Mr. Ken Wong
US Army Corps of Engineers
Regulatory Branch
911 Wilshire Blvd.
Los Angeles, CA 90071

March 12, 2010

Dear Mr. Wong:

On behalf of Gambol Industries, we have enclose two (2) copies of the Sampling and Analysis Plan "Sediment Characterization Sampling and Analysis Plan (SAP) for the Determination of the Vertical Extent of Chemicals of Concern at the Southwest Marine Aquatic Leasehold Area Parcel 4". In addition, we have forwarded one copy of this SAP to each of the participating agency representatives in the Los Angeles Region Contaminated Sediments Task Force (CSTF) Advisory Committee.

This SAP has been prepared in support of a proposed alternative on-site Confined Disposal Facility (CDF) that will allow for continued use of the Southwest Marine (SWM) berths (Port of LA Berths 243 and 245) located within the SWM leasehold area Parcel 4. In this alternative design, sediments that were previously not slated for remediation, since they were to be contained within the rock dike CDF, will now need to be removed to at least the proposed design depth and placed in the newly proposed CDF. Previous studies have characterized sediments within the SWM Parcel 4 area Berths 243 and 245. While the majority of the sediments at this depth were below targeted remediation goals (Weston 2007), select areas were above proposed remediation goals indicating that further characterization will be required to determine the vertical extent of dredging that will be required for the site. This SAP seeks to facilitate the rapid completion of additional sampling and testing in areas below the proposed design depth that exceeded remediation goals and determine the vertical extent of the contamination in those areas.

If you have any questions, please give me a call at (707) 207-7761. I look forward to hearing from you.

Sincerely,

Jeffrey Cotsifas

Digitally signed by Jeffrey Cotsifas
DN: cn=Jeffrey Cotsifas, o=Pacific EcoRisk, ou, email=cotsifas@PacificEcoRisk.com, c=US
Date: 2010.03.12 16:57:27 -08'00'

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Sediment Characterization Sampling and Analysis Plan (SAP) for the Determination of the Vertical Extent of Chemicals of Concern at the Southwest Marine Aquatic Leasehold Area Parcel 4

Prepared for

Gambol Industries, Inc.
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Prepared by

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BLUEWater Design Group
2500 Via Cabrillo Marina, Suite 200
San Pedro, CA 90731

March 2010

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

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List of Acronyms

ASTM	American Society for Testing and Materials
BWDG	BLUEWater Design Group
CAS	Columbia Analytical Services
CDF	Confined Disposal Facility
COC	Chain-of-custody
CSTF	Contaminated Sediments Task Force
DGPS	Differential global positioning system
DMMO	Dredge Materials Management Office
DU	Dredge Unit
Gambol	Gambol Industries, Inc.
ITM	Inland Testing Manual
MLLW	Mean lower low water
PER	Pacific EcoRisk
the Port	Port of Los Angeles
QA/QC	Quality assurance/quality control
RPD	Relative percent difference
RWQCB	Regional Water Quality Control Board
SAP	Sampling and analysis plan
SOP	Standard operating procedures
SWM	Southwest Marine
TEG	TEG Oceanographic Services
TOC	Total organic carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

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1. INTRODUCTION

Years ago, Southwest Marine (SWM) vacated its leasehold at 985 Seaside Avenue on Terminal Island (Figures 1-1 through 1-3) in the Port of Los Angeles (the Port). Gambol Industries, Inc. (Gambol) previously served as a "caretaker" of the SWM leasehold area and is interested in establishing a redeveloped, modern shipyard at the site. Previous SWM activities resulted in contamination at the site that may require remediation. The Port has permitted a rock dike Confined Disposal Facility (CDF) to be constructed within the SWM leasehold area Parcel 4 (Figures 1-3), which consists of the Port's Berths 243 and 245 (Figures 1-3 and 1-4), to be used for the burial and capping of contaminated sediments from the SWM leasehold area as well as the disposal of sediment materials from the Port's planned Main Channel Deepening Program (MCDP). The Port's current rock dike CDF design would likely prohibit Gambol's use of Berths 243 and 245 for shipyard purposes. Gambol has entered into a Memorandum of Understanding with the Port that, among other points, calls for the design and review of an alternative CDF (Figures 1-5 and 1-6) that would meet both the Port's dredged material disposal capacity requirements as well as Gambol's goal to revitalize and reestablish shipbuilding and repair capabilities in Southern California - including the future use of Berths 243-245.

Previous investigations have been performed both landside and within the surrounding SWM berth areas (Weston 2005, 2007a, 2007b). These investigations characterized the horizontal and vertical extent of contaminated sediments and preliminary remediation recommendations. Gambol's proposed alternative design would require sediments from Berths 243 and 245 that were previously slated to be capped under the proposed rock dike to be mitigated to the extent required by law. Gambol proposes to do so by placing such materials, if any, in the newly proposed open cell, vertical containment CDF.

The proposed open cell, vertical containment alternative CDF plan and the proposed project dredging design depth and disposal capacity within Gambol's proposed alternative CDF are presented in Figure 1-6. Proposed dredge limits are presented in Figure 1-7. While the majority of the sediments at the proposed project design depth (plus overdepth) were below targeted remediation goals (Weston 2007a, 2007b), select areas appeared to be above proposed remediation goals for arsenic, copper, lead, mercury, DDD, DDE, DDT, total DDT, and Tributyltin. These results indicated that further characterization would be required to determine the vertical extent of dredging that will be required for the site. This Sampling and Analysis Plan (SAP) identifies areas that are above remediation goals (Weston 2007a, 2007b), proposes the further characterization of these areas, and proposes to determine the vertical extent of dredging that will be required in these areas to meet targeted remediation goals.

This SAP has been prepared in support of a proposed alternative on-site CDF and has been developed in accordance with currently applicable guidance, and establishes the general approach to sampling and assessment of sediments proposed for dredging.

