Environmental Laboratories, Inc. (Calscience)[2]—Physical, sediment chemistry, and tissue chemistry analyses.

1.5 Document Outline

This Project-specific SAPr was prepared by Amec Foster Wheeler on behalf of the Port and includes the following:

- Sample collection methods and locations;
- Sediment, water, and elutriate chemistry testing methods;
- Sediment, water, and elutriate chemistry testing results;
- Data analysis;
- Comparison of the results and the data analysis with available guidelines and databases for sediment and water quality;
- Quality assurance and quality control (QA/QC) evaluations of all results and deliverables for the proposed Project; and
- Project-specific recommendations based on sediment testing results compared with relevant criteria outlined in the ITM/UTM.

Vibracore field logs, field photographs, and chemistry reports are appended to this report for reference.

[1] *Early Bird II* vessel specifications: 40-ft Vega, CA Registration CF58397; call sign is WDC 3623; monitors channel 16. Skiff specifications: 14-ft Carolina, CA Registration: CF5342NX

[2] Eurofins Calscience is a laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP), the California Department of Public Health, and the U.S. Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP) (certificate No. L12-86-121).

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2.0 SITE HISTORY/HISTORICAL DATA REVIEW

This section provides a brief overview of current and historical site uses at the two Project sites.

B195–200A Project Site

The B195–200A terminal is currently occupied by WWL Vehicle Services Americas, which is a vehicle-processing terminal that accepts new automobiles shipped from overseas and performs any final preparations needed for the automobiles to be distributed and sold in the United States (AECOM 2012). Limited site history is available for this facility. At the time this Study was performed, there were no known accidental spills or releases and no data available with regard to recent dredging activity.

B210–211 Project Site

The B210–211 facility is currently operated by SA Recycling, which is a metal recycling facility that handles the bulk loading of scrap metal for export (ICF International 2014). Limited site history is available for this facility, no known accidental spills or releases were reported, and no data are available with regard to recent dredging activity.

2.1 Surrounding Land Use

B195–200A Project Site

The B195–200A site (i.e., the WWL facility) is on the northeastern perimeter of the East Basin of the Port and is surrounded by transportation infrastructure, including railways and roadways. The Volpak liquid bulk terminal is adjacent to the facility on the southwestern side. The community of Wilmington is directly to the northwest, and marinas with moored, live-aboard tenants are across the channel to the southeast (AECOM 2012).

B210–211 Project Site

The B210–211 site is located on Terminal Island and is largely surrounded by industrial activities (ICF International 2014). Transportation infrastructure, including railways, freeways, and arterial routes, connect the harbor facilities. Cargo-handling operations are located to the southwest at the Yusen Terminals, Inc. and Everport container terminals, as well as to the northeast at the Port of Los Angeles Container Terminal (Berths 206–209). The Volpak bulk liquid terminal is located across the East Basin to the northwest. The closest residences are the vessels of the live-aboard tenants moored in the marinas across the Cerritos Channel northeast of the Project site.

2.2 Clean Water Act Section 303(d) List and Total Maximum Daily Load Status

The Inner Harbor area of Los Angeles Harbor in the vicinity of the two Project sites is on the Clean Water Act Section 303(d) list of impaired waters (303(d) list) for dichlorodiphenyltrichloroethane (DDT) and PCBs in fish tissue and for copper, zinc, benzo(a)pyrene, chrysene, toxicity, and benthic community effects in sediments (State Water Resources Control Board, 2011). In addition, the Inner Harbor area is part of the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants Total Maximum Daily Load (TMDL).

2.3 Previous Sediment Testing

No previous sediment testing information is available for either location.

3.0 METHODS

This section describes the sampling locations and techniques that were employed to collect test sediments at five locations at B195–200A and three locations at B210–211 (Table 3-1). Coordination between Amec Foster Wheeler, the Port, pertinent security personnel, and all subcontractors was conducted prior to initiation of any field activities.

Sediment and site water collection followed the guidance provided in *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual* (USEPA 2001), and was detailed in the SAP submitted by Amec Foster Wheeler to the Port and presented to and approved by the CSTF prior to conducting sample collection and testing (Amec Foster Wheeler 2015). The sample collection effort was documented using core logs and photography. Core logs are included as Appendix A; photographs of cores are included as Appendix B.

3.1 Dredge Design

The proposed Project consists of two distinct dredge footprints: one adjacent to B195–200A and one adjacent to B210–211. Dredging at the B195-200A and B210-211 sites will be performed to the maintenance dredge Project depth of -37 feet (ft) mean lower low water (MLLW) (Figures 3-1 and 3-2), likely using a clamshell bucket mechanical dredge. Dredging to the Project depth (plus a 2-foot overdredge [OD] allowance) will generate approximately 13,300 cubic yards (cy) of dredged material at the B195-200A site and 3,100 cy of dredged material at the B210–211 site. Table 3-1 summarizes Project maintenance dredging locations, depths, and volumes.

Table 3-1.
Maintenance Dredge Locations, Depths, and Volumes

Site	Area (acres)	Design Depth (feet MLLW)	Overdredge Depth (feet MLLW) [1]	Dredge Volume to Design Depth (cy)	Dredge Volume to Overdredge Depth (cy)	Total Dredge Volume (cy)	Number of Core Samples per Unit
Berths 195–200A	2.01	-37	-39	6,790	6,510	13,300	5
Berths 210–211	0.382	-37	-39	1,750	1,350	3,100	3

Notes:
1. 2-foot overdredge allowance.
cy = cubic yard(s); ft = foot/feet; MLLW = mean lower low water;

3.2 Dredged Material Collection (Sampling Design)

This section describes the locations and techniques that were used to collect test sediments. Extra sediment volume was collected and archived for future testing, if needed. Field collection occurred on January 20 and 21, 2016. Amec Foster Wheeler coordinated with the Port, pertinent security personnel, and all subcontractors prior to the initiation of all field activities.

3.2.1 Geographic Positioning

To navigate to the target sampling locations, a Differential Global Positioning System (DGPS) with a target navigational accuracy of ±3 meters (m) was used. All sampling location(s) matched proposed locations, with the exception of core sample B195–200A–C1, which had to be moved approximately 15 feet southeast because of an over-water obstruction (Table 3-2, Figures 3-3A, 3-3B, 3-3C, and 3-4). Once a target location was reached, the marine sampling vessel deployed a three-point anchor or double-tied to docks to maintain its position. Once the vessel was secured, Amec Foster Wheeler scientists recorded the position in the field log, measured the water depth with a weighted fiberglass tape, and corrected the water depth to MLLW using National Oceanic and Atmospheric Administration (NOAA) tide tables and bathymetric data provided in the Port's Computer-Aided Design (CAD) files for the Project.

