FINAL
SAMPLING AND ANALYSIS PLAN
BERTHS 163-164 MAINTENANCE DREDGING PROJECT
LOS ANGELES HARBOR

Submitted to:

THE PORT OF LOS ANGELES

Port of Los Angeles
Environmental Management
425 South Palos Verdes Street
San Pedro, California 90731

Submitted by:

AMEC Environment & Infrastructure, Inc.
9210 Sky Park Court, Suite 200
San Diego, California 92123

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AMEC	AMEC Environment & Infrastructure, Inc.
ASTM	ASTM International (formerly the American Society for Testing and Materials)
BP	bioaccumulation-phase
BHC	benzene hexachloride
Calscience	Calscience Environmental Laboratories, Inc.
CCC	Criterion Continuous Concentration
CETIS	Comprehensive Environmental Toxicity Information System
CDF	Confined Disposal Facility
CFR	Code of Federal Regulations
CMC	Criteria Maximum Concentration
COC	chain of custody
CTR	California Toxics Rule
CSTF	Contaminated Sediments Task Force
cy	cubic yard(s)
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
dd/-ddd°mm.mmm	degrees decimal minutes
DGPS	differential global positioning system
DO	dissolved oxygen
Dup.	duplicate
ERL	Effects Range Low
ERM	Effects Range Median
FDA	U.S. Food and Drug Administration
ft	foot/feet
Green Book	*Evaluation of Dredged Material Proposed for Ocean Disposal* EPA 503/8-91/001
HASP	Health and Safety Plan
Inland Testing Manual	*Evaluation of Dredged Materials Proposed for Discharge in Waters of the U.S.* EPA-823-B-98-004
Kinnetic	Kinnetic Laboratories, Inc.
LPC	limiting permissible concentration

ACRONYMS AND ABBREVIATIONS (Cont.)

LC_{50}	median lethal concentration
m	meter(s)
MB	method blank
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
MLLW	mean lower low water
MS	matrix spike
MSA	method of standard addition
MSD	matrix spike duplicate
N/A	not applicable
Nautilus	Nautilus Environmental, LLC
NOAA	National Oceanic and Atmospheric Administration
OD	overdredge
ODMDS	Ocean Dredged Material Disposal Site
OPR	ongoing precision and recovery
oz.	ounce(s)
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pH	potential of hydrogen
ppt	parts per thousand
%Rec	percent recovery
RL	reporting limit
Port	Port of Los Angeles
Project	Berths 163-164 Maintenance Dredging Project
QA/QC	Quality Assurance/Quality Control
RPD	relative percent difference
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
Seaventures	Seaventures, Inc.
SP	solid-phase
SC-DMMT	Southern California Dredged Material Management Team
SPP	suspended particulate-phase

ACRONYMS AND ABBREVIATIONS (Cont.)

SVOC	semivolatile organic compound
TEG	TEG Oceanographic Services
TOC	total organic carbon
ToxScan	ToxScan, Inc.
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WGS84	World Geodetic System 1984

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1.0 INTRODUCTION

This document serves as the Sampling and Analysis Plan (SAP) for the proposed Port of Los Angeles (Port) Berths 163-164 Maintenance Dredging Project (Project). The proposed Project involves dredging of sediment to accommodate berthing operations. The purpose of this SAP is to outline the sampling and analysis procedures for a sediment characterization study of the dredged material. The objective of the sediment characterization study is to implement a tiered approach to analyzing sediment chemistry, toxicity, and bioaccumulation tissue results with the overall goal of evaluating suitable disposal alternatives for the dredged material. All materials will be collected at the same time, but testing of the samples will occur in stages. The tiered approach will include initially conducting sediment chemical analyses and solid-phase toxicity testing using amphipods, followed by additional toxicity testing and bioaccumulation exposures if the chemistry and amphipod results appear favorable for unconfined aquatic disposal. The tiered approach is further explained in Section 4.0.

AMEC Environment & Infrastructure, Inc. (AMEC) was contracted by the Port to prepare this SAP, which includes the following elements:

- project description;
- site maps, including target penetration depth and sampling coordinates;
- descriptions of chemical, toxicological, and bioaccumulation testing;
- vibracore sampling equipment and procedure;
- systematic descriptions of sample handling, chain of custody (COC) procedures, and sample preservation;
- a detailed section on Quality Assurance/Quality Control (QA/QC) procedures and data quality; and
- a schedule for completion.

In order to assess the potential for ocean disposal suitability, the sediments within the proposed dredge footprint will be characterized in accordance with US Environmental Protection Agency (USEPA) / US Army Corps of Engineers (USACE) guidelines outlined in "*Evaluation of Dredged Material Proposed for Ocean Disposal EPA 503/8-91/001*" (Green Book).

In order to assess inland disposal suitability, elutriate testing will be conducted according to guidelines set forth in the USEPA/USACE *Evaluation of Dredged Materials Proposed for Discharge in Waters of the U.S.* EPA-823-B-98-004 (Inland Testing Manual).

1.1 Project Location and Description

The proposed Project involves maintenance dredging of the sediments adjacent to the Nustar Energy and Ultramar industrial petroleum facilities located at Berths 163 and 164, respectively. These facilities are located in Slip 1 directly north of the Turning Basin in Los Angeles Harbor (Figure 1-1).

The proposed Project consists of two distinct dredge areas at each berth: nearshore and offshore. It is likely that if elevated levels of contaminants are found within the footprint, the nearshore sediments would contain higher levels of contaminants than the offshore material. Consequently, AMEC is proposing that the dredge footprint be partitioned into two separate testing areas, referred to as Composite Area A – Nearshore (encompassing Berths 163-164 nearshore area) and Composite Area B - Offshore (encompassing Berths 163-164 offshore area) (Figure 1-2).

The dredge design depth for this project is -40 feet (ft) mean lower low water (MLLW) plus a two-foot overdredge allowance to -42 ft MLLW. The project total dredge volume is an estimated 8,196 cy. Detailed Port Engineering Drawings for Berths 163-164 are included in Appendix A.

Finally, the proposed Project involves potential disposal of dredged material at the LA-2 Ocean Dredged Material Disposal Site (ODMDS) (Figure 1-3). Alternatively, the dredged material may be disposed at the Port's agency-approved Confined Disposal Facility (CDF) located at Berths 243-245. The disposal location will be selected based on the results of the sediment characterization study, which involves a tiered approach to sampling and analysis that will streamline the disposal determination process.

1.2 Site Background

1.2.1 Land Uses and Influences

The Project site is located in Slip 1, north of the Port's Turning Basin. It is bordered by the Port's Construction and Maintenance Division facility to the north (Berths 161-162) and the Borax dry bulk terminal (Berths 165-167) to the south. Across Slip 1 from the Project site is a paved surface parking lot for the Port facility. The Nustar Energy and Ultramar facilities are active industrial petroleum facilities. Both facilities have spill response best management practices located on shore in the event of petroleum spills.

1.2.2 Site History and Data Review

A report conducted by Kinnetic Laboratories, Inc. (Kinnetic) and ToxScan, Inc. (ToxScan) documents environmental testing for dredging at the Project site in 1996 (Kinnetic/ToxScan 1996). In this study, sediment was tested to -42 ft MLLW and was analyzed for bulk sediment chemistry, toxicity, and bioaccumulation. The results of the study indicated that a portion of the Berths 163-164 sediments were suitable for disposal at LA-2 ODMDS (approximately 8,751 cy) and a portion was suitable for disposal at the Anchorage Road upland dredge material disposal facility (approximately 4,375 cy).

More recently, a dredged material study was conducted at Berths 163-164 by Kinnetic as part of the Port of Los Angeles 2006 Marine Exploration Program carried out for the Federal Channel Deepening Project (Kinnetic 2006). The 2006 sediment was tested to a depth of -44 ft MLLW. Although the material was determined to be suitable for disposal at a CDF and/or upland disposal facilities, the site was never dredged.

Results of the 2006 sediment characterization studies are summarized as follows:

Bulk Sediment

The sediments consisted primarily of sand (52.9 percent), with a near equal proportion of silt (22.8 percent) and clay (24.3 percent) making up the finer grain material. Organic carbon content was low (0.47 percent), and there were moderate levels of oil and grease (420 mg/kg) and petroleum hydrocarbons (260mg/kg). There were only a few elevated inorganic and organic contaminants in the Berths 163-164 composite sample. Arsenic, copper, mercury, dichlorodiphenyldichloroethylene (DDE) and total dichlorodiphenyltrichloroethane (DDT) exceeded Effects Range Low (ERL) values and there were no Effects Range Median (ERM) exceedances. The overall mean ERM quotient (0.062) suggested little potential for toxic effects. Tributyltin was present at a concentration of 4.4 ug/kg, which is in the lower end of the range reported by the California State Water Resources Control Board for sediment in California coastal and delta waters.

Elutriate Chemistry

All inorganic and organic constituents were below California Toxics Rule (CTR) Criterion Continuous Concentration (CCC) screening criteria and were at best only slightly elevated above background water concentrations. Minor concentrations of a few polycyclic aromatic hydrocarbon (PAH) compounds were the only organic constituents detected in the elutriate sample.

Toxicity Testing

Effluent (suspended particulate-phase) results indicated no toxicity to *Mytilus galloprovincialis* survival (median lethal concentration [LC_{50}] >100%) or to *Mytilus galloprovincialis* normal development (Median effective concentration >100%).

In addition, the nearby Nustar Energy and Ultramar facilities have storm drains that can be used in emergencies, but are locked shut and practically unused. At Nustar Energy, stormwater is collected and pumped into their central tank farm where it goes through an oil/water separator. The Nustar Energy and Ultramar facilities do not discharge to Los Angeles Harbor.

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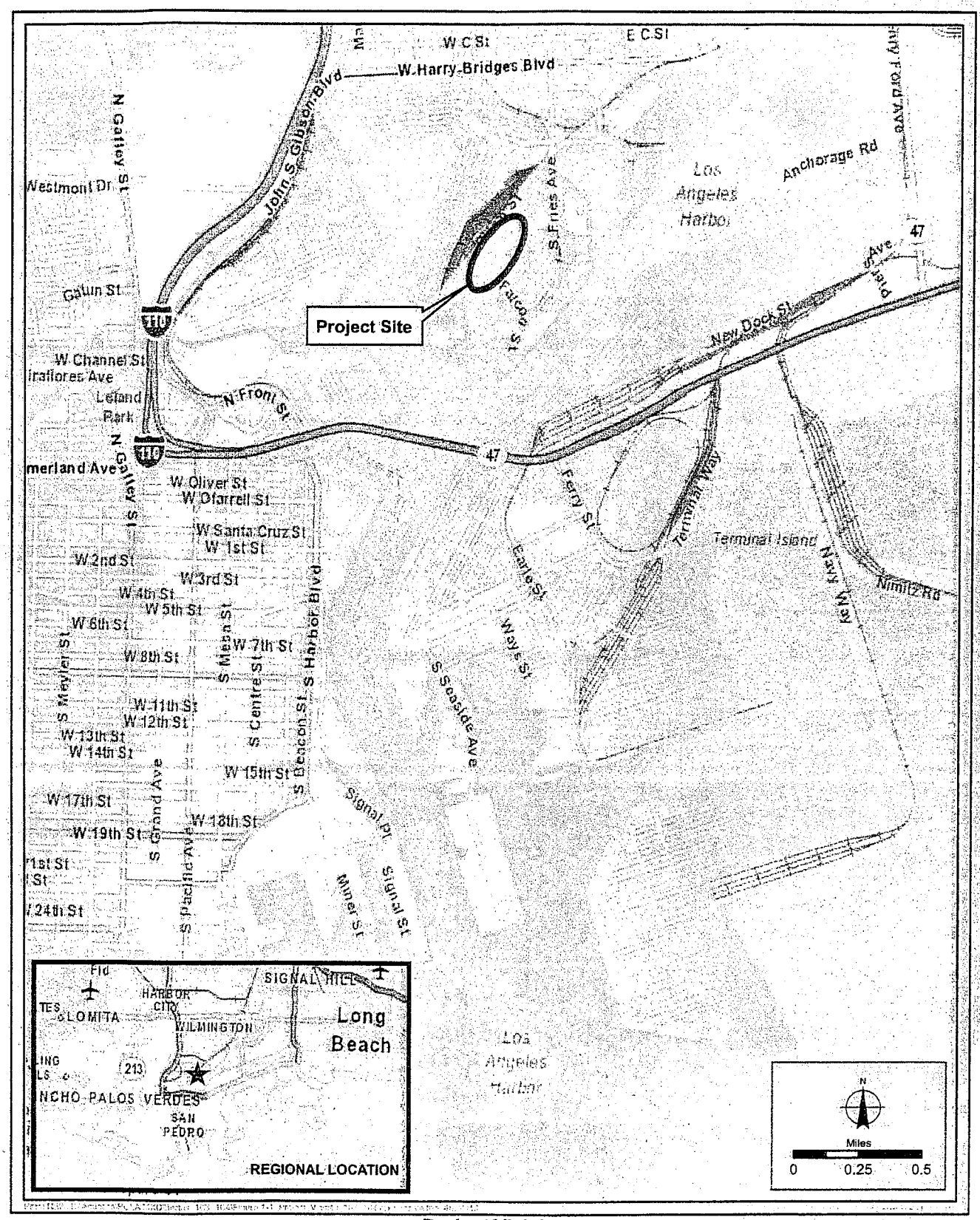

Project Vicinity
Sampling and Analysis Plan
Berths 163-164 Maintenance Dredging Project
Port of Los Angeles