1.1 Objectives of the Sediment Investigation

This Sampling and Analysis Plan (SAP) identifies areas that are above remediation goals (Weston 2007a, 2007b), proposes the further characterization of areas within the proposed dredge design depth (plus overdepth) previously determined to exceed targeted remediation goals, and proposes to determine the vertical extent of dredging that will be required in these areas to meet targeted remediation goals. The procedures for sediment sample collection, sample processing and preparation, physical and chemical analyses, are presented in this SAP. The specific objectives of the SAP scope of work are as follows:

- Collect core samples from within the designated sampling areas following field protocol detailed in this SAP;
- Conduct chemical analysis on select sediment cores sections;
- Compare analytical results to proposed remediation goals (ER-M, CSTF level (e.g., copper), or Port-defined criteria (e.g., tributyltin);
- Determine the vertical extent of contamination within Berths 243 and 245; and
- Propose extent of dredging required to remediate site.

Guidance concerning necessary sampling and analytical protocols, quality assurance/quality control (QA/QC) procedures, and data interpretation can be found in:

- Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (ITM; USEPA/USACE 1998);
- Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual (Ocean Testing Manual). (OTM; USEPA/USACE 1991)

1.2 Overview of Field Activities and Lab Analyses

Using an appropriate coring device, sediment cores will be collected from within the SWM Parcel 4 area as described in Table 3-6 and presented in Figure 3-4. Each of the sediment cores will be divided into 2 ft sections with the sediment from within each section being individually homogenized. An aliquot of each sediment core section will be placed into an appropriate container and submitted to the analytical laboratory for chemical and conventional analyses as described in Table 3-6. An additional sub-sample of the homogenized sediment from each core section will be archived for any follow-up testing, if needed.

Chemical analysis will be performed in a stepwise fashion starting with the portion of the sediment core that represents the sediment layer immediately below the design depth (plus overdepth) or bottom of a previously sampled core depth. For each sediment core, progressively deeper sections will be sequentially analyzed until the contaminant concentration in a specific core section is below the targeted remediation goal (Table 7-1).