3.2.2 Test Sediment Collection

Sample collection was performed at all locations as described in the SAP (Amec Foster Wheeler 2015). A trained Aquatic Blue equipment technician deployed the vibracore to collect sediment samples. The vibracore uses a 4-inch-diameter aluminum tube with a stainless-steel cutter. A new liner was inserted into the tube prior to each attempt to prevent cross-contamination between stations. The aluminum-encased vibrating unit used 240-volt, 3-phase, 30-ampere electricity to drive two counter-rotating concentric vibrators. The vibracore and tube were lowered by a hydraulic winch and vibrated until penetration to Project depth plus the 2-foot overdredge allowance (-39 feet MLLW) was achieved. Core penetration depth was calculated with a tape measure attached to the vibracore head. After the vibracore was turned off, the sediment core was returned to the deck for processing.

Table 3-2 summarizes sampling locations, attempt numbers, existing mudline elevations, and target penetration depths[3] for the Study. For collection and testing purposes, the two berthing areas were tested as two separate composite areas. Sampling locations are shown on Figures 3-3A-C and 3-4 for B195-200A and B210-211, respectively. Sediment collection followed the guidance provided in *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual* (USEPA 2001).

Sample collection was performed at eight vibracore sampling locations for the Study: five within the B195-200A Project footprint (Figures 3-3A-C) and three within the B210-211 Project footprint (Figure 3-4). Core locations were placed in high spots (i.e., shallower areas) within each footprint to provide an adequate representation of the material to be dredged.

Amec Foster Wheeler also collected and archived individual Z-layer sediment samples from each core sampling location for potential future analysis. The Z-layer is defined as the sediment surface within the footprint following completion of dredging operations (i.e., new harbor bottom following dredging) and is composed of the 0.5-foot core segment immediately below the overdredge depth.

[3] Target core length is determined by subtracting the OD depth from the depth of the existing (pre-dredge) mudline depth at each sampling location.

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Project Location
Berths 195 - 200A
Maintenance Dredging
Port of Los Angeles

FIGURE

3-1

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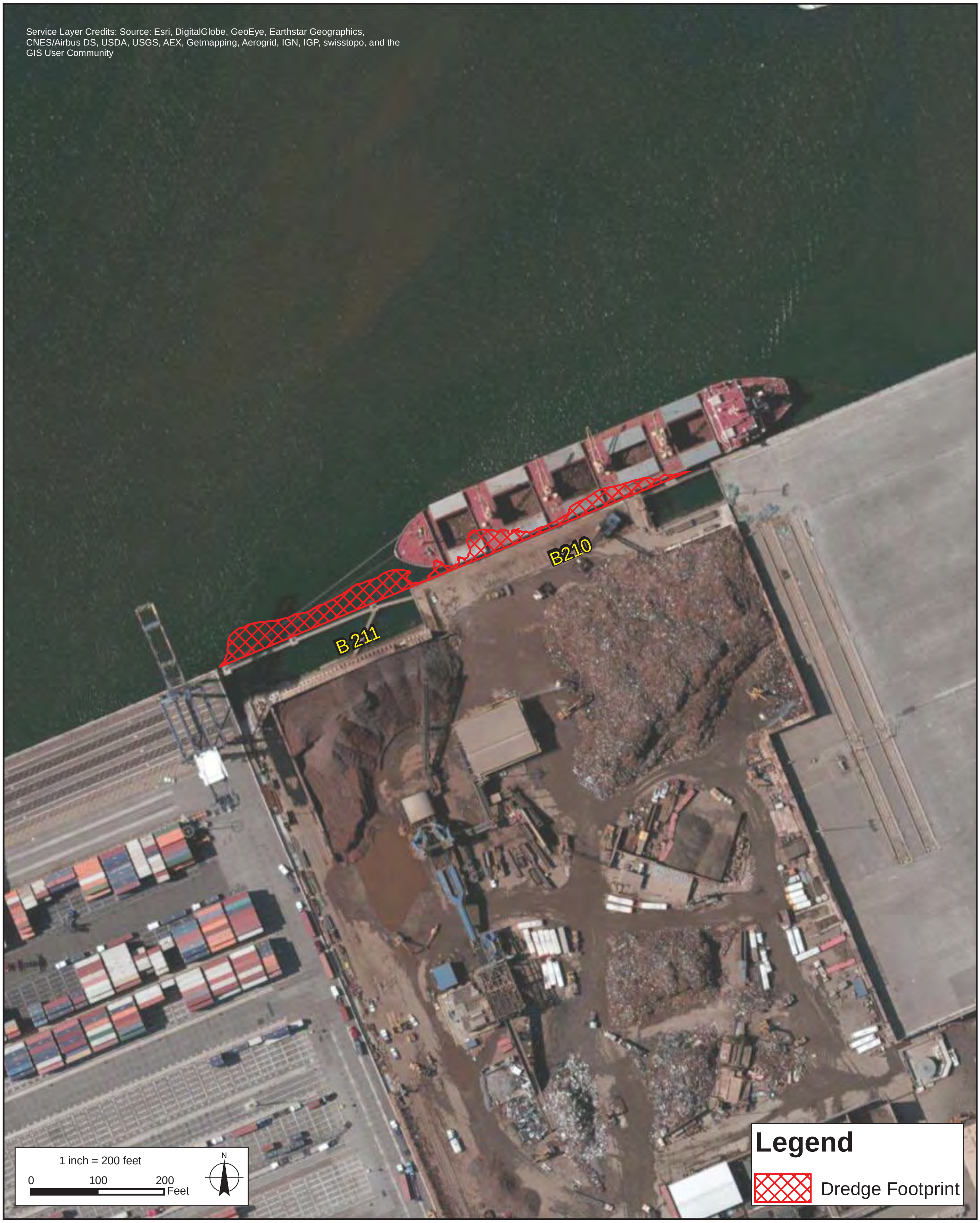

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Project Location
Berths 210 - 211
Maintenance Dredging
Port of Los Angeles