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FIGURE
1-1

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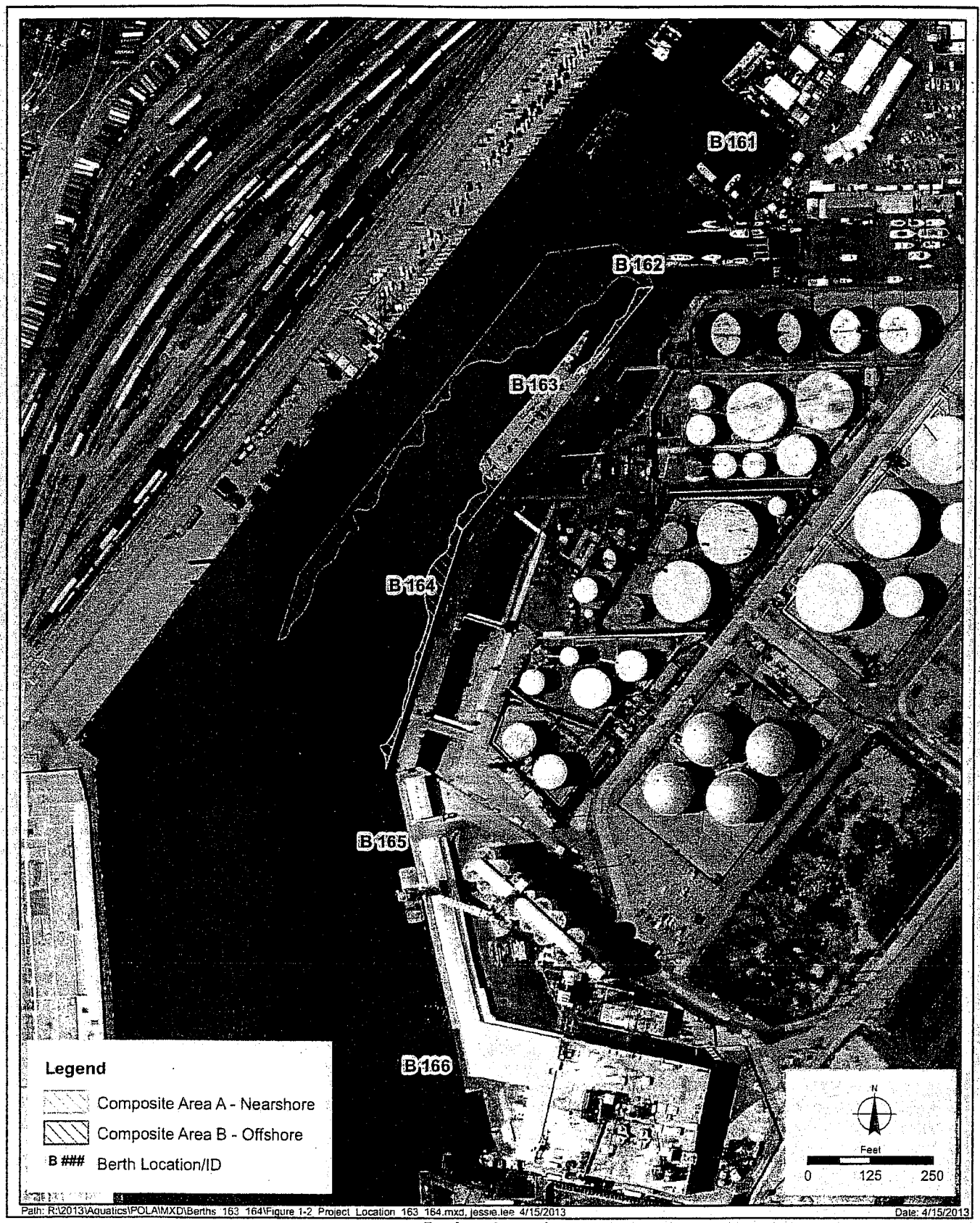

Project Location
Sampling and Analysis Plan
Berths 163-164 Maintenance Dredging Project
Port of Los Angeles

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FIGURE
1-2

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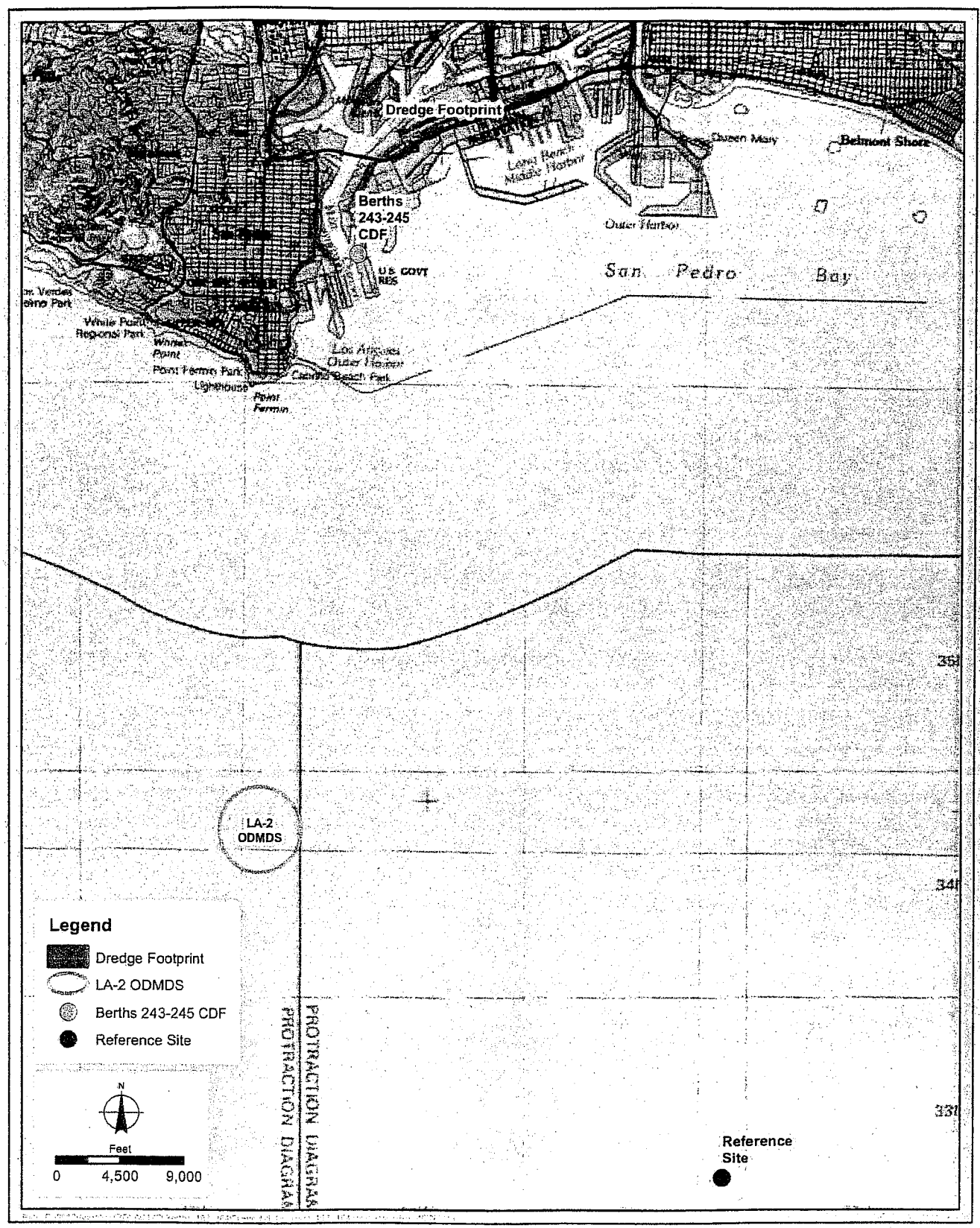

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Potential Disposal Locations
Sampling and Analysis Plan
Berths 163-164 Maintenance Dredging Project
Port of Los Angeles

FIGURE

1-3

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2.0 PROJECT MANAGEMENT RESPONSIBILITIES

2.1 Scope of Work

This SAP details the sediment collection and testing procedures to be conducted on the Project dredged material during the sediment characterization study. The primary disposal option being evaluated is the LA-2 ODMDS, with the Berths 243-245 CDF as an alternative option pending results of the sediment testing. Sediment characterization study elements include:

- preparation of this SAP for regulatory approval;
- preparation of a project-specific Health and Safety Plan (HASP) including an emergency contact list for responsible parties, directions to the nearest medical facilities, and an Accident Hazard Analysis and Accident Prevention Plan;
- field mobilization and collection of sediment samples within the study area as described in this SAP;
- submission of samples to accredited laboratories for chemical and toxicity analysis;
- data QA/QC;
- analysis of sediment chemistry, toxicity, and bioaccumulation results; and
- preparation of a detailed Sediment Characterization Report.

The sediment characterization study will be conducted according to this SAP, and reviewed and approved by the Port as well as the Los Angeles Region Contaminated Sediments Task Force (CSTF) in conjunction with the Southern California Dredged Material Management Team (SC-DMMT).

2.2 Key Project Personnel

AMEC will be responsible for the aforementioned sediment characterization study elements. Key project personnel necessary for this effort are listed with their contact information in Table 2-1. Seaventures, Inc. (Seaventures), TEG Oceanographic Services (TEG), Nautilus Environmental, LLC (Nautilus), and Calscience Environmental Laboratories, Inc. (Calscience) have been subcontracted by AMEC to provide boat services, vibracore operation, toxicity testing, and chemical and physical analyses, respectively.

Table 2-1.
Key Project Personnel

Organization	Name	Title	Office Phone	Cellular Phone
Port	Kat Prickett	Project Manager	(310) 732-3951	N/A
AMEC	Barry Snyder	AMEC Project Manager	(858) 300-4320	(858) 354-8340
AMEC	Chris Stransky	AMEC QA/QC Manager	(858) 300-4350	(858) 775-5547
AMEC	Tyler Huff	AMEC Field Manager	(858) 300-4322	(858) 449-2334
AMEC	Kimbrie Gobbi	AMEC Health and Safety Manager	(858) 300-4321	(858) 869-9410
Seaventures	Kenny Nielsen	Captain, M/V *Early Bird II* Vessel specifications: Early Bird II – 40-foot Vega, white, black trim CA Registration: CF583977 Call Sign: WDC 3623 Monitors channel 16. Skiff specifications: 14-foot Carolina skiff CA Registration: CF5342NX	(949) 637-2433	(949) 637-2433
TEG	Mark Mertz	Vibracore Contractor	(831) 684-2749	(408) 499-8646
Nautilus	Adrienne Cibor	Nautilus Project Manager and QA/QC Specialist	(858) 587-7333 x205	(858) 349-8620
Calscience	Bob Stearns	Laboratory Director	(714) 895-5494	(714) 904-5235

Notes:
N/A - not applicable

3.0 SAMPLE COLLECTION PROCEDURES

3.1 Project Site Access

All survey work will require security clearance from the Port, Harbor Police, and U.S. Coast Guard before field work begins. One week prior to the collection activities, AMEC will prepare and distribute a Notification of Marine Sampling Activities to all appropriate parties. The notification will include project-specific information, including location and nature of field activity; a map of the project location; field personnel; boat information including name, number, and call frequency; and project duration and time of operation. AMEC will contact the Port for coordination and approvals one week prior collection is scheduled to occur. AMEC will contact the Port, Harbor Police, and U.S. Coast Guard to request permission to initiate collection operations on the morning of field work.

3.2 Project-Specific Health and Safety Plan

Due to the potential presence of contaminants in sediments at the site, AMEC will prepare a project-specific Health and Safety Plan (HASP) at the request of the Port and in accordance with Title 29, Code of Federal Regulations (CFR) Part 1910.120 (29 CFR 1910.120). As described in Section 2.0, the HASP will include an emergency contact list for responsible parties, directions to the nearest medical facilities, an Accident Hazard Analysis and Accident Prevention Plan and personal protection protocols. In addition, the HASP requires all workers to have current hazardous waste operations and emergency response training from the Occupational Safety and Health Administration in compliance with 29 CFR 1910.120. Field personnel will be trained in first aid and cardiopulmonary resuscitation.

3.3 Sample Collection

Sampling activities include sediment collection adjacent to Berths 163-164. As described in Section 1.1, AMEC is proposing that the dredge footprint be partitioned into two separate testing areas, Composite Area A - Nearshore (Berths 163-164 nearshore area) and Composite Area B – Offshore (Berths 163-164 offshore area). AMEC will collect 10 vibracore samples (five in each composite area) to project depth of -40 ft MLLW plus a two-foot overdredge allowance to -42 ft MLLW, for both Composite Areas) (Figure 3-1).

AMEC will also collect a Z-layer sediment sample from each core (Section 3.3.2). The Z-layer samples will consist of the 0.5-ft core segment immediately below the overdredge depth. The Z-layer represents the new or resultant harbor bottom once the maintenance dredge material has been removed.

Reference sediment will be collected from the established offshore Reference Site (Figure 1-3).

Field activities are anticipated to take three days, as multiple cores per location will most likely be necessary to achieve the volume necessary to conduct the chemical, toxicological, and bioaccumulation analyses. Extra sediment volume will be collected and archived for future testing, as needed. AMEC will coordinate with all labs, subcontractors, and Port officials prior to the initiation of any field activities.

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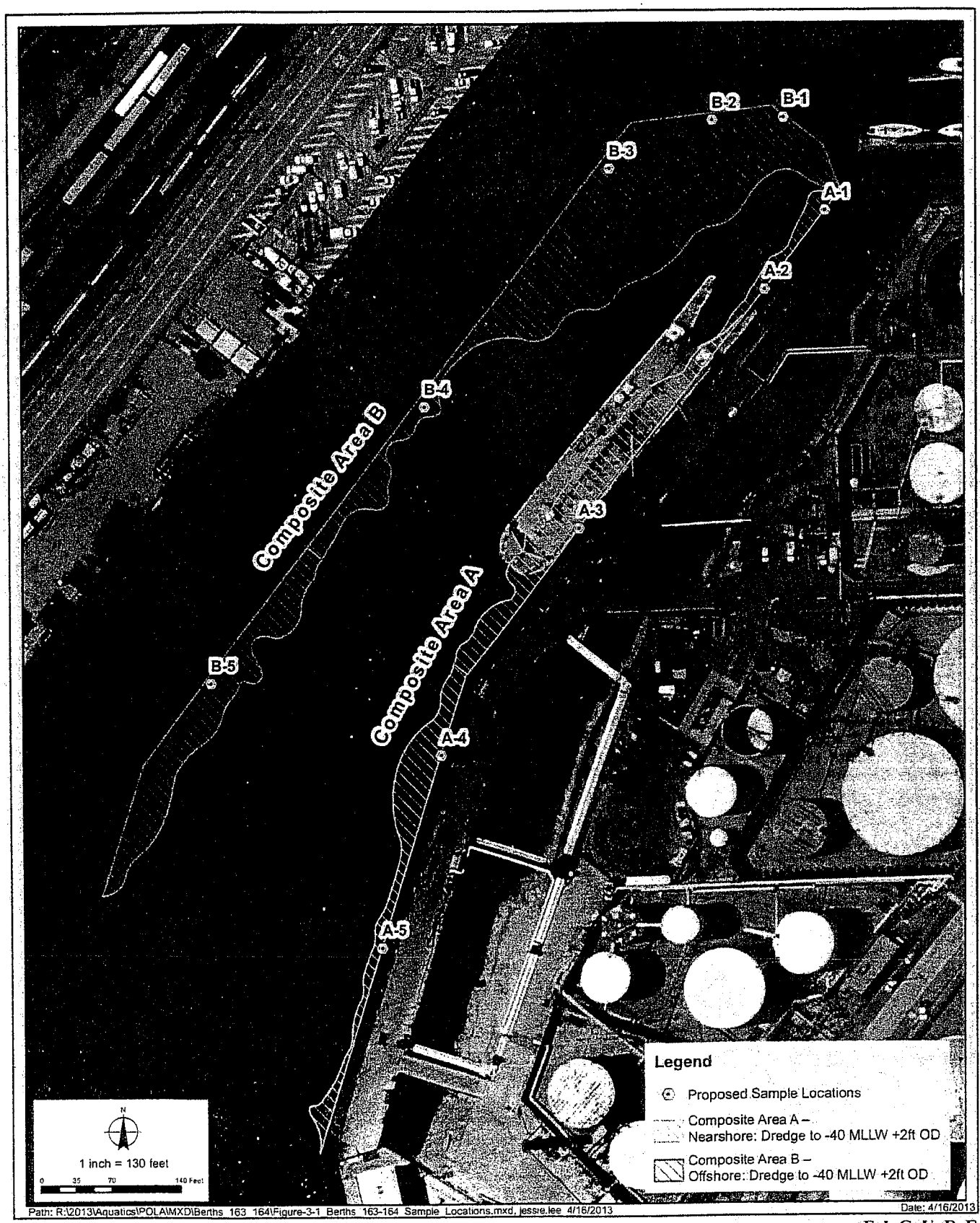

Path: R:\2013\Aquatics\POLA\MXD\Berths 163 164\Figure-3-1 Berths 163-164 Sample Locations.mxd, jessie.lee 4/16/2013

Date: 4/16/2013

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Proposed Sample Locations
Sampling and Analysis Plan
Berths 163-164 Maintenance Dredging Project
Port of Los Angeles

FIGURE

3-1

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3.3.1 Sample Sediment Collection

A differential global positioning system (DGPS) will be used to navigate to the target sampling locations listed in Table 3-1. The *Early Bird II* will deploy a three-point anchor or double-tie to the terminal pilings to maintain its position. The *Early Bird II* also has a 14-ft skiff that Seaventures will use as-needed to deploy the anchors. Once secured, the position will be recorded in the field log and the water depth will be measured with a weighted fiberglass tape. The water depth will be corrected to MLLW using National Oceanic and Atmospheric Administration (NOAA) tide tables and compared to the bathymetric data provided by the Port's Computer-aided Design files for the Project (Appendix A).