Figure 1-1. Location Map: Southwest Marine Leasehold Area, Port of Los Angeles

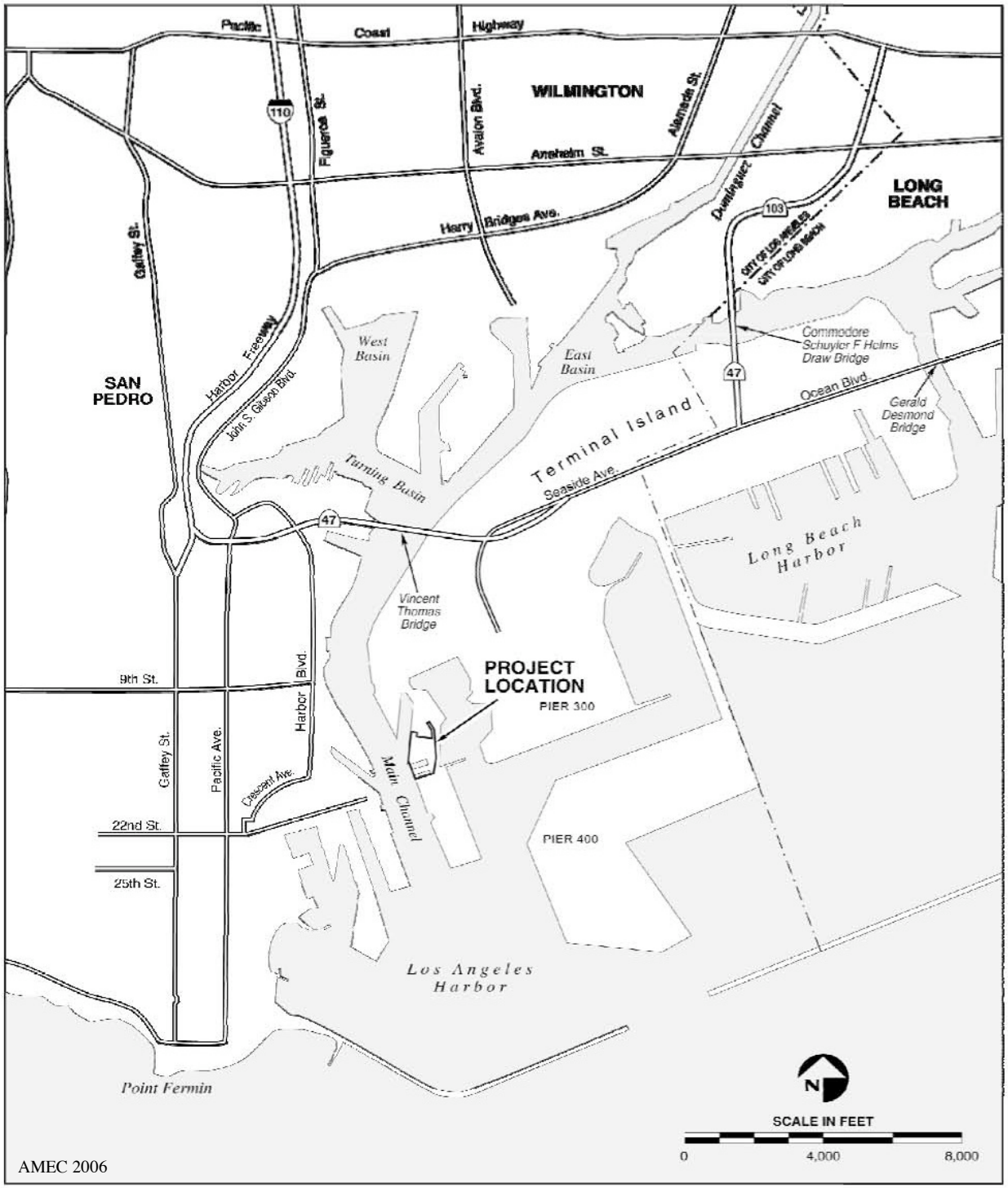

Figure 1-2. Vicinity Map #1: Southwest Marine Parcel 4, Port of Los Angeles

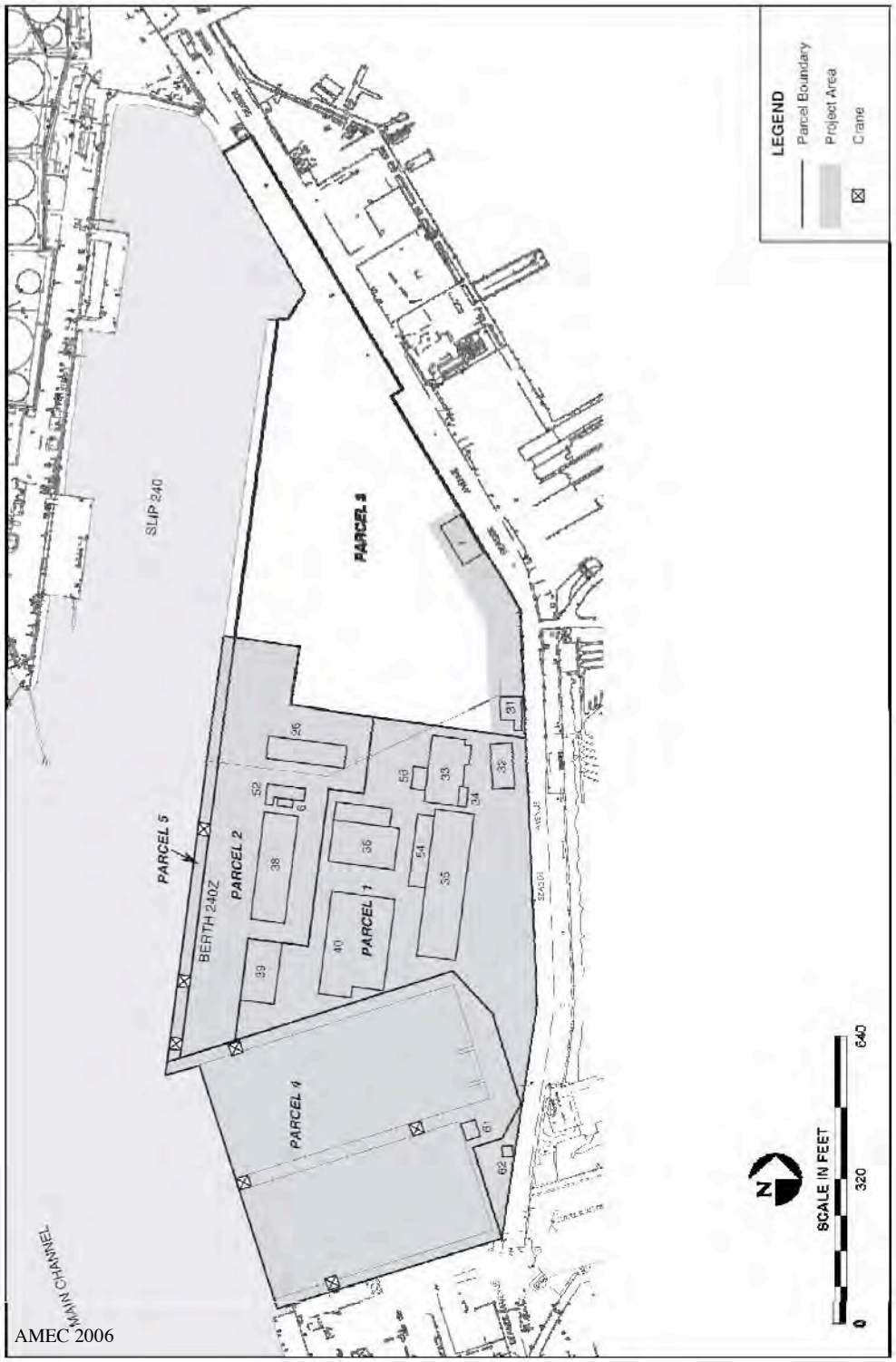

Figure 1-3. Vicinity Map #2: Southwest Marine Leasehold Area, Port of Los Angeles

Figure 1-4. Vicinity Map #3: Southwest Marine Parcel 4, Port of Los Angeles Berths 243 and 245