FIGURE
3-2

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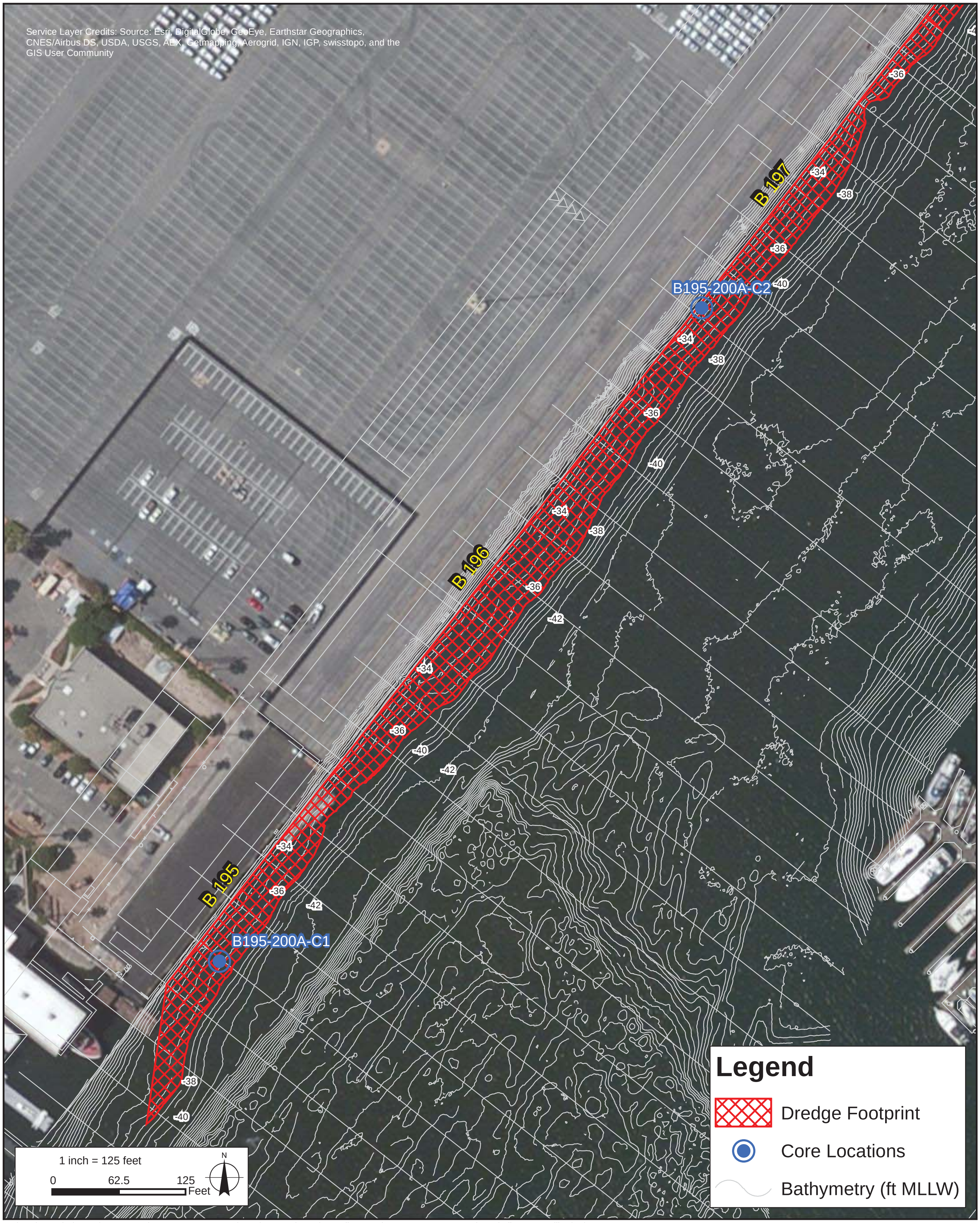

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Actual Sampling Locations
Berths 195 - 200A
Maintenance Dredging
Port of Los Angeles

FIGURE
3-3A

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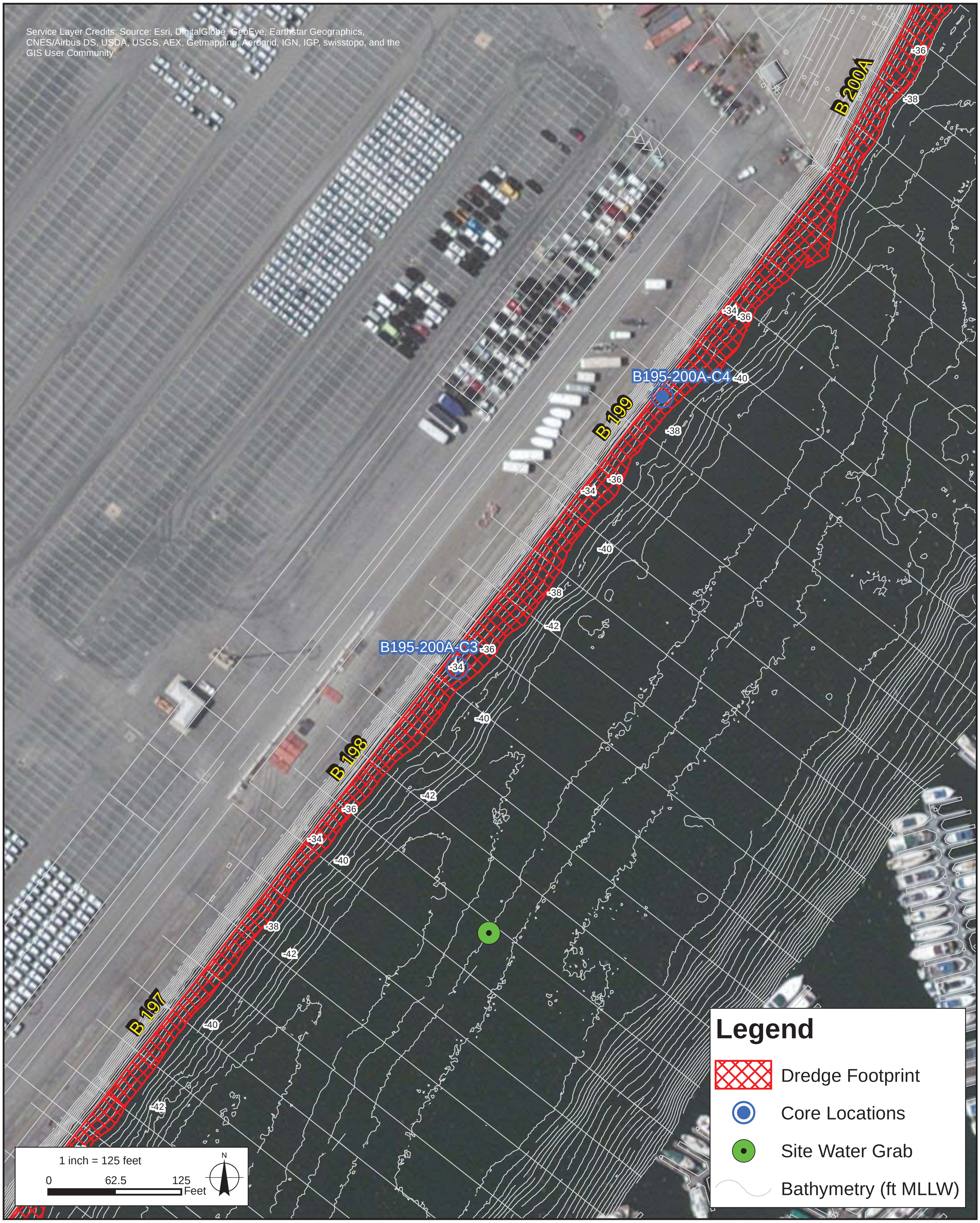

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Actual Sampling Locations
Berths 195 - 200A
Maintenance Dredging
Port of Los Angeles

FIGURE

3-3B

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Actual Sampling Locations
Berths 195 - 200A
Maintenance Dredging
Port of Los Angeles

FIGURE
3-3C

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Actual Sampling Locations
Berths 210 - 211
Maintenance Dredging
Port of Los Angeles

FIGURE
3-4

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3.2.3 Site Water Collection

Site water samples used to prepare the elutriate samples for chemical analysis were collected in the harbor within each proposed dredge area. Site water was collected using a peristaltic pump from approximately mid-depth at each respective berthing area. The site water samples were collected at the end of the sampling effort to reduce holding time. All site water was stored in 20-liter polyethylene cubitainers and delivered to Calscience on the same day as collection.