Table 3-1.
Sample Collection Locations and Target Core Depths

Sample ID	Sample Type	Proposed Collection Coordinates		Sample Collection Type	Sample Collection Depths		
		Latitude WGS84 (dd° mm.mmm')	Longitude WGS84 (-ddd° mm.mmm')		Existing Mudline[1] (ft MLLW)	Dredge Depth incl. two-ft OD (ft MLLW)	Total Target Core Length (ft)
Composite Area A – Nearshore							
A1	Core	33°45.673'	118°15.990'	Vibracore	-35.8	-42	6.2
A2	Core	33°45.660'	118°16.002'	Vibracore	-32.9	-42	9.1
A3	Core	33°45.621'	118°16.038	Vibracore	-38.8	-42	3.2
A4	Core	33°45.584'	118°16.066'	Vibracore	-39.8	-42	2.2
A5	Core	33°45.553'	118°16.077'	Vibracore	-39.1	-42	2.9
Composite Area B – Offshore							
B1	Core	33°45.688'	118°15.998'	Vibracore	-34.3	-42	7.7
B2	Core	33°45.687'	118°16.012'	Vibracore	-37.0	-42	5.0
B3	Core	33°45.679'	118°16.032'	Vibracore	-37.8	-42	4.2
B4	Core	33°45.641'	118°16.069'	Vibracore	-39.4	-42	2.6
B5	Core	33°45.596'	118°16.111'	Vibracore	-39.3	-42	2.7
Reference Site							
Reference	Grab	33°33.200'	118°10.800'	Grab	~600 ft water depth	N/A	Surface

Notes:
[1] Bathymetry provided by the Port in March 2013.
dd/-ddd°mm.mmm - degrees decimal minutes
ft - foot/feet
MLLW - mean lower low water
N/A - not applicable
OD - overdredge
Ref - Reference
WGS84 - World Geodetic System 1984

The target navigational accuracy is ±3 meters (m). AMEC may change sampling location(s) due to the presence of debris, moored vessels or floating objects blocking access to core positions, poor recovery after several attempts, or other unforeseen situations. If such situations arise, the Field Manager will decide where to relocate the sampling location(s) within the dredge footprint and document reasons for the change.

TEG will deploy the vibracore used for sediment sample collection. The vibracore consists of a 4-inch-diameter aluminum tube connected to a stainless steel cutter. The aluminum-encased vibrating unit uses 240-volt, 3-phase, 26-amp electricity to drive two counter-rotating concentric vibrators. First, TEG will lower the vibracore and tube using a hydraulic winch and activate vibration until penetration to project depth is achieved. Next, core penetration depth will be calculated using a tape measure attached to the vibracore head. After the vibracore is turned off, the sediment core will be returned to the boat's deck for processing. Finally, core samples will be carefully extruded into clean, polyethylene-lined trays for inspection.

It is common when vibracoring within Los Angeles Harbor to encounter Malaga Mudstone Formation, which is a native, consolidated, partially lithofied sand/clay layer that the vibracore will not penetrate. When this layer is encountered, it typically leaves a "plug" of hard material in the core cutter. The presence of the plug verifies that the Malaga Mudstone Formation has been encountered, and the core extends to "refusal" depth. If the Field Manager is unable to verify that the Malaga Mudstone Formation was reached (i.e., no plug) and the core has not achieved the desired target penetration, the collection boat will be re-positioned slightly and a second (and third, if necessary) core collection will be attempted.

3.3.2 Z-layer Sediment Collection

The Z-layer is defined as the sediment surface within the footprint following completion of dredging operations. In order to characterize the Z-layer, AMEC will attempt to advance the vibracore to 0.5 ft below the overdredge allowance. As previously discussed, it is common in Los Angeles Harbor to encounter the dense Malaga Mudstone Formation when vibracoring. If the formation is encountered prior to reaching the Z-layer, the vibracore will be advanced as far as possible and the plug of material will constitute the Z-layer at each collection site. The 0.5 foot Z-layer will be removed from the bottom of core and transferred into a glass jar. In addition, a Z-layer composite for each area will be created by taking an equal allotment of sediment from each core in that area.

3.3.3 Reference Sediment Collection

Reference sediment will be collected offshore at the established Reference Site (latitude 33°33.200' North, longitude -118° 10.800' West) that has been used for numerous dredged material toxicity and bioaccumulation tests and has a sediment quality that is acceptable to the USEPA and USACE. The reference sediment will be collected by Seaventures using a pipe dredge.

3.3.4 Control Sediment Collection

Negative control sediments are used for both the solid-phase (SP) toxicity test and bioaccumulation-phase (BP) test. The negative control or "home" sediments are collected at the same location and at the same time as the test organisms. Negative control sediment exposures are used to determine the health of the test organisms during the laboratory exposure period. For the tests to be considered valid, organism performance must meet specific control criteria (greater than 90 percent mean survival in the SP tests and greater than 70

percent mean survival in the BP tests). Survival at these levels attests to the suitability of the organisms for testing purposes. Negative control sediments will be collected by the test organism supplier and sent to Nautilus along with each batch of test organisms.

In addition, a fine grained sediment control will be collected from Sail Bay, which is located in the northwest portion of Mission Bay in San Diego, California. This additional control sediment will be tested alongside sample sediments and used as a measure of the effects of fine grained material on survival of the amphipod used in SP testing. It has been shown that *Eohaustorius sp.* may exhibit reduced survival in the presence of sediments with a high percentage of silts and fines (USEPA 1994, DeWitt 1989). Sail Bay sediment has been screened for toxicity and chemistry in previous programs (Bay et al., 2011) and was found to be a suitable material for a grain size control.

All control sediments will be stored at 4°C prior to test initiation.

3.3.5 Site Water Collection

In the event that an elutriate test needs to be conducted for chemical analysis, AMEC will collect site water either with a Van Dorn bottle or non-contaminating peristaltic pump. Seawater will be collected from mid-depth near the middle of the proposed dredging area. All seawater will be stored in 5-gallon polyethylene cubitainers and delivered to Calscience where it will be used to prepare standard elutriates for chemical analysis. It is expected that seawater samples will be collected at a later date because of the tiered testing approach that AMEC is conducting with regards to regulatory disposal decisions.

3.4 Sample Preparation

3.4.1 Sediment Compositing

On the survey vessel, the sediment samples collected at each of the 10 individual sample locations will first be homogenized separately in a clean, non-contaminating stainless-steel mixing vessel, and then subsampled for chemical analyses and archiving purposes. Next, the two area composites (Composite Areas A and B) will be prepared by combining the sediment collected at the five individual sample locations per composite area, thoroughly homogenizing the composite, then subsampling the final composite for physical and chemical analyses as well as for archiving purposes (Table 3-2). Z-layer samples will be also individually homogenized and then combined together to form their respective area Z-layer composite.

Therefore, two area composites and two Z-layer composites will be prepared as follows:

- Composite Area A – Nearshore = Cores A1 through A5
- Composite Area B – Offshore = Cores B1 through B5
- Z-layer A = Z-layers A1 through A5
- Z-layer B = Z-layers B1 through B5

Subsamples from Composite Area A – Nearshore and Composite Area B – Offshore collected for chemical and physical analyses will be transferred to Calscience in labeled 16-ounce glass jars and plastic bags, respectively. The remainder of these sediment composites will be sent to Nautilus in food-grade plastic bags in iced coolers or buckets for toxicity and bioaccumulation testing. These samples will be held in a cold room maintained at 4 degrees Celsius (°C) until toxicity and bioaccumulation tests are initiated. Nautilus will hold the remainder of the sediment in a 4°C room in case further testing is required.

AMEC will retain archive subsamples from each of the 10 individual core samples and Z-layer samples collected as well as archives of all sediment composite samples. Sample archives will be retained at AMEC in a freezer at -20 degrees Celsius (°C) for at least one year following the collection project.

Table 3-2.
Sediment Testing Matrix

Sample ID	Sample Type	Analysis Type				Archive
		Chemical/ Physical	Solid-Phase Toxicity	Suspended-Phase Toxicity	28-day Bioaccum-ulation-Phase	
A1	Core					X
A2	Core					X
A3	Core					X
A4	Core					X
A5	Core					X
B1	Core					X
B2	Core					X
B3	Core					X
B4	Core					X
B5	Core					X
Composite Area A - Nearshore	Composite	X	X	X	X	X
Composite Area B - Offshore	Composite	X	X	X	X	X
Z-layer A	Composite					X[1]
Z-layer B	Composite					X[1]
Reference	Sediment	X	X		X	X
Control	Sediment		X		X	X
Fine Grained Control	Composite		X[2]			X

Notes:
1 Z-layer individual samples and composite samples will be archived for analysis at a later date if warranted.
2 For amphipod test only.

3.5 Sample Documentation

Proper recordkeeping and chain-of-custody (COC) procedures will be implemented to allow samples to be traced from collection to their final disposition. After collection of sediment,

documentation will be required to adequately identify and catalog station and sample information. Field log entries will be completed at the time observations are made. Archived samples will be retained by the laboratories for one year from collection.

3.5.1 Field Data Collection

The Field Manager will maintain a complete record of field activities, including the following information. An example of the vibracore log is presented in Appendix B.

- Date and time of collection
- Sample ID and location (latitude/longitude to within a 3 m accuracy)
- Climatic conditions
- Water depth (+ 0.1 ft) and mudline elevation
- Tidal stage and currents
- Sampling method and any problems encountered (e.g., debris)
- Sample length and depth below mudline, including the Z-layer
- Description of the material type obtained in the samples, including any vertical stratification
- Description of sediment subsampling methods
- Photographic record of each core

3.5.2 Chain of Custody Procedures

Proper completion of all COC documentation will be the responsibility of the Field Manager. COC forms will be completed and signed before the end of each sampling day and before the samples are removed from the vessel or pass from the control of the Field Manager. COC forms will be signed at each additional point of transfer of samples following departure from the field.

Sample container information will be recorded on the COC form, including the sampling organization, point of contact, sample ID, collection date and time, type of sample, and project name. The form will serve as a sample analysis request form. Samples will be sent via courier to Calscience and Nautilus along with a COC form specifying the sample identification and the analyses to be conducted (by referencing a list of specific analyses or the statement of work for the laboratory). These forms will be prepared in duplicate; the Field Manager will retain one copy, and the other copy will accompany the samples at all times.

A laboratory courier will meet AMEC personnel at the end of the sampling effort to ensure delivery of sample material to the laboratory on the same day as sample collection. All sediment samples will be transported in a cooler with ice.

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4.0 SAMPLE ANALYSIS

AMEC is proposing to conduct the sediment analysis portion of this study using a tiered approach. The first tier includes sediment chemistry analysis on all 10 individual core samples, the two area composites, and the reference sediment. The first tier also involves solid-phase toxicity testing using amphipods. Upon completion of the first tier, a brief results memorandum will be compiled and submitted to the Port for review and discussion with the USACE and USEPA.

If the sediment chemistry results are generally below established general sediment guidelines (e.g., effects range low [ERLs] and effects range median [ERMs], [Buchman 2008; Long et al. 1995]) and the USACE and USEPA respond favorably to the data results, then the second tier of analysis will commence according to guidelines set forth in the Green Book. In this case, Nautilus will conduct additional solid-phase toxicity testing using marine worms, the suspended particulate-phase testing, and the bioaccumulation-phase testing.

In addition, if the Composite Area A - Nearshore and Composite Area B – Offshore sediment chemistry is consistent with one another, then the two composites may be combined to form one composite for further ocean disposal analyses. Per the Green Book, the maximum holding time prior to commencing sediment toxicity and bioaccumulation testing is six weeks.

The toxicity and bioaccumulation analyses will include the following:

- Solid-Phase (SP) toxicity testing using amphipods and marine worms;
- Suspended Particulate-Phase (SPP) toxicity testing on bivalve larvae, fish, and shrimp; and
- 28-day Bioaccumulation-Phase (BP) testing on bivalves and marine worms.

SP, SPP and BP tests will be conducted on the two composite area samples, reference site sediment and control site sediment. The USEPA-approved test species for the sediment characterization study are listed in Table 4-1.

Conversely, if the first tier sediment chemistry results and discussions with USACE and USEPA indicate that ocean disposal is not likely to be approved, no additional toxicity or bioaccumulation testing will be conducted. Instead, elutriate testing for Berths 243-245 CDF approval will be conducted in accordance with the Inland Testing Manual.

Table 4-1.
Proposed Test Species

Test Organism	Taxon	SPP	SP	BP
Bivalve Larvae	*Mytilus galloprovincialis*	X		
Silverside Fish	*Menidia beryllina*	X		
Mysid Shrimp	*Americamysis bahia*	X		
Polychaete	*Neanthes arenaceodentata*		X	
Amphipod[1]	*Ampelisca abdita* or *Eohaustorius estuarius* or *Rhepoxynius abronius*		X	
Polychaete	*Nereis virens*			X
Mollusk	*Macoma nasuta*			X

Notes:
1 one of these species will be selected based upon availability
BP - bioaccumulation-phase test
SP - solid-phase test
SPP - suspended particulate-phase toxicity test

4.1 Chemical and Physical Analyses

Calscience, will conduct all analytical chemical analyses on sediment samples, elutriate samples, and tissue samples. Calscience will analyze the samples according to USEPA and USACE approved methods for the constituents listed in Table 4-2

In the event that elutriate testing is required to evaluate disposal at the Berths 243-245 CDF, it will be conducted to analyze potential water quality compliance issues during dredging and disposal operations. The elutriate samples will be prepared by combining a subsample of the Composites A and B with harbor water collected from the proposed dredging area at the Project site at a 1:4 sediment to water ratio. The elutriate sample will be prepared by Calscience according to the analysis procedures outlined in the Inland Testing Manual (USEPA/USACE 1998). For metal analyses, the elutriate samples will be filtered through a 0.45-micrometer filter so that dissolved metal concentrations can be compared to applicable California Toxics Rule (CTR) criteria (USEPA 2000). In addition to preparing and analyzing test sediment elutriate samples; an untreated dredging-site water sample will also be analyzed. Analysis of the untreated site-water sample will be performed to determine the baseline chemical levels in the water column at the dredging site.