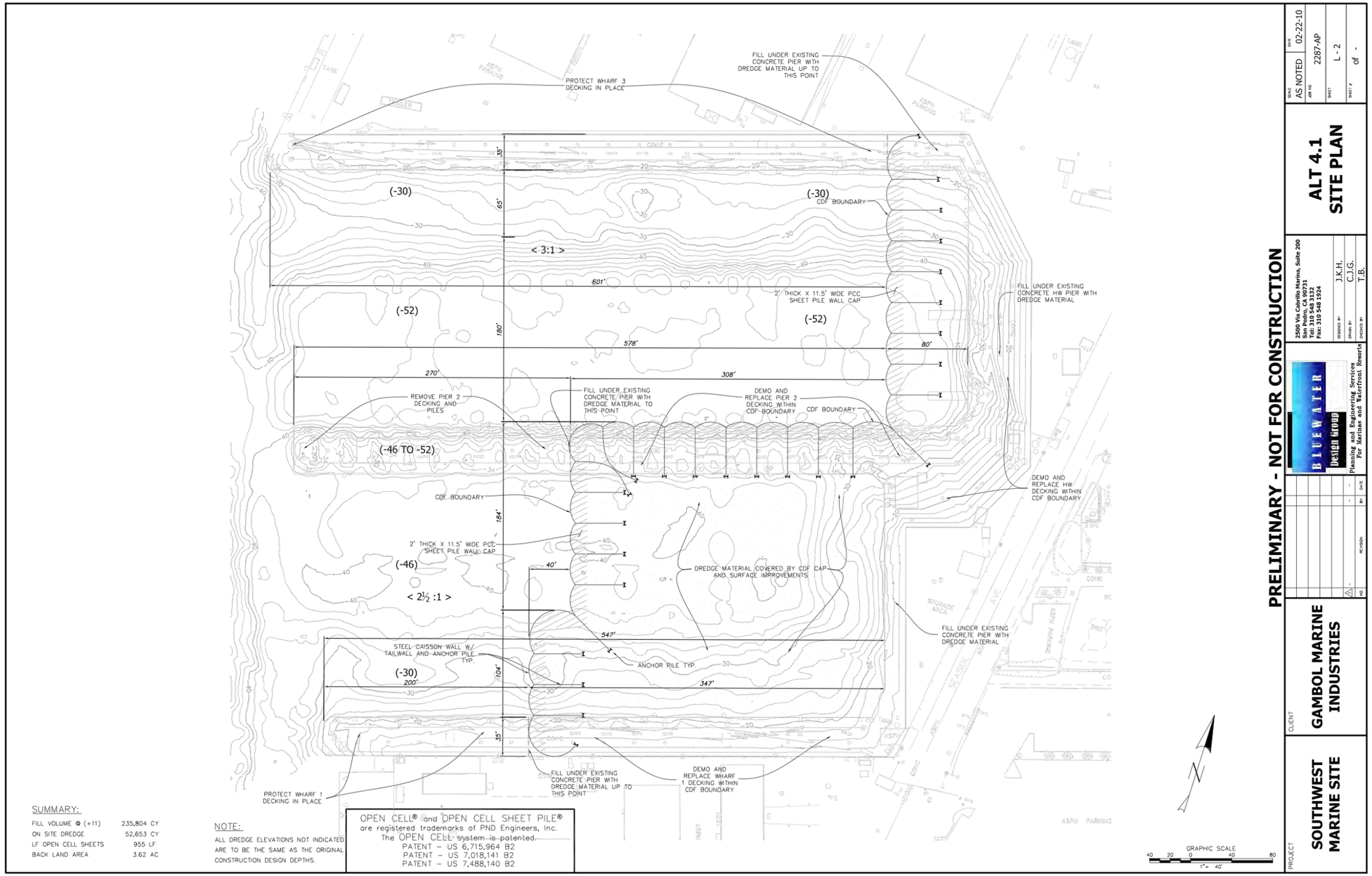

Figure 1-5. Confined Disposal Facility Proposed Alternative Design for Southwest Marine Parcel 4, Port of Los Angeles

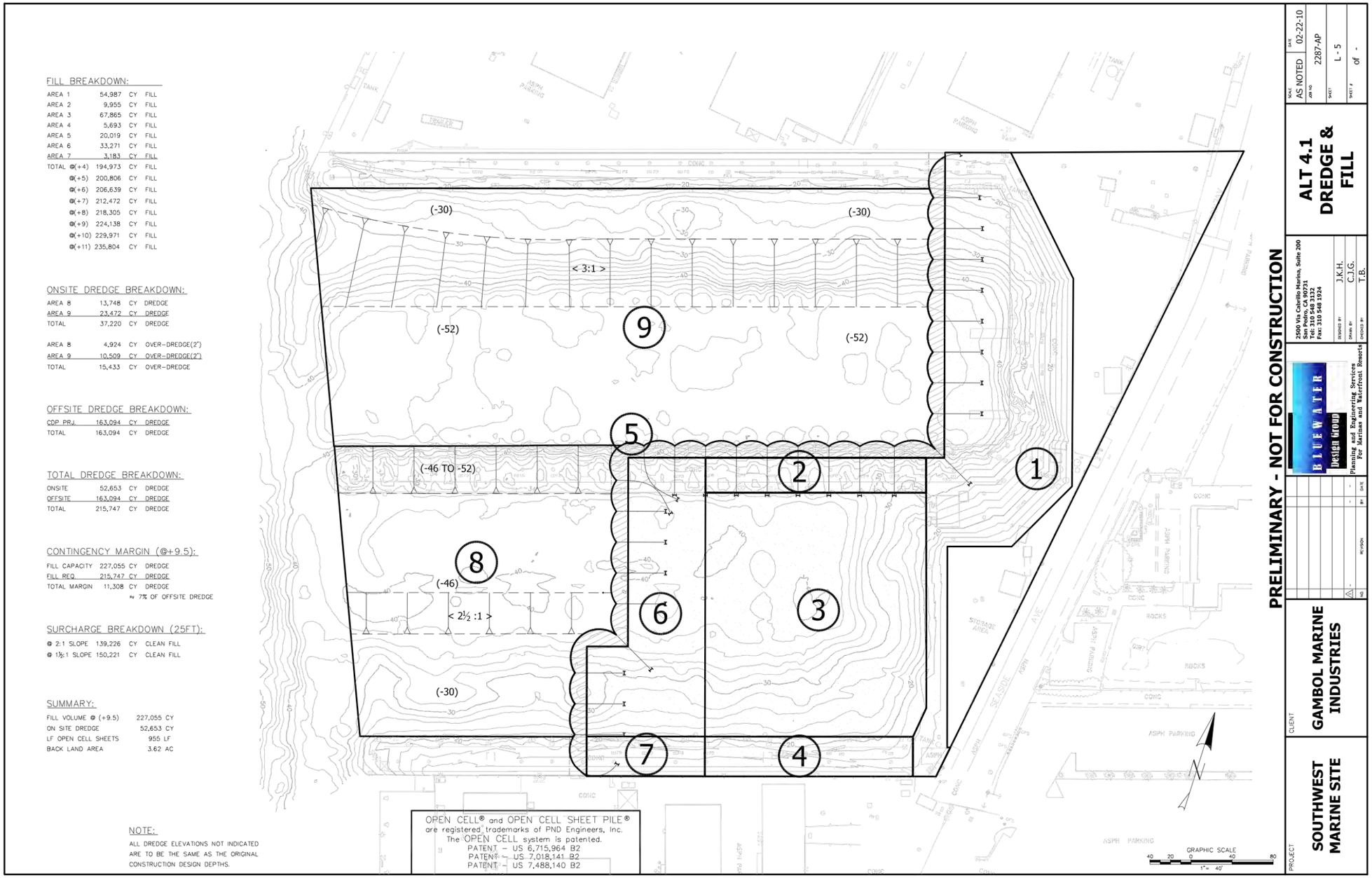

Figure 1-6. Confined Disposal Facility Volume Capacity Southwest Marine Parcel 4, Port of Los Angeles