3.3 Sample Preparation

The sample compositing, testing, and archiving scheme for the proposed Study is summarized in Table 3-3. On the sampling vessel, the sediment samples (of all individual cores and 0.5-foot Z-layer samples from each core) collected at each of the eight sampling locations were first homogenized separately in clean, non-contaminating stainless-steel mixing vessels, and then subsampled for chemical analyses and archiving. The remainder of each sample was then placed in a lab-certified glass jar and stored on ice until all of the samples from an individual composite area were collected.

3.3.1 Test Sediment Compositing

The sediment collection and compositing matrix for the Study is presented in Table 3-3. Once all of the samples were collected, field scientists prepared the composite samples by thoroughly homogenizing sediment collected at each of the individual core sampling locations by composite area. The combined sediments were then subsampled for physical, chemical, and elutriate analyses as well as for archiving purposes (Table 3-3). A labeled grain-size sample, a 16-ounce jar, and an additional 16-ounce jar of sediment for the elutriate sample were delivered by Amec Foster Wheeler scientists to Calscience for the analyses described in Table 3-4.

3.3.1.1 Elutriate Preparation and Testing

A dredging elutriate test (DRET) was conducted to evaluate the potential release of contaminants during dredging operations at the two Study sites. The DRET was prepared by Calscience according to the laboratory's standard operating procedures. To perform the DRET for each Project dredge footprint, two sediment composites were made:

- B195–200A Composite = Cores B195-200A-C1 to B195-200A-C5, and
- B210-211 Composite = Cores B210-211A-C1 to B210-211-C3.

Once each sample was composited and warmed to room temperature, the wet/dry ratio was measured and the samples were weighed. A 10-gram per liter (g/L) aliquot of sediment from each composite sample was then combined with its respective site water to form a slurry. The sediment slurry was mixed vigorously for 5 minutes then aerated for 1 hour with manual stirring in 10-minute intervals. Following mixing, the particulates were allowed to settle for an additional hour and the supernatant (elutriate) was siphoned off into containers for further processing.

For organic and inorganic analyses, the elutriate was centrifuged for approximately 15 minutes prior to transfer to appropriate containers for analysis. For dissolved metals analysis, the elutriate was filtered using a 0.45-micron (µm) membrane filter prior to transfer to appropriate containers for analysis.

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Table 3-2.
Vibracore Log of Sediment Sampling Locations

Sample Identifier	Latitude WGS84 (dd°mm.mmm)	Longitude WGS84 (ddd°mm.mmm)	Collection Date	Time	Depth (feet MLLW)		Penetration (feet)		Recovered Core Length (feet)	Additional Notes
					Mudline	Project[1]	Target	Actual		
B195-200A-C1	33°45.937	-118°15.305	1/20/2016	1340	-36.1	-39	3.9	3.9	3.4	Dock obstructed sample collection near bulkhead; sampling location adjusted ~15 feet.
B195-200A-C2	33°46.038	-118°15.216	1/21/2016	0920	-33.9	-39	6.1	6.1	6.3	Resistance to penetration at about 4 feet, hard 4 feet to 6.1 feet, plug fell out on retrieval.
B195-200A-C3	33°46.149	-118°15.110	1/21/2016	1015	-35.0	-39	5.0	5.0	5.4	None.
B195-200A-C4	33°46.191	-118°15.072	1/21/2016	1105	-35.9	-39	4.1	4.1	4.3	None.
B195-200A-C5	33°46.293	-118°14.999	1/20/2016	1425	-34.6	-39	5.4	5.4	5.4	No resistance to penetration (very soft). About 5 feet from bulkhead.
B210-211-C1	33°45.647	-118°15.264	1/20/2016	0925	-33.1	-39	6.9	6.9	8.3	Extra foot penetrated to obtain adequate Z-layer sample. Super solid bottom/catcher sediments.
B210-211-C2	33°45.660	-118°15.228	1/20/2016	1105	-33.9	-39	6.1	6.1	5.8	Odor on removal of plug; hard at bottom during penetration.
B210-211-C3	33°45.683	-118°15.156	1/20/2016	1230	-36.1	-39	3.9	5.0	3.8	About 15 feet from bulkhead, and at 3.9 feet, removed 4.0 feet to 5.0 feet because of over-penetration; no resistance to penetration at depth.

Notes:
1. Including the 2-foot overdredge allowance. All attempts were penetrated to -40 feet MLLW to collect a representative Z-layer sample.
dd/ddd°mm.mmm = degrees decimal minutes; MLLW = mean lower low water; WGS = World Geodetic System

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Table 3-3.
Sediment and Elutriate Testing and Archiving Matrix

Station ID	Sample Type	Proposed Collection Coordinates		Sample Collection Method	Analysis Type			Archive
		Latitude WGS84 (dd°mm.mmm')	Longitude WGS84 (ddd°mm.mmm')		Sediment Chemistry	Sediment Grain Size	Site Water/ Elutriate Chemistry	
B195-200A-C1	Sediment Core	33° 45.937' N	118° 15.305' W	Vibracore				X
B195-200A-C1-Z								X[1]
B195-200A-C2		33° 46.038' N	118° 15.216' W					X
B195-200A-C2-Z								X[1]
B195-200A-C3		33° 46.149' N	118° 15.110' W					X
B195-200A-C3-Z								X[1]
B195-200A-C4		33° 46.191' N	118° 15.072' W					X
B195-200A-C4-Z								X[1]
B195-200A-C5		33° 46.293' N	118° 14.999' W					X
B195-200A-C5-Z								X[1]
B210-211-C1		33° 45.647' N	118° 15.264' W					X
B210-211-C1-Z								X[1]
B210-211-C2		33° 45.660' N	118° 15.228' W					X
B210-211-C2-Z								X[1]
B210-211-C3		33° 45.683' N	118° 15.156' W					X
B210-211-C3-Z								X[1]
B195-200A-Comp	Sediment Composite	B195-200A-C1, B195-200A-C2, B195-200A-C3, B195-200A-C4, and B195-200A-C5		Composite	X	X	X[1]	X
B210-211-Comp	Sediment Composite	B210-211-C1, B210-211-C2, and B210-211-C3		Composite	X	X	X[1]	X
B195-200A Site Water	Water Grab	33° 46.108' N	118° 15.104' W	Van Dorn Bottle			X	
B210-211 Site Water	Water Grab	33° 45.712' N	118° 15.210' W	Van Dorn Bottle			X	

Notes:
dd/ddd°mm.mmm' = degrees decimal minutes; DRET = dredging elutriate test; ID = identification; WGS = World Geodetic System
1. Z-layer sediments were archived from each core for potential future analysis. Potential analysis will be determined through consultation with the agencies based on the testing results of the overlying dredged materials; however, based on overlying sediment testing results, it is not recommended at this time. Z-layer sediments may be tested individually or as a composite, depending on need. Sediments from the composite sample were used to make the DRET elutriate.