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

Table 4-2.
Chemical Analyses for Elutriate, Sediment and Tissue Samples

Analyte	Analysis Method	Elutriate Target Detection Limits[a, b]	Sediment Target Detection Limits[a, b]	Tissue Target Detection Limits[a, b]
Total Solids	160.3/SM 2540 B	N/A	0.1 %	0.100 %
Total Organic Carbon	9060	N/A	0.1 %	N/A
Total Ammonia	SM 4500-NH3 B/C (M) / 350.2M[c]	N/A	0.2 mg/kg	N/A
Total Sulfides	376.2M[c]	N/A	0.5 mg/kg	N/A
Soluble Sulfides	SM 4500 S2 – D[c]	N/A	0.5 mg/kg	N/A
Arsenic	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Cadmium	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Chromium	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.02 mg/kg
Copper	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Lead	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Mercury	7471A[d]	0.0002 mg/L	0.02 mg/kg	0.02 mg/kg
Nickel	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Selenium	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Silver	6020/6010B[d]	0.001 mg/L	0.1 mg/kg	0.1 mg/kg
Zinc	6020/6010B[d]	0.005 mg/L	1.0 mg/kg	1.0 mg/kg
Total Lipids	NOAA 1993a[i]	N/A	N/A	0.1 %
TRPH	418.1M[d]	N/A	10 mg/kg	N/A
TPH (C6-C44)	8015B(M)/8015B[d]	N/A	-5.0 mg/kg	N/A
PAHs[e]	8270C SIM/ GC/TQ[d]	0.2 µg/L	10 µg/kg	10 µg/kg
Chlorinated Pesticides[f]	8081A[d]	0.1 µg/L	1.0 – 20 µg/kg	0.5 - 20 µg/kg
PCB Congeners[g]	8270C SIM PCB[d]	0.02 µg/L	0.5 µg/kg	0.5 µg/kg
Phenols	8270C SIM[d]	N/A	20 – 100 µg/kg	N/A
Pyrethroids	GC/MS/MS[j]	N/A	0.5 – 1.0 µg/kg	N/A
Phthalates	8270C SIM[d]	N/A	10 µg/kg	N/A
Organotins	Rice/Krone[h]	3.0 ng/L	3.0 µg/kg	N/A

Notes:

a Sediment minimum detection limits are on a wet-weight basis. Tissue minimum levels are on a wet-weight basis.

b Reporting limits provided by Calscience Environmental Laboratories, Inc.

c Standard Methods for the Examination of Water and Wastewater, 19th Edition American Public Health Association et al. 1995.

d USEPA 1986-1996. SW-846. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Edition.

e 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.

f Includes aldrin, α-benzene hexachloride (BHC), β-BHC, γ-BHC (lindane), δ-BHC, chlordane, 2,4- and 4,4-dichlorodiphenyldichloroethane (DDD), 2,4- and 4,4-dichlorodiphenyldichloroethylene (DDE), 2,4- and 4,4-dichlorodiphenyltrichloroethane (DDT), dieldrin, endosulfan I and II, endosulfan sulfate, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, and toxaphene.

g 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)

h Rice, C.D. et al. 1987, or similar (e.g. Krone et al. 1989)

i NOAA 1993

j 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

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
ng/L - nanograms per liter
N/A - not applicable

PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
SM - Standard Methods
SOP - standard operating procedure
TPH - total petroleum hydrocarbons
TRPH - total recoverable petroleum hydrocarbons

4.2 Solid-Phase Toxicity Tests

Ten-day amphipod and polychaete SP tests will be conducted under static or static-renewal (if porewater ammonia or dissolved oxygen [DO] levels are determined to be near organism threshold levels) conditions according to Green Book and ASTM 1998 protocols. The five replicate SP test chambers consisting of 1-L glass jars will contain a 2-centimeter layer of control, reference, or test sediment, along with 950 milliliters (mL) of clean seawater. Test chambers will be permitted to equilibrate for 24 hours before adding test organisms. Test chambers are lightly aerated for the duration of the test period.

Twenty amphipods are distributed randomly to each chamber. The polychaete test is conducted with 5 individuals per replicate container. Water quality parameters of DO, pH, temperature, and salinity are measured prior to test initiation, then daily during the 10-day test period. Aliquots of pore water are collected and tested for total and un–ionized ammonia prior to test initiation. Aliquots of overlying water are collected from test chambers of each site at Days 0 and 10 for measurement of total and un–ionized ammonia. The organisms are not feed during the test period.

After 10 days, test organisms will be removed by gently sieving the contents of each chamber through a 0.5mm Nitex mesh screen. Organisms are collected on the screen and the number of surviving organisms is recorded.

4.3 Suspended Particulate-Phase Toxicity Tests

The test solution used in the SPP toxicity tests is prepared by mixing seawater and test sediment to yield a volumetric water-to-sediment ratio of 4:1. Mechanical mixing, using a stainless steel impeller, is applied to vigorously agitate the mixture for 30 minutes. A 1-hour settling time follows (or longer if insufficient settling has occurred), after which the supernatant is drained from the top of the mixing chamber. The supernatant is the 100 percent SPP liquid, or elutriate. Test concentrations include 100, 50, and 10 percent of the dredged-material elutriate. The 100 percent elutriate is then mixed with clean, filtered seawater (from Scripps Institution of Oceanography) to prepare the 50 and 10 percent exposure concentrations. The negative control consists of the clean seawater used to prepare the dilutions.

Control and test solutions are distributed to individual test chambers, and initial water quality readings are recorded. Readings include DO, pH, temperature, ammonia, and salinity. If DO is below 60 percent of saturation in any concentration, all test chambers are lightly aerated for duration of the test. Water quality is monitored daily for the duration of the test period to ensure that acceptable test conditions are met. Tests are initiated by adding 10 mysid shrimp and 10 silversides to separate test chambers. Bivalve larvae test vials are stocked with approximately 20 fertilized embryos per mL. Bivalve larvae are not fed during the test period. Silversides are fed once daily, however mysid shrimp must be fed twice daily to prevent cannibalism.

The test duration is 96 hours for the mysid shrimp and silverside, and 48 hours for the bivalve larvae. Counts of mysids and fish are recorded daily, dependent upon the visibility of the test organisms given the opaqueness of the test solution. At test termination, final counts will be made of surviving mysid shrimp and silversides. The bivalve larvae test is terminated by adding 1 mL of 10 percent buffered formalin to each exposure vial. Normal versus abnormal bivalve development is assessed by visually observing the preserved larvae on an inverted microscope. Normally developed larvae are those that have reached the D-shaped prodissiconch I stage.

4.4 Bioaccumulation-Phase Tests

BP testing will be performed by exposing the polychaete worm (*Nereis virens*) and the bent-nose clam (*Macoma nasuta*) to control, reference, and test sediments for a 28-day test period. Testing is initiated in the same manner as described for other 10-day testing, except that tests will be carried out in 10-gallon glass aquaria designed to accommodate 10 polychaetes and 35 clams per replicate in order to yield the required tissue biomass for the achievement of the specified detection limits. The chambers will be maintained under flow-through conditions, producing two complete turnovers of water per test chamber per day. Daily water quality measurements will be measured in each chamber as described in the 10-day test and aliquots of overlying water will be collected at Day 0 and every seven days thereafter during the test period for analysis of total and un-ionized ammonia.

Upon test termination, all sediments will be sieved to remove the worms and clams. The number of surviving organisms will be recorded and then placed, by replicate, back in clean aquaria with water only and held under flow-through conditions to depurate for 24 hours.

Following depuration, animals will be carefully removed from the holding chambers, rinsed of any debris, and placed into labeled Ziploc plastic storage bags to be frozen. Each bag will be assigned a random number. Frozen test tissue will be shipped via same day courier to Calscience for chemical analyses. As a quality control measure, pre-test samples of tissue (i.e., time zero) from both species will also be frozen for future analysis, if needed. The same suite of chemical analyses used to analyze sediments will be measured in the organism tissue samples.

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5.0 DATA ANALYSIS

The chemical, physical, and biological testing methods proposed in this SAP are of sufficient sensitivity to meet the objectives of the testing protocols and ensure that any adverse impacts to the water column are identified.

5.1 Chemical and Physical Analyses

The sediment results for this study will be compared to available sediment quality guidelines (e.g., ERLs and ERMs) to assess the potential for chemical contaminants in the sediment to cause adverse environmental effects. If elutriate tests are conducted, their results will be compared to CTR ambient water quality criteria (USEPA 2000). The CTR criteria contain the following guidelines for seawater: Criteria Maximum Concentration (CMC) and CCC guideline values. The CMC is an acute 1-hour average exposure criterion that should not to be exceeded more than once every three years. The CCC is for a 4-day average chronic exposure criterion not to be exceeded more than once every three years. These guidelines will help determine the solubility of chemicals in the aquatic environment during dredging and disposal.

5.2 Toxicity and Bioaccumulation Analyses

Bioaccumulation results of test sediment will be compared statistically to reference site results to assess potential adverse impact on the water column during dredging and disposal operations, and on benthic communities at the disposal site. Sediment quality evaluation thresholds for dredged material testing are detailed in Table 5-1.

Statistical analyses used to evaluate all bioassays will follow the guidelines in the Green Book. In cases where average survival in the test treatments equals or exceeds that of the reference (for SP and BP tests) or control (for SPP tests), no statistical analyses are necessary. If SP or BP organism survival in test sediments is lower than reference survival, a student's t-test will be used to determine if the difference in survival is statistically significant ($p \leq 0.05$). Dunnett's Multiple Comparison test is used for SPP data to assess significant reductions in survival or normality (bivalve larvae) in elutriate test concentrations compared to control survival or normality. Results are analyzed using the CETIS (Comprehensive Environmental Toxicity Information System) program (Tidepool Scientific Software 2000-2012).

In addition, two other statistical determinations will be performed: the limiting permissible concentration (LPC), and LC_{50}. The LPC is calculated if the LC_{50} is less than 100 percent. It is used to determine whether contaminants of concern are within acceptable water quality objectives. The LPC will be determined by inputting applicable chemical concentrations, toxicity results, and disposal site water quality parameters into the Automated Dredging and Disposal Alternatives Management System (ADDAMS; Schroeder and Palermo 1990). The LC_{50} will be determined by the probits, moving average, bootstrap, or linear interpolation method using the CETIS program.

Table 5-1.
Sediment Quality Evaluation Thresholds for Dredged Material Testing

Biological Test	Sediment Quality Assessment	Sediment Quality Determination
Solid-Phase Tests		
Amphipod	Mortality in test sediment is statistically greater ($p \leq 0.05$) than reference sediment and exceeds mortality in the reference sediment by more than 20%.	Benthic LPC is exceeded.
Polychaete	Mortality is statistically greater ($p \leq 0.05$) and exceeds mortality in the reference sediment by more than 10%.	Benthic LPC is exceeded.
Suspended-Particulate Phase Toxicity Tests		
Silverside	Mortality is statistically greater ($p \leq 0.05$) than control survival and the concentration in the water column after a 4-hour initial mixing period is greater than 0.01 of the LC_{50}.	Water column LPC is exceeded.
Mysid Shrimp	Mortality is statistically greater ($p \leq 0.05$) than control survival and the concentration in the water column after a 4-hour initial mixing period is greater than 0.01 of the LC_{50}.	Water column LPC is exceeded.
Bivalve Larvae	Abnormally developed larvae are statistically greater ($p \leq 0.05$) than control larvae and the concentration in the water column after a 4-hour initial mixing period is greater than 0.01 of the LC_{50}.	Water column LPC is exceeded.
Bioaccumulation-Phase Tests		
Metals	Bioaccumulation is statistically greater ($p \leq 0.05$) in test tissues than reference tissues.	Severity of bioaccumulation must be addressed using the criteria in Section 6.3 of the Green Book.
Organics	Test tissue bioaccumulation exceeds FDA action limits for fish and shellfish.	Severity of bioaccumulation must be addressed using the criteria in Section 6.3 of the Green Book.
Whole Sediment Chemistry Data	Whole sediment chemistry data are compared to sediment quality guidance such as ERLs and ERMs.	Sediment quality is based on the effects data listed above.

Notes:
ERL - effects range low
ERM - effects range medium
FDA - U.S. Food and Drug Administration
LC_{50} - median lethal concentration
LPC - limiting permissible concentration

The bioaccumulation test tissue chemistry results will be evaluated four separate ways. First, the test tissue results will be compared statistically to the reference sediment exposure results using a one-tailed t-test. Second, the chemicals that are shown to be in statistically elevated concentrations compared to reference tissue levels will be evaluated for their bioconcentration potential, propensity to biomagnify, and toxicological importance. The third evaluation procedure will be to compare the test tissue concentration levels with published U.S. Food and Drug Administration (FDA) action levels for deleterious substances in fish and shellfish. Finally, the test tissue concentration levels will compared to the Environmental Residue-Effects Database compiled by the USACE/USEPA.

6.0 DATA QUALITY ASSURANCE/QUALITY CONTROL

6.1 Vessel Positioning

The vessel will be positioned to collect samples within approximately ± 3 m of the intended collection location using DGPS.

6.2 Sediment Collection

Vibracore penetration accuracy will be ± 0.5 ft, and the target penetration to the project design depth will be corrected for the tidal elevation at each coring location. NOAA charts or recent bathymetric data will be used to assess water depth, which will be verified using the *Early Bird II's* fathometer. The penetration depth will be determined by using a measuring tape attached to the vibracore head, and the distance from where the tape is attached to the vibracore head will be 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 will be determined to assess the amount of compaction that occurred during collection.

6.3 Chemical and Physical Analyses

Analytical QA/QC for bulk sediment and elutriate chemistry results will be evaluated according to *QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations (Chemical Evaluations)* EPA 832-B-95-001 (USEPA 1995). QA/QC will be 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 (Table 4-2). All QA/QC information will be included with the sediment testing report.

Replicate analyses for each type of determination are performed on each type of sample matrix. Precision is expressed as the difference in results of replicate analyses ("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 0 percent means that replicate results were identical. Instrumental calibration and verification are performed using USEPA and/or National Bureau of Standards traceable reference materials. Quality Control requirements for this study are outlined in Tables 6-1 through 6-4.

6.4 Toxicity and Bioaccumulation Analyses

Test organisms used in the toxicity tests will be collected in areas known to be generally free of pollutants or purchased from reputable culturists. Organisms are purchased from vendors who are screened by their reputation, depth of knowledge concerning the organism of choice, and their ability to consistently deliver healthy test organisms.

Upon receipt in the laboratory, test organisms will be slowly acclimated to test conditions in environmentally controlled holding areas in accordance with the test protocol for each test organism. Test organisms will be evaluated on a performance basis for every test conducted in the laboratory. Negative controls and reference toxicant tests will be tested concurrent with each study to evaluate the health of the test organisms and the acceptability of the test conditions.

The laboratory controls for each test must meet test acceptability criteria (90 percent mean survival for amphipods, mysid shrimp, and silversides, and 70 percent normality for bivalve larvae) to be considered valid. If the controls do not meet these criteria, the test will be repeated. Reference toxicant tests will be conducted concurrent to each test to evaluate the sensitivity of the batch of test organisms used for the study. These tests involve exposing organisms to concentrations of a known toxicant over a range that will produce a response.

The results of these tests will be compared to previous reference toxicant tests conducted in Nautilus's laboratory to determine if the batch of animals used in the study is of typical sensitivity to the known toxicant. Measurement objectives for the water quality measurements made during the tests are listed in Table 6-5.