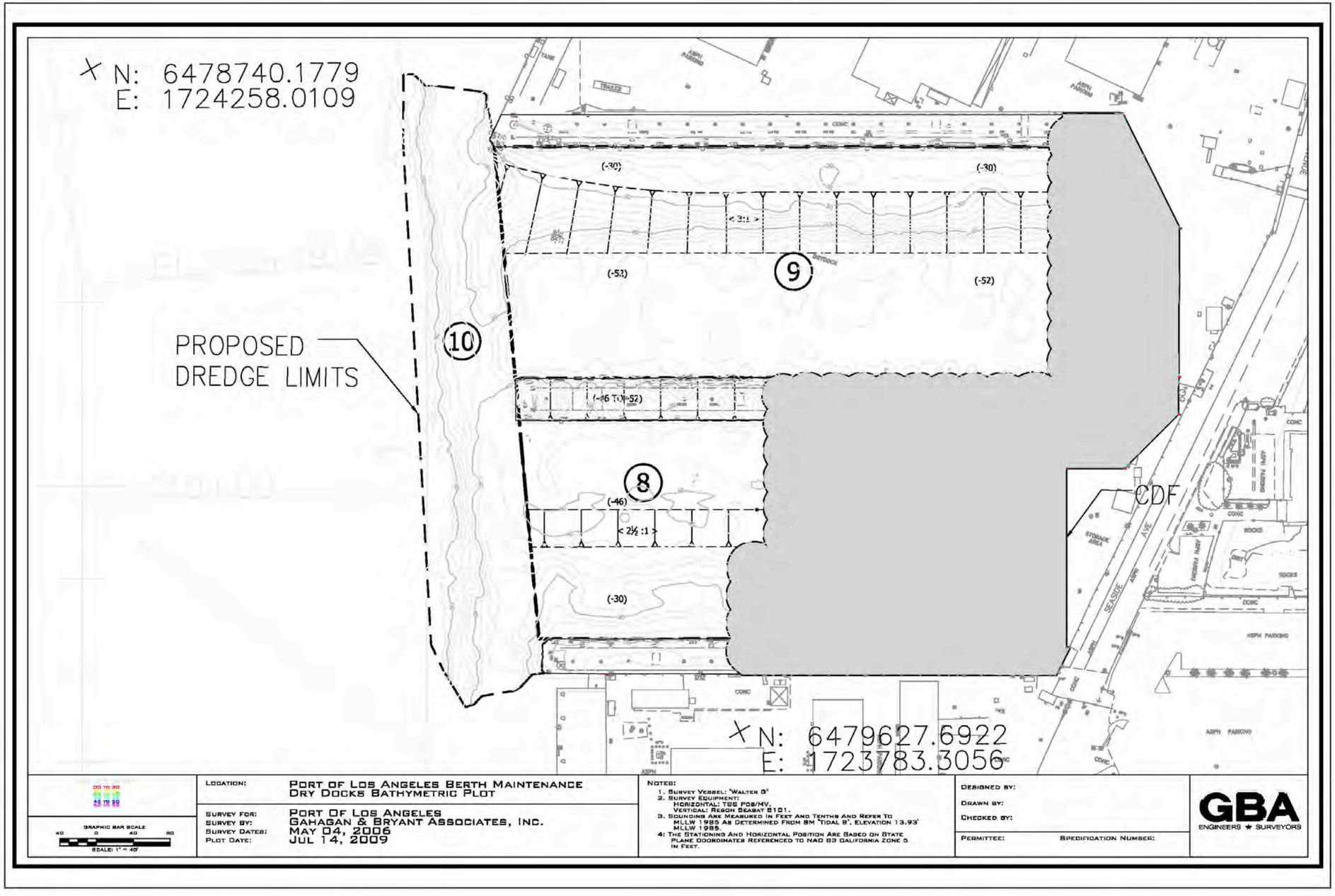

Figure 1-7. Proposed Design Depth and Dredge Limits for Southwest Marine Parcel 4 Berths 243 and 245, Port of Los Angeles

2. PROJECT MANAGEMENT AND RESPONSIBILITIES

2.1 Program and Field Activities

Mr. Tim Bazley of BLUEWater Design Group (BWDG) will serve as Gambol's overall Project Manager. The Sampling and Analysis Project Manager will be Mr. Jeff Cotsifas, assisted by Dr. Scott Ogle, both from Pacific EcoRisk (PER). Mr. Cotsifas will be responsible for overall project coordination, including production of all project deliverables, collection and submittal of environmental samples to the designated laboratories for chemical and physical analyses, and administrative coordination to assure timely and successful completion of the project. Mr. Cotsifas will also be responsible for all decisions concerning sample collection, for QA/QC oversight, and ensuring that appropriate protocols for decontamination, sample preservation, and holding times are observed. Mr. Cotsifas will be involved in all aspects of this project, including preparation, and approval of the SAP, and review and interpretation of all analytical results; Dr. Ogle will be involved in review and interpretation of all analytical results. The project management organization is illustrated in Figure 2-1.

All field activities will be performed under the direction of Mr. Cotsifas. Sediment cores will be collected by TEG Oceanographic Services (TEG) and PER. During collection of cores, the sampling vessel will be staffed with a captain, operating crew, and 2 field scientists. Mr. Mark Mertz of TEG will captain the sampling vessel, and will be responsible for location control and positioning, and providing all coring devices and operating crew. PER will supply a Field Manager and Field Scientist.