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In addition to preparation and analysis of test sediment elutriate samples, an untreated site water sample was also analyzed to determine the background chemical levels in the water column at each dredging site.

3.3.1.2 Sediment Archiving

Amec Foster Wheeler retained archived subsamples from each of the eight individual core samples, eight individual core Z-layer samples, two sediment composite samples, and several distinct substrata (see core logs in Appendix A). Archived samples will be retained in a freezer maintained at −20°C, for up to one year following the collection program so that additional analyses can be performed if requested by the Port or other agency.

3.3.2 Sample Handling and Chain-of-Custody Procedures

Proper completion of all chain-of-custody (COC) documentation is the responsibility of the Field Manager. COC forms were completed and signed before the end of each sampling day and before the samples were removed from the vessel or passed from the control of the Field Manager. COC forms were signed again at all points of transfer of samples following departure from the field.

Sample container information was recorded on the COC forms, including the sampling organization, point of contact, sample identification (ID), collection date and time, type of sample, and project name. The form serves as a sample analysis request form. All sediment samples were transported in coolers with ice and maintained at a temperature of 4 degrees Celsius (°C) or cooler until delivery to Calscience by Amec Foster Wheeler scientists. Samples and accompanying COC forms were delivered on January 21, 2016. The COC forms specified the sample identifiers and the analyses to be conducted for each sample type. The forms were prepared in duplicate; the Field Manager retained one copy while the other copy accompanied the samples at all times.

3.3.3 Equipment Decontamination

Once the core sleeve was extracted from the vibracore tube/barrel, any remnant sediment on the vibracore was removed with site water and the vibracore was scrubbed with a clean brush and an Alconox-water solution. The core barrel was then re-rinsed with site water prior to moving to the next sampling location. Additionally, all sediment sampling tools, including stainless-steel mixing vessels and scoops, core extraction trays, and other reusable items that come in contact with the sample, were similarly decontaminated prior to reuse.

3.4 Physical and Chemical Testing

Sample analysis included physical, chemical, and elutriate (DRET) testing, per guidelines in the ITM/UTM (Table 3-4). The chemical testing methods are of sufficient sensitivity to meet the objectives of the testing protocols and to ensure that any adverse impacts to the water column are identified.

Table 3-4.
Chemical Analyses for Sediment and Elutriate Samples

Analyte	Analysis Method	Sediment Target Detection Limit[1,2]	Elutriate Target Detection Limit[1,2]
Grain Size	ASTM D4464	0.1 %	NA
Total Solids	SM 2540 B	0.1%	NA
Total Organic Carbon	9060	0.1%	NA
Total Ammonia	SM 4500-NH3 B/C (M)[c]	0.2 mg/kg	NA
Total Sulfides	376.2M[3]	0.5 mg/kg	NA
Soluble Sulfides	SM 4500 S2 - D	0.5 mg/kg	NA
Oil and Grease	USEPA 413.2M	10 mg/kg	NA
Arsenic	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Cadmium	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Chromium	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Copper	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Lead	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Mercury	7471A[4]	0.02 mg/kg	0.0002 mg/L
Nickel	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Selenium	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Silver	6020/6010B[4]	0.1 mg/kg	0.001 mg/L
Zinc	6020/6010B[4]	1.0 mg/kg	0.005 mg/L
TPH (C6-C44)	USEPA 8015B(M)/8015B	5.0 mg/kg	NA
TRPH	418.1M[4]	10 mg/kg	NA
PAHs[5]	8270C SIM/ GC/TQ[4]	10 µg/kg	0.2 µg/L
Chlorinated Pesticides[6]	8081A[4]	1.0 - 20 µg/kg[10]	0.1 µg/L
PCB Congeners[7]	8270C SIM PCB[4]	0.5 µg/kg	0.02 µg/L
Phenols	8270C SIM[4]	20 - 100 µg/kg	NA
Phthalates	8270C SIM[4]	10 µg/kg	NA
Pyrethroids	GC/MS/MS[8]	0.5 – 1.0 µg/kg	NA
Organotins	Rice/Krone[9]	3.0 µg/kg	3.0 ng/L

Notes:
1. Sediment minimum detection limits are on a dry-weight basis.
2. Reporting limits were provided by Eurofins Calscience Environmental Laboratories, Inc.
3. Standard Methods for the Examination of Water and Wastewater, 19th edition, American Public Health Association et al. 1995.
4. USEPA 1986-1996. SW -846. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, 3rd Edition.
5. Includes naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene.
6. Includes aldrin, α-benzene hexachloride (BHC), β-BHC, γ-BHC (lindane), δ-BHC, chlordane, 2,4- and 4,4- dichlorodiphenyldiethane (DDD), 2,4- and 4,4- dichlorodiphenylethylene (DDE), 2,4- and 4,4- dichlorodiphenyltrichloroethane (DDT), dieldrin, endosulfan I and II, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, and toxaphene.
7. PCBs (sum of 41 congeners: 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194,201, and 206)
8. Allethrin (Bioallethrin), Bifenthrin, Cyfluthrin-beta (Baythroid), Cyhalothrin-Lamba, Cypermethrin, Deltamethrin (Decamethrin), Esfenvalerate, Fenpropathrin (Danitol), Fenvalerate (sanmarton), Fluvalinate Permethrin (cis and trans), Resmethrin (Bioresmethrin), Resmethrin, Sumithrin (Phenothrin), Tetramethrin, and Tralomethrin
9. Rice et al. 1987 or similar (e.g., Krone et al. 1989)
10. Except toxaphene, which is 1,000 µg/kg

µg/kg = micrograms per kilogram (parts per billion); µg/L = micrograms per liter; mg/kg = milligrams per kilogram (parts per million); mg/L = milligrams per liter; NA = not applicable; ng/L = nanograms per liter; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; SM = Standard Method; SOP = standard operating procedure; TPH = total petroleum hydrocarbons; TRPH = total recoverable petroleum hydrocarbons.

3.4.1 Physical Analysis

Grain-size analysis was performed on the composite samples. The analyses were performed at Calscience using the American Society for Testing and Materials (ASTM) International D4464M (ASTM, 1967) laser method. Percent gravel, sand, silt, and clay are reported to 0.1 percent, along with the corresponding millimeter and phi sizes, and a cumulative grain-size distribution diagram.

3.4.2 Chemical Analysis

Full laboratory reports, including analytical methods, detection limits, and relevant QA/QC information, are provided in Appendix C. A sample analysis matrix for whole sediment chemicals is provided in Table 3-4. Calscience, a California-accredited laboratory, conducted all analytical chemical analyses on the sediment and elutriate samples. Samples were analyzed according to USEPA and USACE approved methodologies as summarized in the analytical laboratory reports in Appendix C.