Table 6-1.
Sample Containers, Holding Times, Preservation and Storage

Parameter	Method	Sample Size	Container	Holding Time	Preservation
Sediment					
Grain Size	ASTM D4464	250 g	8 oz. glass jar	Undetermined	Cool/4°C
Specific Gravity/Atterberg Limits	ASTM D854/ASTM D4318	500 g	16 oz. glass jar	Undetermined	Cool/4°C
Total Solids	SM2540B	10 g	16 oz. glass jar with Teflon lid	6 months	Freeze/-18°C
Ammonia	SM 4500 NH3 B/C (M)	200 g	From Total Solids jar	24 hours	Cool/4°C
				28 days	Freeze/-18°C
					H_2SO_4 to pH<2 / Cool/4°C
Sulfides	USEPA 9030B/9034	20 g	4 oz. glass jar with Teflon lid	7 days	Zn(OAc)2 / Cool/4°C
Oil and Grease	USEPA 413.2M	40 g	4 oz. glass jar with Teflon lid	24 hours	Cool/4°C
				28 days	HCl/ Cool/4°C
				6 months	Freeze/-18°C
TRPH	USEPA 418.1M	10 g	From Oil & Grease jar	24 hours	Cool/4°C
				28 days	HCl/ Cool/4°C
				6 months	Freeze/-18°C
TOC	USEPA 9060A	10 g	From Total Solids jar	28 days	Cool/4°C
				6 months	Freeze/-18°C
Percent Volatile Solids	EPA 160.4M	20 g	From Total Solids jar	6 months	Freeze/-18°C
Metals	USEPA 6020; USEPA 7471 for mercury	20 g	From Total Solids jar	6 months; 28 days for mercury	Cool/4°C
				2 years (except mercury, 28 days)	Freeze/-18°C
PAHs, Phthalates, Phenols, PCBs/ Organotins/ Pesticides/Pyrethroids	USEPA 8270C-SIM/ Krone et al. 1989/ USEPA 8081A	100g	From Total Solids jar	Extracted within 14 days/ Analyzed within 40 days of extraction	Cool/4°C
				Extracted within 1 year	Freeze/-18°C

Table 6-1.
Sample Containers, Holding Times, Preservation and Storage (Cont.)

Parameter	Method	Sample Size	Container	Holding Time	Preservation
Tissue					
Lipids	SOP M489 (NOAA 1993a)	From Organic Extract	From Organics jar	Extracted within 1 year	Freeze/-18°C
Metals	USEPA 6020; USEPA 7471 for mercury	5 g	From Organics jar	6 months; 28 days for mercury	Cool/4°C
				2 years (except mercury, 28 days)	Freeze/-18°C
PAHs, Phthalates, and PCBs/ Organotins/ Pesticides/Pyrethroids	USEPA 8270D GC-MS-MS/ Krone et al. 1989/ USEPA 8081A	60 g	4 oz. glass jar	Extracted within 14 days/ Analyzed within 40 days of extraction	Cool/4°C
				Extracted within 1 year	Freeze/-18°C

Notes:
°C - degrees Celsius
EPA - Environmental Protection Agency
g - gram(s)
mL - milliliter(s)
oz. - ounce(s)
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
SVOC - semivolatile organic compound
SP - solid-phase toxicity test
SPP - suspended-particulate phase toxicity test
TOC - total organic carbon
TRPH - total recoverable petroleum hydrocarbons

Table 6-2.
Minimum Laboratory Quality Control

Analyte	Method Blanks	Surrogates	Duplicate	Precision and Recovery	Matrix Spike	Matrix Spike Dup.
Total Solids			X			
TOC	X		X	X	X	x
Ammonia	X		X	X		
Sulfides	X		X	X		
Grain Size			X			
Metals	X		X	X	X	X
PAHs	X	X	X	X	X	X
PCBs	X	X	X	X	X	X
Pesticides	X	X	X	X	X	X
Phenols	X	X	X	X	X	X
Phthalates	X	X	X	X	X	X
TRPH	X		X	X	X	X
Pyrethroids	X	X		X	X	X
Organotins	X	X		X	X	X

Notes:
Dup. - duplicate
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TOC - total organic carbon
TRPH - total recoverable petroleum hydrocarbons

Table 6-3.
Acceptance Limits and Corrective Actions for Quality Control

QC Category	Acceptance Limits	Corrective Action
MB	≥0.10 analyte level	Correct source of contamination, obtain acceptable blank values, and prepare fresh aliquots of the samples and reanalyze.[2]
Surrogate[1]	--[1,2]	Poor surrogate recovery may indicate a problem with the sample composition and shall be reported to the client whose sample produced the poor recovery.
Duplicate RSD	20-30%	When it is not possible to determine mean and standard deviations, such as for presence/absence and logarithmic values, the laboratory will assess performance against established and documented criteria.
OPR	20-50%	The source of the problem must be identified and resolved before continuing analyses. Prepare fresh aliquots of the samples and reanalyze.[2]
MS and MSD	30-50%	If MB and OPR are in control, the problem is judged to be matrix related, not system related. Evaluate the need to perform MSA or whether the data need to be qualified as a suspected matrix effect.[2]
MS and MSD RPD	30%	If the %REC or RPD of the MS/MSD are unacceptable, all associated sample data will be reevaluated.

Notes:
1 Calscience will calculate in-house performance criteria for matrix spike recoveries and surrogate recoveries.
2 Any matrix spike, surrogate, or OPR results outside of the control limits will be evaluated by the laboratory.

MB - method blank
MS - matrix spike
MSA - method of standard addition
MSD - matrix spike duplicate
OPR - ongoing precision and recovery
RPD - relative percent difference
RSD - relative standard deviation
%REC - percent recovery

Table 6-4.
Measurement Quality Objectives for Chemical Analyses

Constituent	Units (wet weight)	Reporting Limit	Accuracy	Precision	Frequency
Arsenic	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Barium	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Cadmium	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Chromium	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Copper	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Lead	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Mercury	mg/kg	0.02	+25 Percent	<20 Percent	1/Batch
Nickel	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Selenium	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Silver	mg/kg	0.1	+20 Percent	<20 Percent	1/Batch
Zinc	mg/kg	1.0	+20 Percent	<20 Percent	1/Batch
Organotins	µg/kg	3.0	+20 Percent	<30 Percent	1/Batch
Organochlorine Pesticides	µg/kg	1.0 to 20	+50 Percent	<2520 Percent	1/Batch
PCB Congeners	µg/kg	0.5	+50 Percent	<30 Percent	1/Batch
PAH	µg/kg	10	+60 Percent	<30 Percent	1/Batch
Phenols	µg/kg	10 to 500	+60 Percent	<30 Percent	1/Batch
Phthalates	µg/kg	10	+60 Percent	<30 Percent	1/Batch
Pyrethroids	µg/kg	0.5	+100-75 Percent	<30 Percent	1/Batch
TPH (C6-C44) Carbon Breakdown	mg/kg	5.0 mg/kg	±25 Percent	≤20 Percent	1/Batch
TRPH	mg/kg	10	+30 Percent	<30 Percent	1/Batch
Total Organic Carbon	mg/kg	500	+20 Percent	<25 Percent	1/Batch
Oil and Grease	mg/kg	10	±35 Percent	≤20 Percent	1/Batch
Ammonia	mg/kg	0.2	+20 Percent	<25 Percent	1/Batch
Total Sulfides	mg/kg	0.5	+20 Percent	<25 Percent	1/Batch
Water Soluble Sulfides	mg/kg	0.5	+20 Percent	<25 Percent	1/Batch
Grain Size	Percent	0.1	N/A	N/A	N/A

Notes:

µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
N/A - not applicable
PAH - polycyclic aromatic hydrocarbons
PCB - polychlorinated biphenyls
RL - Reporting Limit
TPH - total petroleum hydrocarbons
TRPH - total recoverable petroleum hydrocarbons

Table 6-5.
Water Quality Objectives for Toxicity Tests

Measurement Parameter	Measurement Frequency	Precision
Dissolved Oxygen	At Test Initiation and Daily Thereafter	±0.2 mg/L
Temperature	At Test Initiation and Daily Thereafter	±0.1°C
Salinity	At Test Initiation and Daily Thereafter	±0.5 ppt
pH	At Test Initiation and Daily Thereafter	±0.1 Units
Pore-Water Ammonia	Prior to Test Initiation	±0.05 mg/L
Ammonia (overlying water)	At Test Initiation and at Termination	±0.05 mg/L
Sulfides	If Requested	±0.05 mg/L

Notes:
°C - degrees Celsius
mg/L - milligrams per liter
ppt - parts per thousand

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7.0 SCHEDULE

It is expected that this SAP will be presented to and approved by CSTF in conjunction with SC-DMMT at their April 2013 meeting, followed by sample collection in May 2013, with a final Sediment Characterization Report available two to three months after sediment samples have been delivered to the laboratories.

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8.0 REPORTING

The Draft and Final Sediment Characterization Reports will contain the following information:

- Introduction – Includes a project description and a dredge history of the site, historical uses, results of previous toxicity or sediment work, known contamination or discharges, and other relevant information;
- Site Maps – Depicts the test and reference sediment collection locations;
- Core Logs – Includes core collection coordinates, target/actual penetration, sediment characteristics (i.e., strata, color, odor) and photographic documentation;
- Methods and Materials – Includes all information pertaining to test sediment collection, handling, and analyses;
- Results – Includes results from all physical, chemical, and toxicity analyses and a comparison to ocean disposal suitability criteria;
- Discussion – Includes a detailed description of the chemical, physical, and toxicity characteristics of the test sediments;
- QA/QC Information – Includes all raw data sheets, spike and recovery information, and internal Quality Control audits; and
- References

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9.0 REFERENCES

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APPENDIX A

PORT ENGINEERING DRAWINGS BERTHS 163-164

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1-3076 T-01

THE PORT OF LOS ANGELES

ENGINEERING DIVISION

1-3076 BERTHS 163 & 164 MAINTENENCE DREDGING

SPECIFICATION NO. 2743

NO.	DATE	DRAWN	REVISIONS –	CHK'D	APP'D
			NOT FOR CONSTRUCTION		

2/14/2013
DRAFT

CONSTRUCTION DIVISION		TRANS	R/W	ARCH	SPECS	CHIEF OF DESIGN
INSPECTION	SURVEY		CIVIL	ELEC	PR MNGR	ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER – CONST DIV.			STRUCT	MECH	CAD MNGR	CHIEF HARBOR ENGINEER DATE

BERTHS 163 & 164 MAINTENANCE DREDGING

COVER SHEET

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

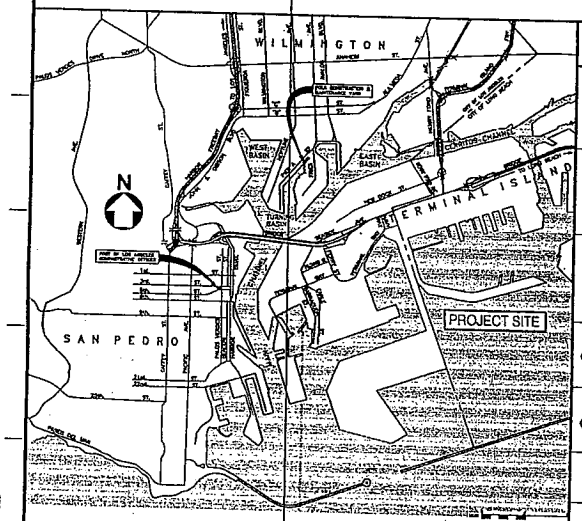
DRAWING NUMBER 1-3076 T-01

INDEX TO DRAWINGS

DRAWING NUMBER	TITLE	DRAWING NUMBER	TITLE
1-3076 T-01	COVER SHEET		
1-3076 T-02	INDEX TO DRAWINGS AND VICINITY MAP		
1-3076 C-01	GENERAL NOTES		
1-3076 DR-01	BERTH 163 DREDGE PLAN		
1-3076 DR-02	BERTH 164 DREDGE PLAN		
1-3076 DR-03	BERTH 163 CROSS-SECTIONS STATIONS 9+00 & 10+00		
1-3076 DR-04	BERTH 163 CROSS-SECTIONS STATIONS 11+00 & 12+00		
1-3076 DR-05	BERTH 163 CROSS-SECTIONS STATIONS 13+00 & 14+00		
1-3076 DR-06	BERTH 164 CROSS-SECTIONS STATIONS 0+25 & 1+00		
1-3076 DR-07	BERTH 164 CROSS-SECTIONS STATIONS 2+00 & 3+00		
1-3076 DR-08	BERTH 164 CROSS-SECTIONS STATIONS 4+00 & 4+80		

*REFERENCE DRAWINGS

*REFERENCE DRAWINGS ARE AVAILABLE FOR REVIEW IN THE L.A.H.D. CHIEF HARBOR ENGINEER'S OFFICE 425 SOUTH PALOS VERDES STREET SAN PEDRO, CALIFORNIA 90731



VICINITY MAP

REFERENCING SYSTEM

MAIN PLAN & ELEVATIONS
- 1A-01 / A-01: DETAIL NUMBER OF PLAN OR ELEVATION NUMBERED CONSECUTIVELY ON EACH SHEET.
- SHEET NUMBER WHERE PLAN OR ELEVATION IS DRAWN.

MAIN DETAIL, FLAG-SECTIONS & DETAILS
- 2A-03 / 1A-01: DETAIL NUMBER OF SECTION OR ELEVATION NUMBERED CONSECUTIVELY ON EACH SHEET.
- SHEET NUMBER WHERE SECTION OR ELEVATION IS DRAWN.
- DETAIL & SHEET NUMBER WHERE SECTION OR DETAIL REFERENCE ORIGINATED.

SUB-DETAIL, FLAG-INTERIOR, ELEVATIONS & DETAILS
- A / 2A-04: SUB-DETAIL NUMBER OF INTERIOR ELEVATION OR DETAIL CONSECUTIVELY LISTED ALPHABETICALLY.
- DETAIL & SHEET NUMBER WHERE SUB-DETAIL REFERENCE ORIGINATED.

REFERENCE FLAG
- 2A-05: DETAIL & SHEET NUMBER WHERE DETAIL, SECTION DETAIL OR ELEVATION IS DRAWN.

SECTION FLAG
- 2A-05: ARROW INDICATES DIRECTION OF CUT-VIEW.
- DETAIL & SHEET NUMBER WHERE SECTION OR DETAIL IS DRAWN.

- INTERIOR ELEVATION CALLOUT.
- DRAWN ELEVATION CALLOUT WHERE MULTI ELEVATION OCCURS.

REVISION SYMBOL
- A: REVISION NUMBER (ALPHABETIC DESIGNATION-PRIOR TO BID OPENING, NUMERIC DESIGNATION APPROVED DURING CONSTRUCTION)
- CLOUDED AREA DESIGNATES REVISED AREA.