2.2 Project Management

A Laboratory Project Manager will be appointed from each laboratory. Laboratory Project Managers will provide analytical support and will be responsible for ensuring that all laboratory analyses meet the project data quality objectives and other specifications required by the ITM, regional guidance, and the DMMO review process. The Laboratory Project Managers are as follows:

Project Management, Sampling, and
Mr. Jeffrey Cotsifas
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Telephone: (707) 207-7760
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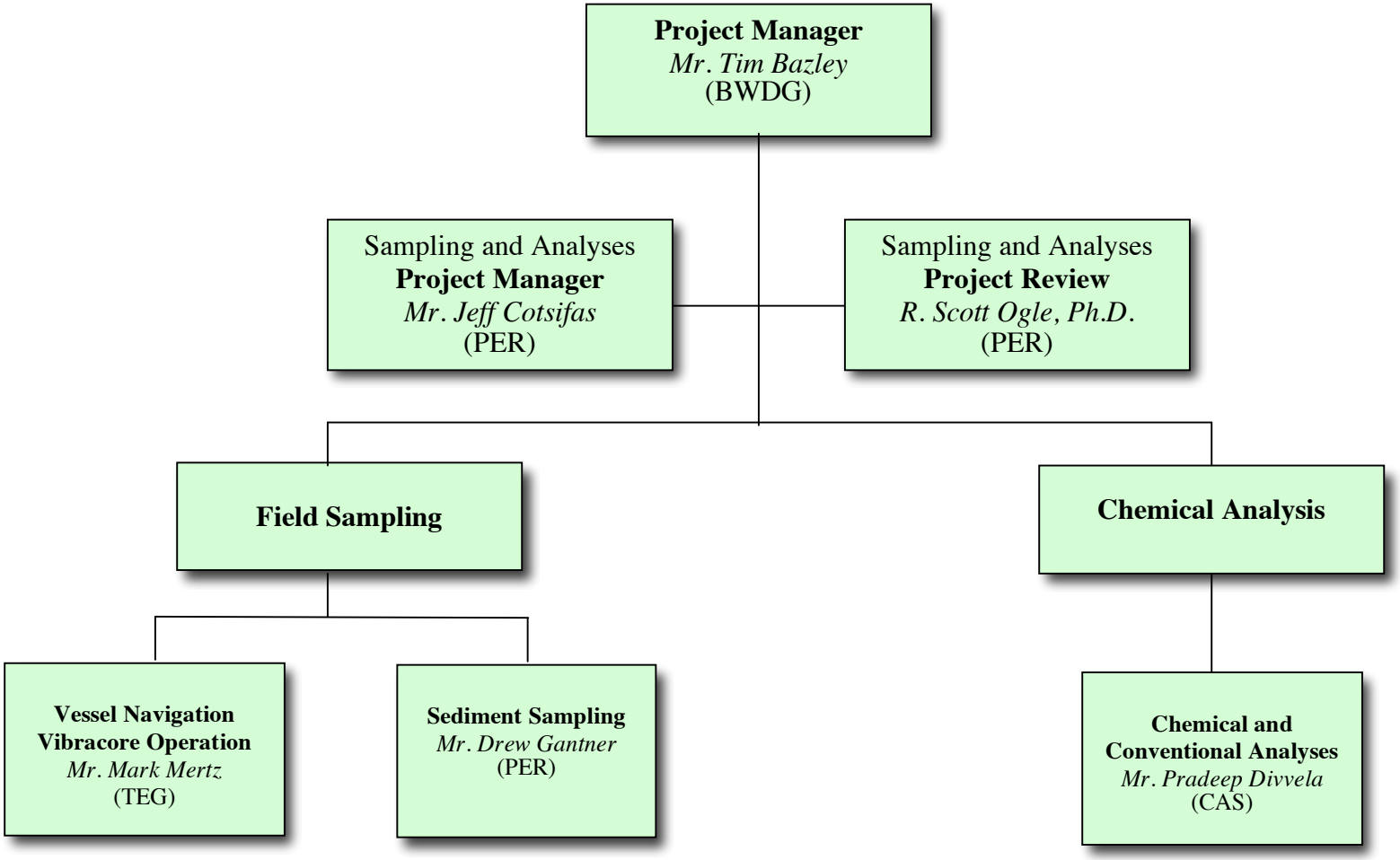

Figure 2-1. Project Organizational Chart

The contract laboratories are expected to meet the following minimum technical requirements as specified in their negotiated subcontracts with PER:

1. Adherence to the methods outlined in the SAP, including those methods referenced for each analytical procedure, as per ITM/OTM, and region-specific regulatory requirements;
2. Deliver electronic data files as specified;
3. Meet all reporting requirements;
4. Implement and comply with QA/QC procedures required by ITM and region-specific guidelines;
5. Allow PER to perform laboratory and data audits; and
6. Meet turnaround times for deliverables.

3. SITE HISTORY AND REVIEW OF EXISTING DATA

3.1. Site History

The SWM leasehold area is located within the Port (Figure 1-2). Berths 243 and 245 within Parcel 4 of the SWM leasehold area were excavated in the early 1900s in support of the construction of the SWM facility (Figure 3-1). SWM operated shipbuilding and repair facilities (Figure 3-2) at the site. The shipbuilding facility is considered one of the oldest within the Port. The currently vacated shipyard consists of 5 distinct parcels totaling approximately 31.6 acres (Figure 1-3). Gambol previously served as a film services "caretaker" for the SWM leasehold area, currently operates a shipyard in the neighboring Port of Long Beach, and is interested in establishing and operating a modern shipyard at the site. Previous SWM activities may have resulted in contamination at the site that will require remediation.