The two site composite samples, prepared separately by combining sediment cores collected within each dredge footprint, were analyzed for grain size and a full suite of chemicals, including metals, chlorinated pesticides, PCBs, PAHs, pyrethroid pesticides, phenols, phthalates and organotins. The physical and chemical analyses, USEPA and USACE approved analysis methods, and target detection limits for sediment and elutriate testing are listed in Table 3-4.

In addition to bulk sediment chemistry tests, dredged material was subjected to elutriate analyses to evaluate the potential release of contaminants into the water column during dredging operations. As discussed in the SAP, Z-layer samples have been archived for potential future analysis.

3.5 Data Quality Objectives

3.5.1 Sediment Collection

The vessel was positioned to collect samples within approximately ±3 meters of the intended sampling location using a DGPS. Vibracore penetration accuracy was ±0.5 ft, and the target penetration to the Project design depth was corrected for the tidal elevation at each core sampling location. NOAA charts or recent bathymetric data were used to assess water depth and were verified using the sampling vessel's fathometer. The penetration depth was determined by using a measuring tape attached to the vibracore head, and the distance from where the tape was attached to the vibracore head was added to the length from that point to the core cutter. Following the collection of each core, the actual length of the sediment in the tube was determined to assess the amount of compaction that occurred during collection.

3.5.2 Chemical and Physical Analyses

Analytical QA/QC for bulk sediment chemistry results was evaluated according *to QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations (Chemical Evaluations) USEPA 832-B-95-001* (USEPA 1995). QA/QC was maintained during the analytical portion of this Study by using duplicate sample analyses, reagent blanks, and spiked samples as specified in the USEPA methods for individual chemicals. All QA/QC information is included with the sediment testing reports (Appendix C).

Replicate analyses were performed for all sample matrices. Precision is expressed as the difference in results of replicate analysis ("analysis" includes all steps of preparation and determination) divided by the average of those values and expressed as a percentage. Thus, a relative percent difference of zero percent means that replicate results were identical. Instrumental calibration and verification are performed using USEPA and/or National Bureau of Standards traceable reference materials. QA/QC requirements, including measurement quality objectives, for this Study are outlined in the final SAP (Amec Foster Wheeler 2015).

3.6 Disposal Suitability Evaluation

The sediment chemistry results for this dredged material assessment were compared with California Title 22 Total Threshold Limit Concentration (TTLC) criteria to determine whether the dredged materials contain any California hazardous wastes that may preclude it from disposal at the CDF (California Code of Regulations, Title 22, Chapter 11, Article 3).

For consistency with previous Port projects, the results are also compared with Effects Range-Low (ERL) and Effects Range-Median (ERM) screening guidelines; however, these guidelines are not directly applicable to CDF disposal suitability.

4.0 RESULTS

4.1 Physical Analysis

Grain size analysis was performed on the two dredged material composite samples. Grain size distribution and mean grain size for each sample was classified by Calscience using methods described in *Procedures for Handling and Chemical Analysis of Sediment and Water Samples* (Plumb 1981). The mean grain size classification for both the B195–200A and B210-211 samples was silt. A more detailed summary of grain size fractions is presented in Table 4-1. The original grain size lab data report from Calscience is provided in Appendix C.

Table 4-1.
Grain Size Results

Analytical Method	Grain Size	Units	B195–200A	B210–211
ASTM D464 (M)	Clay	%	32.83	27.76
	Silt	%	67.17	72.24
	Total Silt and Clay	%	100.0	100.0
	Very Fine Sand	%	0.00	0.00
	Fine Sand	%	0.00	0.00
	Medium Sand	%	0.00	0.00
	Coarse Sand	%	0.00	0.00
	Very Coarse Sand	%	0.00	0.00
	Gravel	%	0.00	0.00
	Mean Grain Size	mm	0.008	0.010
	Grain Size Classification	Plumb, 1981	Silt	Silt

Notes:
(M) = modified; % = percent; mm = millimeters

4.2 Bulk Sediment Chemistry Results

Sediment chemistry results are summarized in Tables 4-2 and 4-3. Table 4-2 presents a comparison of the sediment chemistry results (reported as wet weight values) with California Title 22 TTLC hazardous waste criteria. Table 4-3 presents a comparison of the sediment chemistry results (reported as dry weight values) with ERL and ERM guidelines. Analytical chemistry reports and tables with a complete list of sediment testing results are provided as Appendix C.

None of the analytes with Title 22 TTLC hazardous waste criteria were detected at concentrations that exceeded those values (Table 4-2); however, not all analytes have hazardous waste criteria (i.e., TRPH, TPH, PAHs, phenols, phthalates, pyrethroids pesticides, or organotin compounds).

As shown in Table 4-3, several metals were detected at concentrations that exceeded ERL guideline values: arsenic, cadmium, chromium (B195–200A only), copper, lead, mercury, nickel, and zinc. In addition, two metals were found at concentrations above ERM guideline values: mercury in the B195–200A composite sample and zinc in the B210–211 composite.

Organic contaminants found at concentrations exceeding ERL guidelines were anthracene, fluorene (B195–200A only), and total detectable PAHs. Total PCB congeners and total DDTs were detected at concentrations above ERM guideline values in both composite samples (Table 4-3).

General chemistry (total solids, total organic carbon [TOC], total ammonia, total and soluble sulfides, and oil and grease) results are summarized in Tables 4-2 and 4-3. Total solids were measured at 54.3 percent and 66.5 percent for B195–200A and B210–211 sediment samples, respectively. Wet-weight TOC was measured at 1.4 percent and 0.73 percent in the B195–200A and B210–211 sediment samples, respectively. The concentration for total ammonia (wet-weight) was 5.01 milligrams per kilogram (mg/kg) in the B195–200A sample, and 4.19 mg/kg in the B210–211 sample. The concentration of total sulfide measured was 13.0 mg/kg wet-weight in both samples; soluble sulfides were not detected.

4.3 Elutriate and Site Water Chemistry Results

Elutriate and site water chemistry results are presented in Table 4-4. Analytical chemistry reports and tables for elutriate and site water results are provided in Appendix C.

The chemical composition of the site water was also analyzed and reported to assess background chemical levels at the two dredge sites for comparison purposes. The same mixing method used for elutriate preparation, sans sediments, was used for the site water. Elutriate and site water chemistry results were compared with applicable California Toxics Rule (CTR) criteria (USEPA 2000). For metal analyses, the elutriate samples were filtered through a 0.45-μm filter so that dissolved metal concentrations could be accurately compared with CTR criterion continuous concentration (CCC) and criteria maximum concentration (CMC) values (USEPA 2000).