NO.	DATE	DRAWN	REVISIONS	CHK'D	APP'D

NOT FOR CONSTRUCTION

NO.	DATE	DRAWN	REVISIONS	CHK'D	APP'D

2/14/2013
DRAFT

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIN
DESIGNED: E. LEE
ENGINEER / ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER

BERTHS 163 & 164 MAINTENANCE DREDGING

INDEX TO DRAWINGS AND VICINITY MAP

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER 1-3076 | SHEET NUMBER T-02

DREDGING NOTES:

1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOB SITE PRIOR TO DREDGING.
2. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE THE DREDGING OPERATIONS WITH THE HARBOR DEPARTMENT'S TENANTS TO AVOID CONFLICT WITH SHIPPING SCHEDULES AND CARGO MOVEMENTS. SEE SPECIFICATIONS FOR DETAILS.
3. NO EQUIPMENT WILL BE ALLOWED ON WHARVES FOR HANDLING DREDGING MATERIAL.
4. ALL WORK SHALL BE COORDINATED THROUGH THE L.A.H.D. TO ASSURE PERFORMANCE IN ACCORDANCE WITH THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LOS ANGLES REGION AND THE U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICTS.
5. ALL DREDGE AND BANK EXCAVATION MATERIAL SHALL BE DISPOSED OF AT THE CONFINED DISPOSAL FACILITY AT BERTHS 243-245.
6. ELEVATION DATUM FOR SOUNDINGS ARE REFERENCED TO MEAN LOWER LOW WATER (M.L.L.W.) AS ELEVATION 0.00.
7. THE DREDGE AREAS CALLED OUT ON THE CROSS-SECTIONS INDICATES BOTH THE REQUIRED AND OVERDEPTH CUT IN SQUARE FEET AT EACH CROSS SECTION.
8. THE QUANTITY OF MATERIAL REMOVED WILL BE COMPUTED BASED UPON THE SURVEYS TAKEN BEFORE AND AFTER DREDGING.
9. EXACT VERTICAL AND HORIZONTAL LOCATIONS OF EXISTING SUBMARINE PIPE LINES AND OTHER CHANNEL CROSSINGS SHOWN ON THE DREDGING PLANS HAVE NOT BEEN VERIFIED BY THE HARBOR DEPT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING OWNERS VERIFYING THESE LOCATIONS AND PROTECTING EACH FACILITY.
10. THE CONTRACTOR SHALL EXERCISE CAUTION WHEN DREDGING NEAR THE FACE OF THE WHARVES AS THE EXACT TIP LOCATIONS OF FENDER PILES ARE UNKNOWN.
11. EXTREME CAUTION SHALL BE EXERCISED IN EXCAVATING ADJACENT TO THE PIERHEAD LINE TO AVOID UNDERMINING THE WHARF SLOPES. THE ASSUMED SLOUGH LINES AND DESIGN SLOPE SHOWN ON THE CROSS SECTIONS ARE SHOWN TO DEFINE THE LIMITS OF PAY FOR MATERIAL. THE SLOUGH LINES AND DESIGN SLOPE HAVE A SLOPE OF 1.5:1 WATERSIDE OF THE PIERHEAD LINE.
12. DREDGING TOLERANCE:
    HORIZONTAL DREDGE LINES: TOLERANCE SHALL BE ZERO(0) FEET ABOVE AND TWO (2) FOOT BELOW HORIZONTAL DREDGE LINES. CONTRACTOR SHALL BE ELIGIBLE FOR OVERDREDGE PAYMENT OF TWO (2) FOOT ON ALL HORIZONTAL DREDGE LINES. ASSUMED SHOUGH LINES: TOLERANCE SHALL BE ONE (1) FOOT ABOVE AND ZERO (0) FEET BELOW ASSUMED SLOUGH LINES. NO OVERDREDGE PAYMENT SHALL BE MADE FOR ASSUMED SLOUGH LINES.
13. THE CONTRACTOR SHALL USE LIQUID TIGHT TRUCKS AND USE THE DESIGNATED AREA AS ASSIGNED BY THE ENGINEER AS A TRANSFER POINT TO TRUCK DREDGE MATERIAL TO THE CONFINED DISPOSAL FACILITY AT BERTHS 243-245. THE CONTRACTOR SHALL CLEAN OFF DAILY ALL DREDGED MATERIAL SPILLED ON THE ROAD DURING TRUCKING OPERATION. HYDRAULIC PUMPING OF DREDGED MATERIAL TO STORAGE SITES IS NOT PERMITTED.
14. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY PERMIT VIOLATIONS.
15. CONTRACTOR SHALL NOTIFY THE ENGINEER (48) HOURS IN ADVANCE OF ANY ACTIVITY WHICH MAY RESTRICT NAVIGATION WITH ANY CHANNEL OR BRIDGE.
16. CONTRACTOR SHALL CONTAIN ALL DREDGED WATER AND MATERIAL AT THE TRANSFER SITE. DREDGED WATER SHALL NOT RUN BACK INTO OCEAN.

NO.	DATE	DRAWN	REVISIONS	CHKD	APPD	NO.	DATE	DRAWN	REVISIONS	CHKD	APPD
			NOT FOR CONSTRUCTION						2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIM
DESIGNED: E. LEE
ENGINEER / ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER — DATE

BERTHS 163 & 164 MAINTENANCE DREDGING

GENERAL NOTES

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER 1-3076 | SHEET NUMBER C-01

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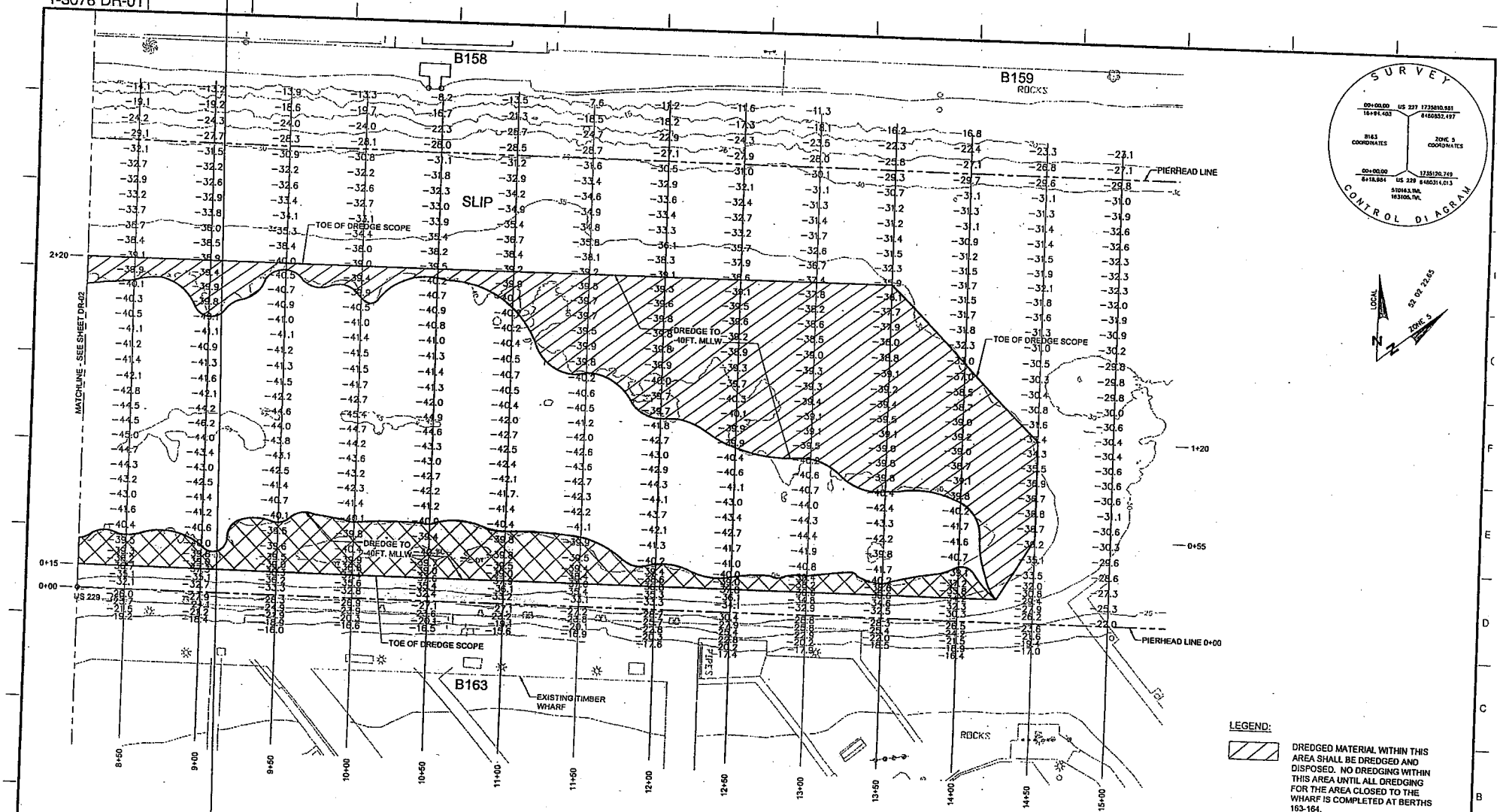
DATE: Feb 26, 2013 11:22am JREPS: NAVCES

1-3076 DR-01



1DR-01 / DR-01 **DREDGING PLAN**
SCALE: 1"=30'

LEGEND:

DREDGED MATERIAL WITHIN THIS AREA SHALL BE DREDGED AND DISPOSED. NO DREDGING WITHIN THIS AREA UNTIL ALL DREDGING FOR THE AREA CLOSED TO THE WHARF IS COMPLETED AT BERTHS 163-164.

DREDGED MATERIAL WITHIN THIS AREA SHALL BE DREDGED AND DISPOSED. ALL DREDGING WITHIN THIS AREA MUST BE DREDGED AND A BATHYMETRY MUST BE CONDUCTED PRIOR TO DREDGING IN THE OCEAN DISPOSAL AREA AT BERTHS 163-164.

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D

NOT FOR CONSTRUCTION

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D

2/14/2013
DRAFT

SCALE: AS SHOWN
DRAWN: J.LARA
CHECKED: A.LIN
DESIGNED: E.LEE

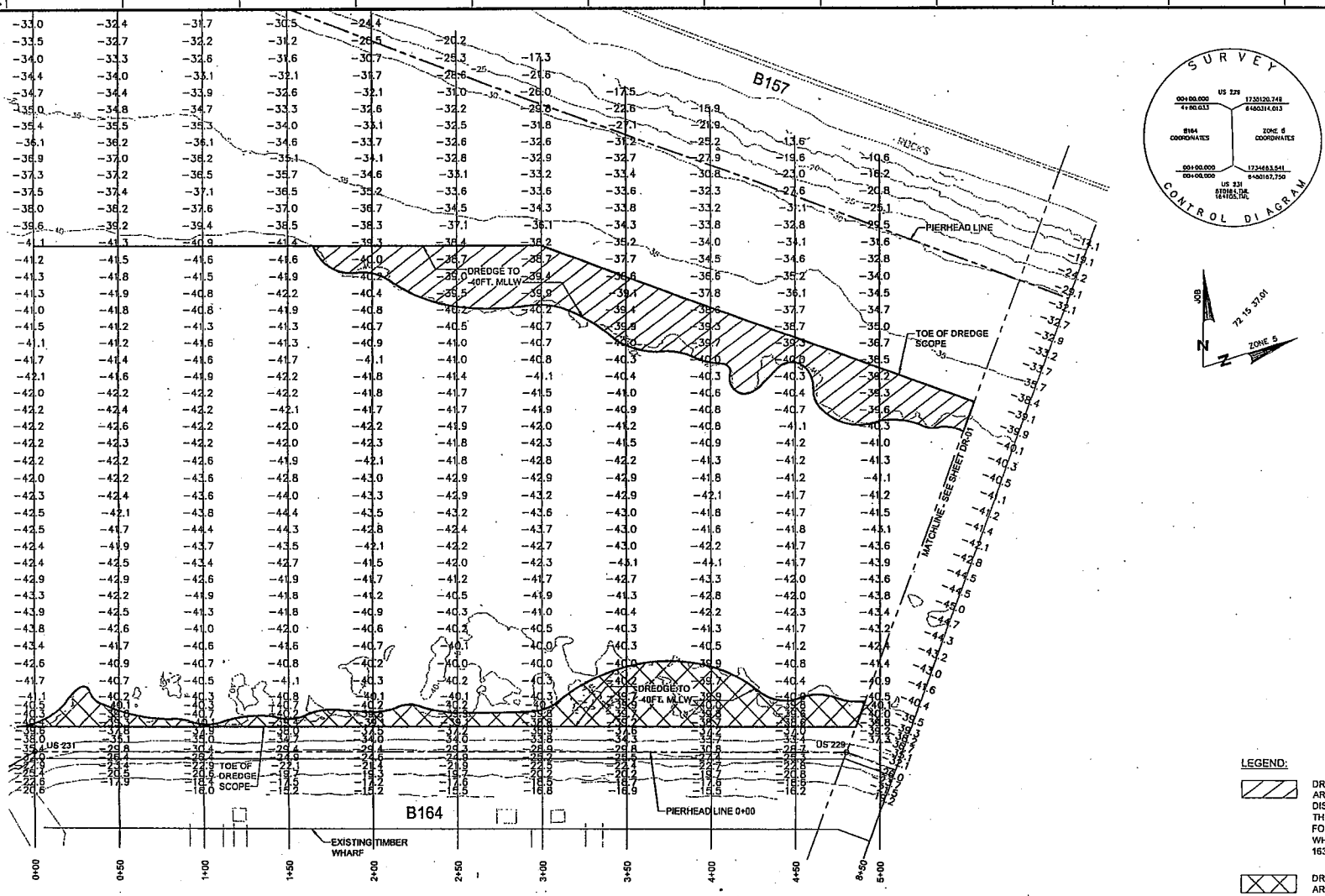
CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
ENGINEER / ARCHITECT
CHIEF HARBOR ENGINEER — DATE

BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 163 DREDGE PLAN

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER: 1-3076 SHEET NUMBER: DR-01



LEGEND:

DREDGED MATERIAL WITHIN THIS AREA SHALL BE DREDGED AND DISPOSED. NO DREDGING WITHIN THIS AREA UNTIL ALL DREDGING FOR THE AREA CLOSED TO THE WHARF IS COMPLETED AT BERTHS 163-164.

DREDGED MATERIAL WITHIN THIS AREA SHALL BE DREDGED AND DISPOSED. ALL DREDGING WITHIN THIS AREA MUST BE DREDGED AND A BATHYMETRY MUST BE CONDUCTED PRIOR TO DREDGING IN THE OCEAN DISPOSAL AREA AT BERTHS 163-164.