In support of any required sediment remediation at the site, the Port has permitted a rock dike Confined Disposal Facility (CDF) to be constructed within the SWM leasehold area Parcel 4 (Figures 1-2 and 1-3), which consists of the Port's Berths 243 and 245 (Figure 1-4), to be used for the disposal of contaminated sediments from the SWM leasehold area, surrounding areas as well as the Ports upcoming channel deepening program. Previous SWM activities resulted in contamination at the site that may require remediation. The Port has permitted a rock dike Confined Disposal Facility (CDF) to be constructed within the SWM leasehold area Parcel 4 (Figures 1-3), which consists of the Port's Berths 243 and 245 (Figures 1-3 and 1-4), to be used for the burial and capping of contaminated sediments from the SWM leasehold area as well as the disposal of sediment materials from the MCDP. The Port's current rock dike CDF design would likely prohibit Gambol's use of Berths 243 and 245 for shipyard purposes. Gambol has entered into a Memorandum of Understanding with the Port that, among other points, calls for the design and review of an alternative CDF (Figures 1-5 and 1-6) that would meet both the Port's dredged material disposal capacity requirements as well as Gambol's goal to revitalize and reestablish shipbuilding and repair capabilities in Southern California-- including the future use of Berths 243-245.

3.2 Recent Testing History

This section reviews the recent testing performed in support of the Port's site characterization and remediation activities at the SWM leasehold area (Appendices B and C). This review is limited to the Port's Berth 243 and 245 sediments within Parcel 4. Only sediments in the areas that will require dredging in support of the alternative CDF proposed by Gambol are evaluated; sediments within the CDF are not evaluated as they will not require remediation. Data sources for this review include:

- Weston (2005) Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles, San Pedro, California. Prepared by Weston Solutions, Inc. Prepared for Port of Los Angeles, Environmental Division May 2005.

- Weston (2007a) Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine Leasehold Areas for Use in Remediation Efforts, Port of Los Angeles, San Pedro, California. Prepared by Weston Solutions, Inc. Prepared for Port of Los Angeles, Environmental Division May 2007.

- Weston (2007b) Southwest Marine Aquatic Leasehold Area: Volume Estimates for Remediation. Final Report. Prepared by Weston Solutions, Inc. Prepared for Port of Los Angeles, Environmental Division May 2007.

Figure 3-1. Construction of SWM Parcel 4 Circa 1918

Figure 3-2. SWM during active dry dock operations within Parcel 4

Figure 3-3. Current conditions within SWM Parcel 4

Results of these recent studies for site locations for which contaminants were present at the project design depth (plus overdredge) above the ER-L are summarized and presented in Appendix A. Contaminant concentrations for these sediment cores were compared to the ER-M or Port-developed cleanup criteria to determine if the chemical concentrations in the sediment core sections at the proposed project design depth were above or below a clean-up level. The ER-M was used as the proposed remediation goal based on previous study plans and analytical programs presented in previous studies performed for the Port (Weston, 2007a, 2007b). These results indicated that the contaminant concentrations at the proposed project design depths within select areas of the berths were above targeted remediation goals (Figure 3-4); a summary of the compounds that were above individual sediment cores and is presented in Table 3-1. As a result, additional core samples will be collected within select areas to further characterize the vertical extent of the contamination. The sample locations are presented in Figure 3-4 and sampling procedures to be used are presented in Section 4.

Table 3-1. Summary of sediment cores with compounds measured above the ER-M or Port-developed criteria at or below proposed project "design depth + overdepth" and proposed follow-up action

Area	SAMPLE ID	Dredge Unit Design Depth + Overdepth (ft MLLW)	Analytes Above ER-M or Port-developed Criteria At or Below Proposed Project Design Depth + Overdepth	Total Depth Sampled (ft. MLLW)	Analytes Above ER-M at Bottom of Core	Proposed Action
DU1	2	-32	Cu, Pb, Hg, 4,4'-DDE, 4,4'-DDT	-38	none	No further characterization needed
	37	-32	Hg [A]	-41	none	No further characterization needed
DU2	3 (2005)	-48	Cu, Pb, Hg, Zn, DDE [B]	-44	Cu, Pb, Hg, Zn, DDE	See Station 3 (2007) [B]
	3b (2005)	-48	Cu, Pb, Hg, Zn, DDE, TBT [B]	-45	Cu, Pb, Hg, Zn, DDE, TBT	See Station 3 (2007) [B]
	3 (2007)	-48	Cu, Pb, Hg, Zn, DDE, ∑DDT	-52	none	No further characterization needed
DU3	10 (2005)	-54	Cu, Hg, Zn, DDT, TBT [B]	-47	Cu, Hg, Zn, DDT, TBT	Additional characterization of material below bottom of previously sampled core to -70 ft MLLW or refusal
	10 (2007)	-54	Cu, Hg, Zn, DDE, ∑DDT, TBT	-54	none	No further characterization needed
	13 (2005)	-54	Cu, Zn, DDE, TBT	-52	Cu, Zn, DDE, TBT	None – additional sampling for DU3 characterization performed at Station 13 (2007)
	13 (2007)	-54	As, Cr, Cu, Hg, Pb, Zn, DDD, DDE, ∑DDT, TBT	-59	Cr, Cu, Hg, Pb, DDD, DDE, ∑DDT, TBT	Additional characterization of material below bottom of previously sampled core to -70 ft MLLW or refusal
	14	-54	Cu, Hg, Zn, DDE, TBT [C]	-48	Cu, Hg, Zn, DDE, TBT	None – additional sampling for DU3 characterization performed at Station 15
	15	-54	DDE	-52	DDE	Additional characterization of material below bottom of previously sampled core to -70 ft MLLW or refusal
	32	-54	TBT	-54	TBT	None – additional sampling for DU3 characterization performed at Station 13
	33	-54	Cu, Hg, Pb, Zn, DDD, DDE, ∑DDT, TBT	-57	none	No further characterization needed
	34	-54	DDE, TBT	-54	DDE, TBT	None – additional sampling for DU3 characterization performed at Station 13
DU4	9	-32	Hg	-32	Hg	Additional characterization of material below bottom of previously sampled core to -53 ft MLLW or refusal
	11	-32	TBT	-40	none	No further characterization needed
	12	-32	Hg	-31	Hg	Additional characterization of material below bottom of previously sampled core to -40 ft MLLW or refusal
	26	-32	DDD, ∑DDT, TBT	-34	none	No further characterization needed
Optional DU	1	-32 to -52	Pb, Hg, Zn, 4,4'-DDD, 4,4'-DDT	-38	Hg	Additional characterization of material below bottom of previously sampled core to -53 ft MLLW or refusal

A - Mercury was not measured at -34 ft MLLW (2 ft below the design depth) but was slightly elevated at -39 ft MLLW. Mercury was not detected at -41 ft MLLW.
B - Extent of sampling was above the dredge design depth; sampling in 2007 indicates that analyte concentrations in the "overdepth" profile were below the ER-M or Port-developed criteria.
C - Extent of sampling was above the dredge design depth; it is assumed that these contaminants may also present at the project dredge design depth.