4.3.1 Analytical Results

Of the analytes detected in the two site water samples, only copper was detected at a concentration above its CCC (Table 4-4). In addition, copper was detected at concentrations above its respective CMC in the elutriate samples from both berthing areas, and nickel was detected at concentrations above its respective CCC in elutriate samples for both berthing areas (Table 4-4).

The concentrations of copper were 8.08 micrograms per liter (μg/L) and 9.61 μg/L in the B195-200A and B210–211 elutriate samples, respectively. Of this, 3.75 μg/L and 4.13 μg/L were detected in the site water at B195–200A and B210–211, respectively (Table 4-4).

No other analytes were detected at concentrations above CMC values in the Study elutriate samples; however, total PCB congeners were detected at a concentration above the CCC of 0.03 µg/L in the B195–200A elutriate sample (concentration 0.0433 µg/L) and tributyltin was detected at a concentration above the CCC of 0.0074 µg/L in the B210–211 elutriate sample (concentration 0.028 µg/L, Table 4-4). Most of the other analytes, including PAHs and organochlorine pesticides, were predominantly non-detect (Appendix C).

Table 4-2.
Sediment Chemistry Results Summary – Wet Weight

Analyte	Units	TTLC	Results	
			B195–200A	B210–211
Total Solids	%	.	54.3	66.5
Total Organic Carbon	mg/kg	.	1.4	0.73
Ammonia (as Nitrogen)	mg/kg	.	5.01	4.19
Oil and Grease	mg/kg	.	1303	665
Total Sulfide	mg/kg	.	13	13
Dissolved Sulfide	mg/kg	.	ND < 0.054	ND < 0.067
TRPH	mg/kg	.	1140	266
C6-C44 Total	mg/kg	.	141	86.45
Arsenic	mg/kg	**500**	7.66	8.05
Cadmium	mg/kg	**100**	1.08	1.08
Chromium[1]	mg/kg	**500**	52.6	43.9
Copper	mg/kg	**2500**	92.3	77.1
Lead	mg/kg	**1000**	85.3	75.8
Nickel	mg/kg	**2000**	23.2	27.0
Mercury	mg/kg	**20**	0.30	0.80
Selenium	mg/kg	**100**	0.37	0.44
Silver	mg/kg	**500**	0.51	0.29
Zinc	mg/kg	**5000**	239	243
Total Detectable DDTs	µg/kg	**1000**	70	47
Total Detectable PAHs	µg/kg	-	5820	1750
Total PCB Congeners	µg/kg	**50,000**	203	123
Total Detectable Pyrethroid Pesticides	µg/kg	.	15	4.9
Dibutyltin	µg/kg	.	109	113
Monobutyltin	µg/kg	.	3.1	6.0
Tetrabutyltin	µg/kg	.	ND < 3.0	3.8
Tributyltin	µg/kg	.	81.5	253
Total Detectable Organotins	µg/kg	.	193	376

Notes:
https://www.dtsc.ca.gov/LawsRegsPolicies/Title22/
Values are in wet weight.
BOLD = concentration of analyte exceeds TTLC
< = less than; µg/kg = micrograms per kilogram; DDD = dichlorodiphenyldichloroethane; DDE = dichlorodiphenyldichloroethylene; DDT = dichlorodiphenyltrichloroethane; mg/kg = milligrams per kilogram; ND = not detected; PCB = polychlorinated biphenyl; TTLC = total threshold limit concentration

Table 4-3.
Sediment Chemistry Results Summary – Dry Weight

Analyte	Units	ERL	ERM	Results	
				B195–200A	B210–211
Total Solids	%	.	.	54.3	66.5
Total Organic Carbon	mg/kg	.	.	2.6	1.1
Ammonia (As N)	mg/kg	.	.	9.3	6.3
Oil and Grease	mg/kg	.	.	2400	1000
Total Sulfide	mg/kg	.	.	24	20
Dissolved Sulfide	mg/kg	.	.	ND < 0.10	ND < 0.10
TRPH	mg/kg	.	.	2100	400
C6-C44 Total	mg/kg	.	.	260	130
Arsenic	mg/kg	**8.2**	**70**	**14.1**	**12.1**
Cadmium	mg/kg	**1.2**	**9.6**	**1.99**	**1.63**
Chromium	mg/kg	**81**	**370**	**96.9**	66.0
Copper	mg/kg	**34**	**270**	**170**	**116**
Lead	mg/kg	**46.7**	**218**	**157**	**114**
Mercury	mg/kg	**0.15**	**0.71**	**0.557**	**1.20**
Nickel	mg/kg	**20.9**	**51.6**	**42.8**	**40.6**
Selenium	mg/kg	·	·	0.688	0.665
Silver	mg/kg	**1.0**	**3.7**	0.939	0.433
Zinc	mg/kg	**150**	**410**	**441**	**365**
Total DDTs	µg/kg	**1.58**	**46.1**	**128**	**71**
Total Detectable PAHs	µg/kg	**4022**	**44792**	**12519**	**3150**
Total PCB Congeners	µg/kg	**22.7**	**180**	**373**	**185**
Total Detectable Pyrethroid Pesticides	µg/kg		_	27.7	7.4
Dibutyltin	µg/kg	.	.	200	170
Monobutyltin	µg/kg	.	.	5.8	9.0
Tetrabutyltin	µg/kg	.	.	ND < 5.5	5.7
Tributyltin	µg/kg	.	.	150	380
Total Detectable Organotins	µg/kg	.	.	356	565

Notes:
ERL and ERM guideline values are from Buchman, 2008.
Values are in dry weight.
BOLD = concentration of analyte exceeds ERL
BOLD = concentration of analyte exceeds ERM
µg/kg = micrograms per kilogram; DDD = dichlorodiphenyldichloroethane; DDE = dichlorodiphenyldichloroethylene; DDT = dichlorodiphenyltrichloroethane ERL = effects range-low; ERM = effects range-median; mg/kg = milligrams per kilogram; ND = not detected; PCB = polychlorinated biphenyl

Table 4-4.
Elutriate and Site Water Chemistry Summary

Analyte	Units	CCC	CMC	Site Water Results		Elutriate Results	
				B195–200A	B210–211	B195–200A	B210–211
Arsenic	µg/L	36	69	1.39	1.40	ND < 1.00	1.20
Cadmium	µg/L	8.8	40	0.0382	0.0335	ND < 10.0	ND < 10.0
Chromium[1]	µg/L	50	1100	ND < 0.500	ND < 0.500	ND < 10.0	ND < 10.0
Copper	µg/L	3.1	4.8	3.75	4.13	8.08	9.61
Lead	µg/L	8.1	210	0.0685	0.0539	ND < 10.0	ND < 10.0
Nickel	µg/L	8.2	74	0.562	0.527	10.3	11.2
Mercury[2]	µg/L	0.94	1.8	ND < 0.0500	ND < 0.0500	ND < 0.500	ND < 0.500
Selenium	µg/L	71	290	0.0534	ND < 0.0500	ND < 10.0	ND < 10.0
Silver	µg/L	1.9	-	0.337	0.346	ND < 10.0	ND < 10.0
Zinc	µg/L	81	90	14.5	13.9	14.3	14.1
Total Detectable DDTs	µg/L	-	-	ND <0.010	ND <0.010	ND < 0.0097	ND < 0.0098
Total Detectable PAHs	µg/L	-	-	0.00	0.00	0.30	ND < 0.20
Total PCB Congeners	µg/L	0.03	-	0.00	0.00	0.0433	0.0147
Tributyltin	µg/L	0.0074	0.42	ND < 0.0030	ND < 0.0029	0.0046	0.028