1DR-02 / DR-02 **DREDGING PLAN**
SCALE: 1"=30'

NO.	DATE	DRAWN	REVISIONS -	CHKD	APPD	NO.	DATE	DRAWN	REVISIONS -	CHKD	APPD
			NOT FOR CONSTRUCTION						2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIM
DESIGNED: E. LEE
ENGINEER/ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER — DATE

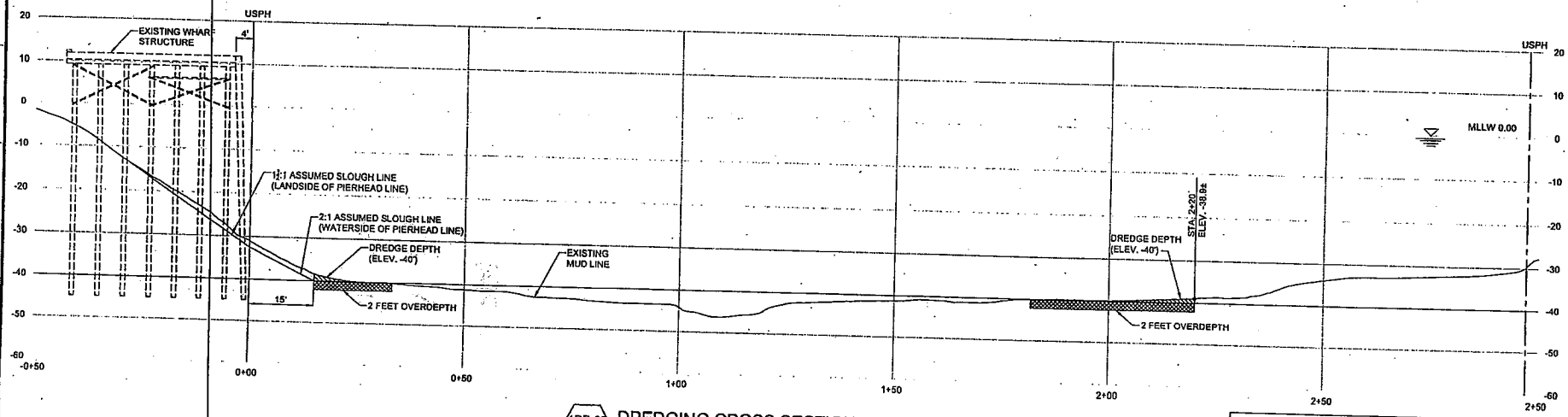
BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 164 DREDGE PLAN

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER 1-3076 | SHEET NUMBER DR-02

1-3076 DR-03



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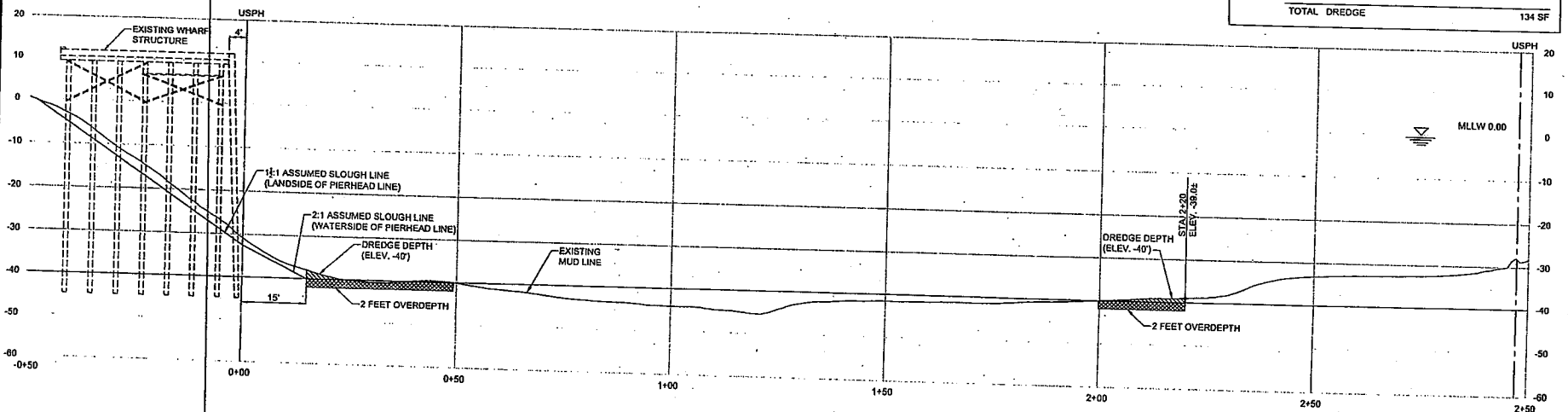
SCALE: 1" = 1'-0"

REQUIRED DREDGE	21 SF
OVERDEPTH DREDGE	113 SF
TOTAL DREDGE	134 SF



2DR-03 / DR-01 DREDGING CROSS SECTION STA. 10+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	22 SF
OVERDEPTH DREDGE	105 SF
TOTAL DREDGE	127 SF

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D

NOT FOR CONSTRUCTION

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D

2/14/2013
DRAFT

SCALE: AS SHOWN
DRAWN: A.CARA
CHECKED: A.LIM
DESIGNED: E.LEE
ENGINEER / ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER — DATE

BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 163 CROSS-SECTIONS STATIONS 9+00 &10+00

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER: 1-3076
SHEET NUMBER: DR-03

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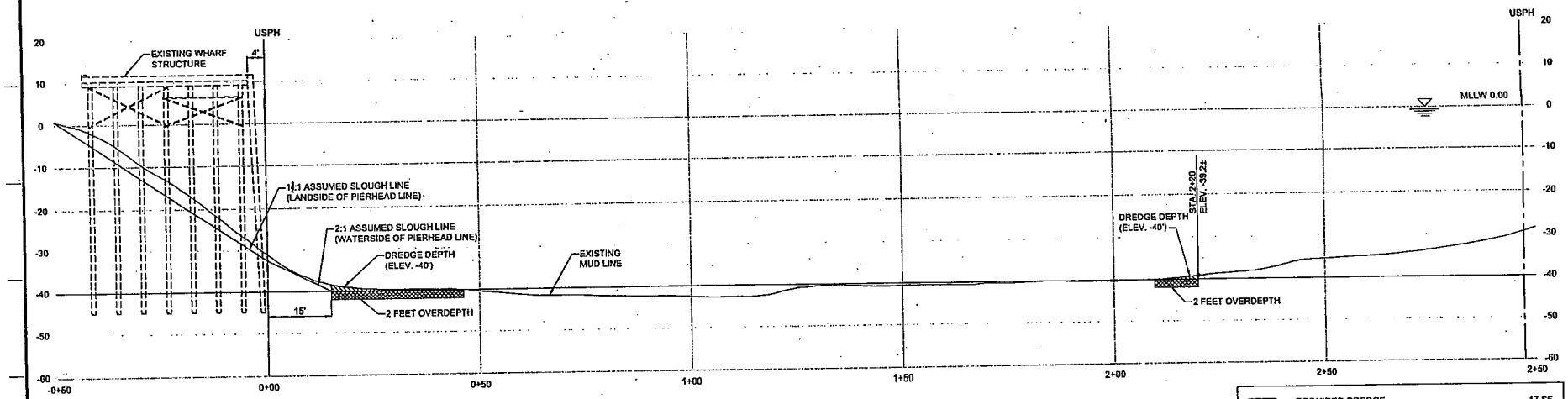
DATE: Apr 04, 2013 11:22am JOB: PS ESSOR B163-164Dredge\ SHEET: DR-03

1-3076 DR-04



1DR-04 / DR-01 DREDGING CROSS SECTION STA. 11+00
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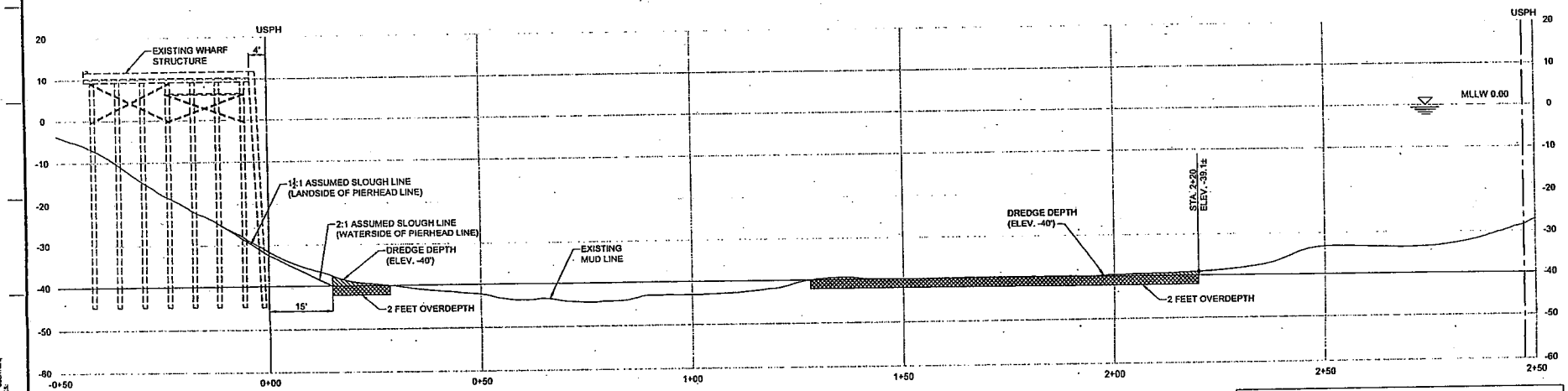
REQUIRED DREDGE	17 SF
OVERDEPTH DREDGE	83 SF
TOTAL DREDGE	100 SF



2DR-04 / DR-01 DREDGING CROSS SECTION STA. 12+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	38 SF
OVERDEPTH DREDGE	211 SF
TOTAL DREDGE	249 SF

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D	NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D
			NOT FOR CONSTRUCTION						2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIU
DESIGNED: E. LEE
ENGINEER / ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER DATE

BERTHS 163 & 164 MAINTENANCE DREDGING

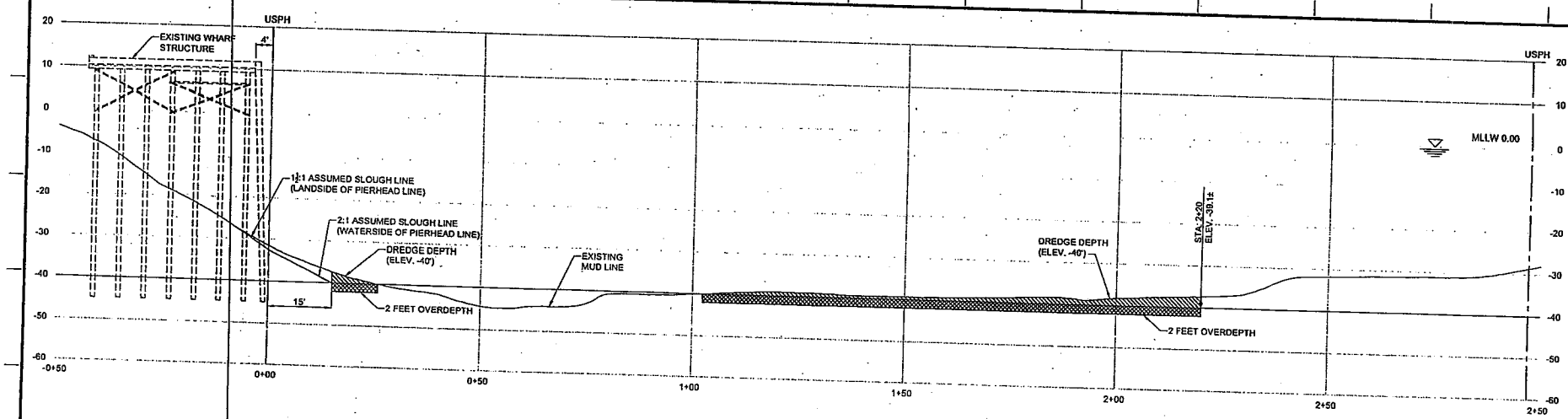
BERTH 163 CROSS-SECTIONS STATIONS 11+00 &12+00

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER 1-3076 | SHEET NUMBER DR-04

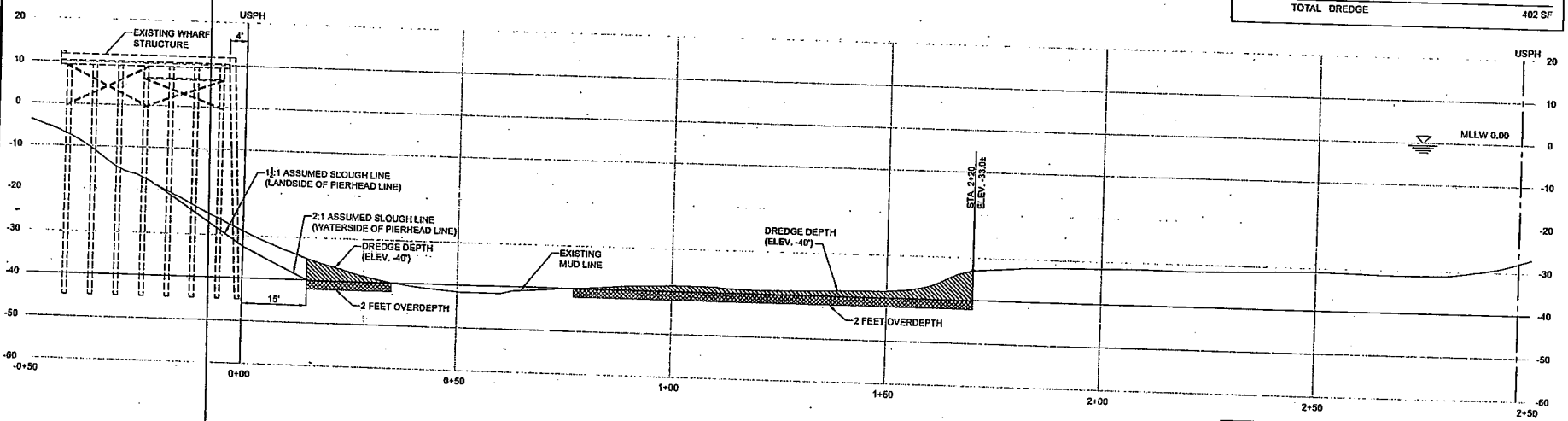
DWG: H:\cadprojects\1-3076 B163-164 Dredge\1-3076 DR-04.dwg USER: lara
DATE: Apr 24, 2013 11:00am PAGE SETUP: 1-3076 B163-164 Maintenance.dwg

1-3076 DR-05



1DR-05 / DR-01 DREDGING CROSS SECTION STA. 13+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	145 SF
OVERDEPTH DREDGE	257 SF
TOTAL DREDGE	402 SF



2DR-05 / DR-01 DREDGING CROSS SECTION STA. 14+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	193 SF
OVERDEPTH DREDGE	225 SF
TOTAL DREDGE	418 SF

NO.	DATE	DRAWN	REVISIONS	CHK'D	APP'D

NOT FOR CONSTRUCTION

NO.	DATE	DRAWN	REVISIONS	CHK'D	APP'D

2/14/2013
DRAFT

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIN
DESIGNED: E. LEE
ENGINEER/ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER — DATE

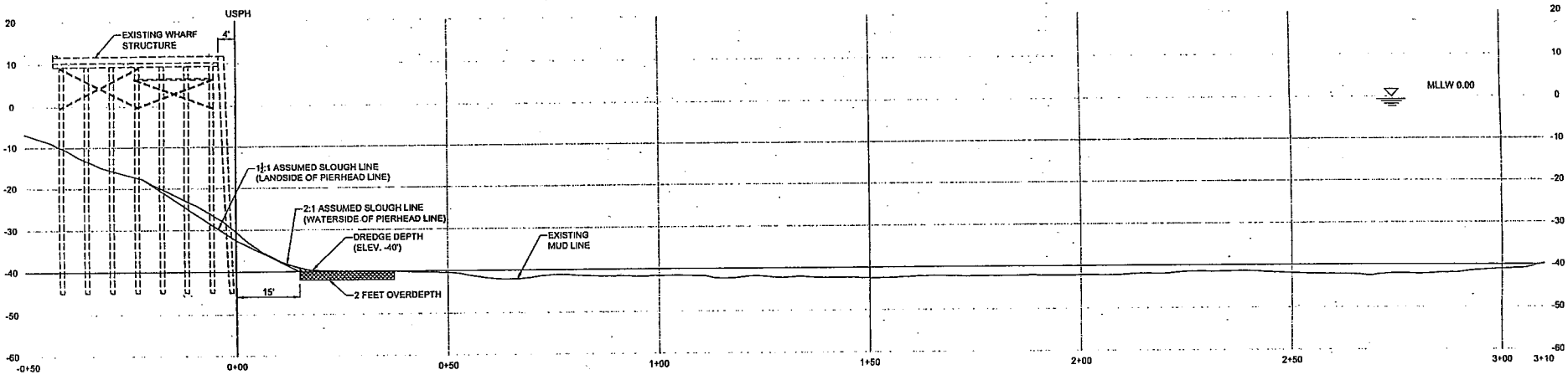
BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 163 CROSS-SECTIONS STATIONS 13+00 &14+00

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

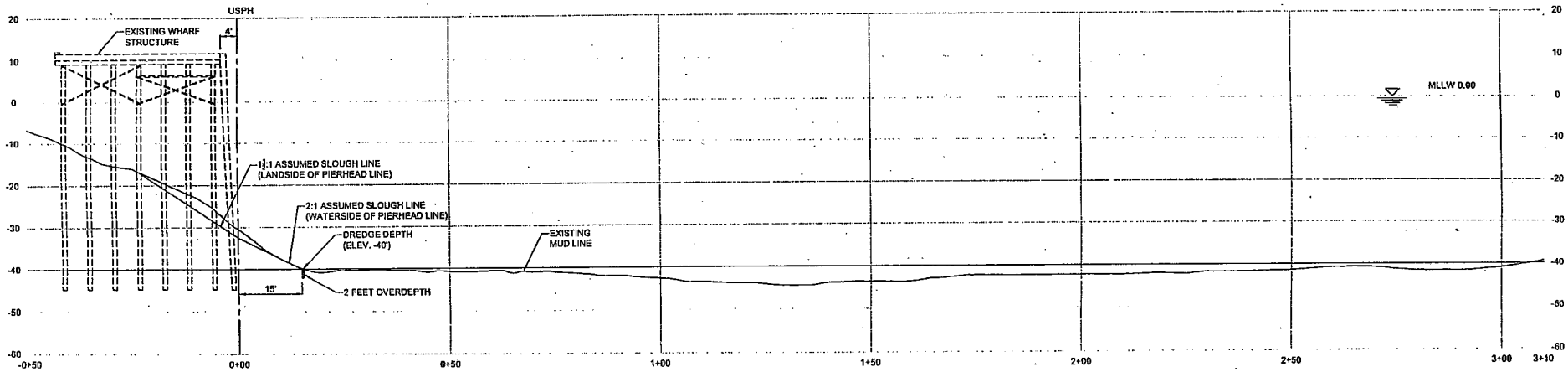
DRAWING NUMBER 1-3076 | SHEET NUMBER DR-05

DWG: N:\projects\pmt\1-3076 B163-164 Dredge\1-3076 DR-05.dwg, USER: lang
DATE: Apr 04, 2013 11:22am, XREF: E:\Projects\B163-164 Dredge\XREF\



1DR-06 / DR-02 DREDGING CROSS SECTION STA. 0+25
SCALE: 1" = 1'-0"

REQUIRED DREDGE	4 SF
OVERDEPTH DREDGE	45 SF
TOTAL DREDGE	49 SF



2DR-06 / DR-02 DREDGING CROSS SECTION STA. 1+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	0.5 SF
OVERDEPTH DREDGE	1 SF
TOTAL DREDGE	1.5 SF

NO.	DATE	DRAWN	REVISIONS	CHKD	APP'D	NO.	DATE	DRAWN	REVISIONS	CHKD	APP'D
			NOT FOR CONSTRUCTION						2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIN
DESIGNED: E. LEE
ENGINEER/ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER

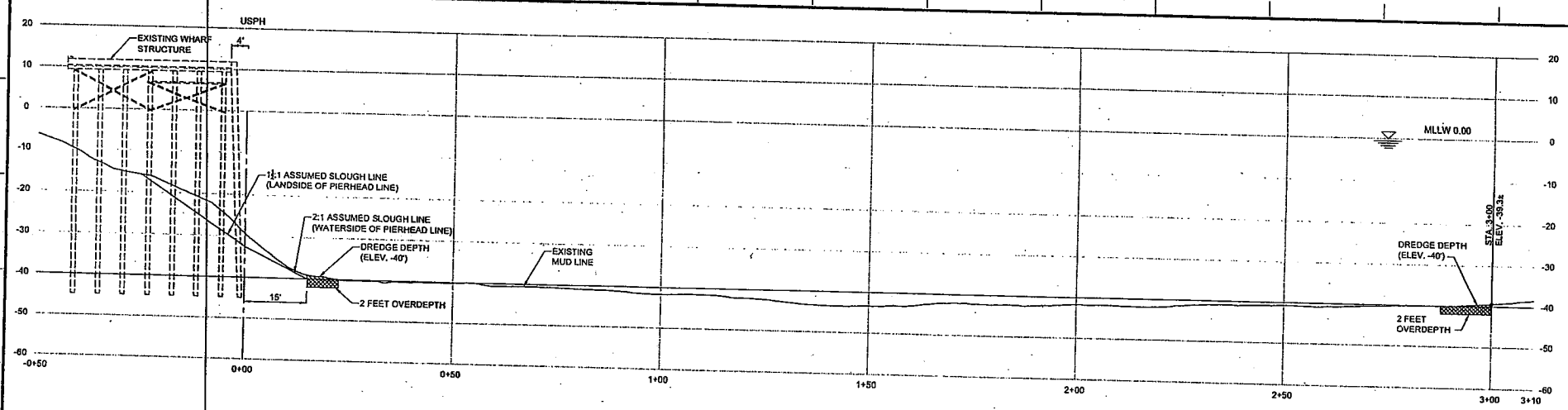
BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 164 CROSS-SECTIONS STATIONS 0+25 & 1+00

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

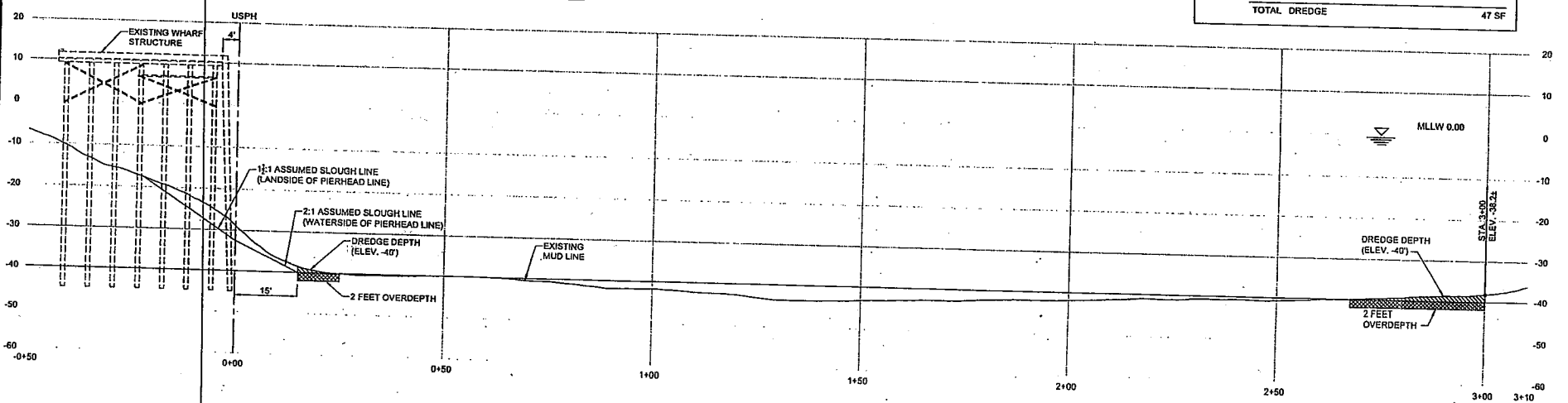
DRAWING NUMBER: 1-3076
SHEET NUMBER: DR-06

1-3076 DR-07



1DR-07 / DR-02 DREDGING CROSS SECTION STA. 2+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	7 SF
OVERDEPTH DREDGE	40 SF
TOTAL DREDGE	47 SF



2DR-07 / DR-02 DREDGING CROSS SECTION STA. 3+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	34 SF
OVERDEPTH DREDGE	85 SF
TOTAL DREDGE	119 SF

DRAFT

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D
			NOT FOR CONSTRUCTION		

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D
			2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIM
DESIGNED: E. LEE
ENGINEER / ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER

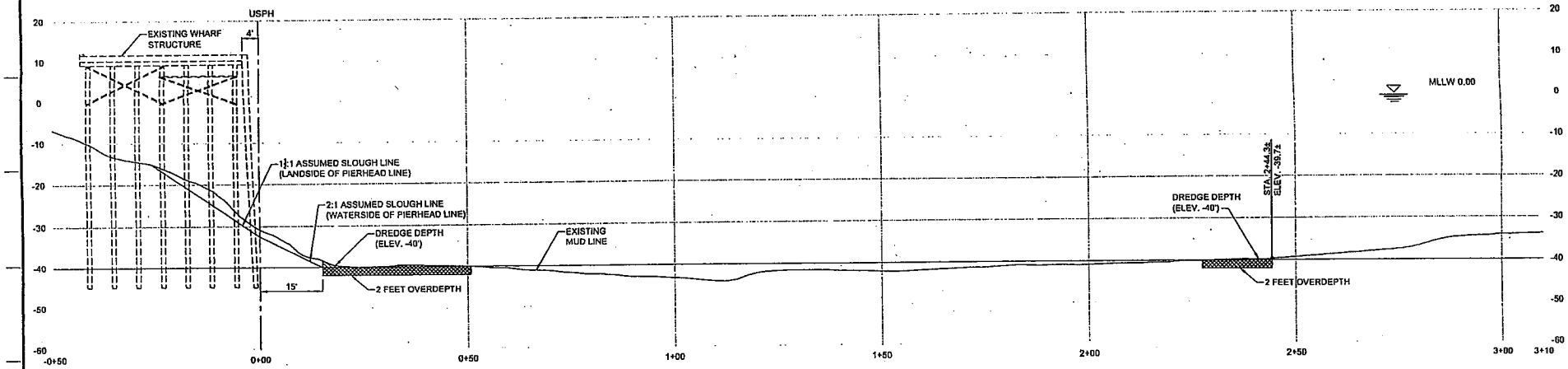
BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 164 CROSS-SECTIONS STATIONS 2+00 & 3+00

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

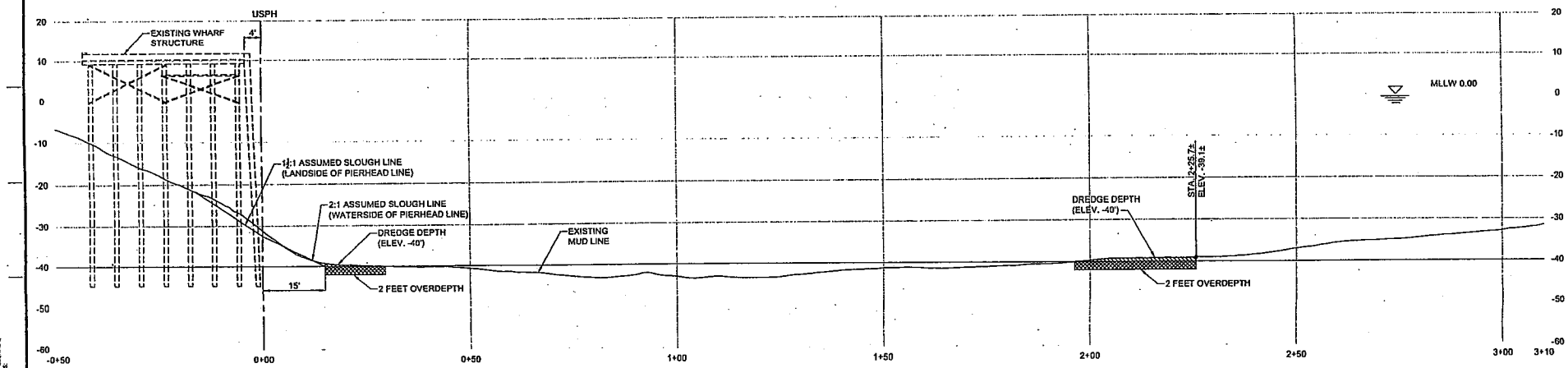
DRAWING NUMBER: 1-3076
SHEET NUMBER: DR-07

1-3076 DR-08



1DR-08 / DR-02 DREDGING CROSS SECTION STA. 4+00
SCALE: 1" = 1'-0"

REQUIRED DREDGE	13 SF
OVERDEPTH DREDGE	105 SF
TOTAL DREDGE	118 SF



2DR-08 / DR-02 DREDGING CROSS SECTION STA. 4+80
SCALE: 1" = 1'-0"

REQUIRED DREDGE	25 SF
OVERDEPTH DREDGE	88 SF
TOTAL DREDGE	113 SF

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D
			NOT FOR CONSTRUCTION		

NO.	DATE	DRAWN	REVISIONS -	CHK'D	APP'D
			2/14/2013 DRAFT		

SCALE: AS SHOWN
DRAWN: J. LARA
CHECKED: A. LIM
DESIGNED: E. LEE
ENGINEER/ARCHITECT

CHIEF OF DESIGN
ASSISTANT CHIEF HARBOR ENGINEER
CHIEF HARBOR ENGINEER

BERTHS 163 & 164 MAINTENANCE DREDGING

BERTH 164 CROSS-SECTIONS STATIONS 4+00 & 4+80

THE PORT OF LOS ANGELES
ENGINEERING DIVISION
425 S. PALOS VERDES STREET SAN PEDRO CA 90731-3309

DRAWING NUMBER: 1-3076
SHEET NUMBER: DR-08

APPENDIX B

EXAMPLE VIBRACORE LOG

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amec

PROJECT: 163-164 Maintenance Dredging Project

LOG OF STATION ID:

ATTEMPT NUMBER:

DATE: 6/ /2013

LATITUDE: 33°

TIME:

LONGITUDE: -118o

WATER DEPTH (ft):

PROJECT DEPTH (ft MLLW): -42.5

TIDE (ft):

MUDLINE ELEVATION (ft MLLW):

MUDLINE ELEVATION (ft MLLW):

TARGET PENETRATION (ft):

PROJECT MANAGER: Barry Snyder

ACTUAL PENETRATION (ft):

LOGGED AND SAMPLED BY: KG/TH

RECOVERED CORE LENGTH (ft):

DEPTH (ft)	LITHOLOGY	SEDIMENT DESCRIPTION	COLOR	ODOR	REMARKS
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

ADDITIONAL COMMENTS:

Project No: 1015101930

Sheet 1 of ____