Notes:
http://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
1. CCC and CMC values are for chromium VI
2. CCC and CMC values are for mercury/methylmercury
BOLD = concentration of analyte exceeds CCC
BOLD = concentration of analyte exceeds CMC
µg/L = micrograms per liter; CCC = criterion continuous concentration; CMC = criterion maximum concentration; DDT = dichlorodiphenyltrichloroethane; ND = not detected PCB = polychlorinated biphenyl

4.4 Data Quality Evaluation

Quality assurance (QA) data are presented in full detail within the original chemistry and toxicity reports (Appendices C and D). This section summarizes the results of the quality control (QC) procedures used to ensure that the chemistry data reported are valid.

4.4.1 Calibration

Frequency and control criteria for initial and continuing calibration verifications were met. The method detection limits were met.

4.4.2 Blanks

Concentrations of target analytes in the method blank were found to be below reporting limits for all testing.

4.4.3 Laboratory Control Samples

A laboratory control sample (LCS) analysis was performed for each applicable test. All parameters were within established control limits.

4.4.4 Surrogates

Surrogate recoveries for all applicable tests and samples were within acceptable control limits.

4.4.5 Matrix Spikes

Matrix spiking was performed at the required frequencies for the sediment on both project and non-project samples.

5.0 DISCUSSION

The purpose of the proposed Project is to perform maintenance dredging at Berths 195–200A and Berths 210–211. This Study was performed to evaluate sediment quality at the Project sites and to determine whether the dredged materials proposed for disposal are suitable for placement in the Berths 243–245 CDF.

This sediment quality evaluation included bulk sediment chemistry, elutriate, and site water testing. Test results are discussed in Sections 5.1 and 5.2.

5.1 Bulk Sediment Chemistry

A total of eight vibracore samples were collected: five in the B194-200A area and three in the B210–211 area (Figures 3-3A-C and 3-4). Samples within each of the areas were combined to create two composite samples (B195–200A and B210–211, respectively) for the dredged material characterization study.

The results of the chemical analyses conducted on the two sediment composite samples showed that the concentration of analytes in the sediments was considerably lower than the California Title 22 criteria levels for hazardous waste determination. The sediment samples also contained detectable concentrations of TPH, pyrethroids, pesticides, PAHs, and organotins, but there are no TTLC regulatory criteria with which to compare the result values. Because no chemicals exceeded Title 22 hazardous waste levels in the B195–200A and B210-211 dredged materials, this material is suitable for disposal in the Berths 243–245 CDF.

5.2 Elutriate Chemistry

Elutriate analysis was performed to evaluate the potential for resuspension of contaminants during dredging operations.

Copper was detected at concentrations above the CMC in both elutriate samples and detected concentrations also exceeded the CCC in both site water samples. Subtracting the concentration of copper detected in site water samples from the concentration found in the elutriate samples from each area reduces the overall concentration of copper to levels below the CMC in both elutriate samples (4.33 µg/L and 5.48 µg/L of copper at B195-200A and B210–211, respectively).

Nickel was also found at concentrations above the CCC in both elutriate samples, but results were well below the CMC criteria.

Total PCB congeners were found at concentrations that exceeded the CTR CCC in the B195-200A elutriate, while the tributyltin concentration exceeded the CCC in the B210–211 sample. However, a PCB study in the USACE DRET development technical manual noted that PCB congeners are not easily released from particles during dredging; they tend to stay sorbed onto the sediments and only small amounts dissolve into the water column (DiGiano et al. 1995).

Elutriate testing results for the Study indicate the potential for resuspension of contaminants during dredging operations at both Project sites. Turbidity control may be necessary to lessen potential impacts on water quality during dredging operations.

6.0 CONCLUSION

The results of the B195–200A and B210–211 dredged material characterization Study showed the following:

- Sediment chemical levels were well below California Title 22 hazardous waste criteria levels, indicating that the proposed dredged materials from both maintenance dredge footprints are suitable for disposal at the CDF.
- Elutriate analyses detected a few analytes in exceedance of CTR criteria levels, particularly copper (detected above the CMC), nickel, total PCB congeners, and tributyltin (detected above the CCC).
- Turbidity controls may need to be implemented at the dredging site to mitigate the potential release of soluble contaminants during dredging operations.

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8.0 ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%	percent
<	Less than
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µm	micron
303(d) list	Clean Water Act Section 303(d) list of impaired waters
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
Aquatic Blue	Aquatic Blue Environmental
ASTM	ASTM International (formerly the American Society for Testing and Materials)
B195–200A	Berths 195–200A
B210–211	Berths 210–211
BHC	benzene hexachloride
CAD	Computer-Aided Design
Calscience	Eurofins Calscience Environmental Laboratories, Inc.
CCC	Criterion Continuous Concentration
CDF	Confined Disposal Facility
CMC	Criteria Maximum Concentration
COC	chain-of-custody
CSTF	Los Angeles Region Contaminated Sediments Task Force
CTR	California Toxics Rule
cy	cubic yard(s)
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
dd/ddd°mm.mmm	degrees decimal minutes
DGPS	differential global positioning system
DoD ELAP	United States Department of Defense Environmental Laboratory Accreditation Program
DRET	dredging elutriate test
EPA	U.S. Environmental Protection Agency
ERL	Effects Range-Low
ERM	Effects Range-Median
ft	foot/feet
g/L	gram(s) per liter
ID	identification
ITM	Inland Testing Manual
L	liter
LCS	laboratory control sample
m	meter(s)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter

ACRONYMS AND ABBREVIATIONS (Cont.)

MLLW	mean lower low water
NA	not applicable
ND	not detected
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
NOAA	National Oceanic and Atmospheric Administration
OD	overdredge
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Project	Port of Los Angeles maintenance dredging at Berths 195–200A (B195–200A) and Berths 210–211 (B210–211)
Port	Port of Los Angeles
QA	quality assurance
QA/QC	quality assurance/quality control
QC	quality control
SAP	Sampling and Analysis Plan
SAPr	Sampling and Analysis Plan report
SM	Standard Method
SOP	standard operating procedure
Study	Port of Los Angeles dredged material characterization study
TMDL	total maximum daily load
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TTLC	total threshold limit concentration
TMDL	Total Maximum Daily Load
U.S.	United States
USACE	U.S. Army Corps of Engineers
UTM	Upland Testing Manual
WGS	World Geodetic System
WWL	Wallenius Wihelmsen Logistics