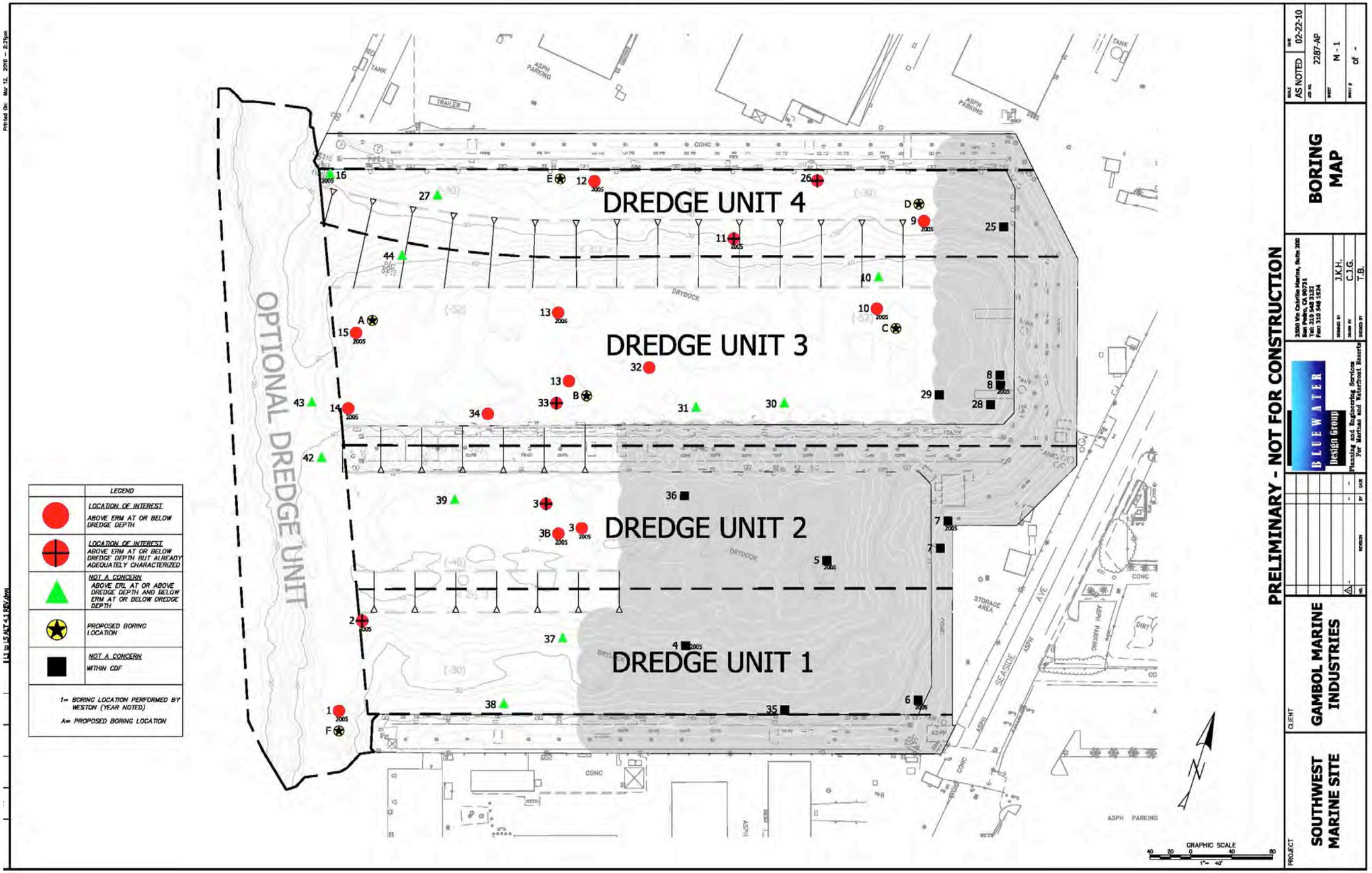

Figure 3-4. Previous Sample Locations and Proposed Additional Boring Locations for SWM Parcel 4 Berths 243 and 245, Port of Los Angeles

4. SAMPLING PROGRAM: SEDIMENT COLLECTION AND HANDLING

4.1 Selection of Sample Locations

The sampling station selection provides samples that represent, as accurately as possible, the physical and chemical characteristics of the sediments to be dredged. Summarized results of the most recent studies performed at the SWM leasehold Parcel 4 area (Table 3-1; summary of analytical data presented in Appendix A) were used to assist in choosing core sample stations that will allow for the determination of the vertical extent of contaminated sediments that are below the project's proposed dredge depths (Figure 4-1).

Table 4-1. Locations of sampling stations and estimated core depth

Area	SAMPLE ID	Mudline Elevation (ft. MLLW)	Proposed Sampling Depth (ft. MLLW)	Estimated Core Length (ft.)
DU3	A	-47	-70	23
	B	-39	-70	31
	C	-47	-70	23
DU4	D	-24	-45	21
	E	-22	-45	23
Optional DU	F	-31	-53	22

DU –Dredge Unit

4.2 Sampling Platform

Collection of sediment cores will be performed by both TEG and PER Field Scientists.
TEG will provide the sampling vessel and all equipment necessary for the safe operation of the boat to support sampling operations. The sampling vessel is a 35-ft long trawler vessel with a 4-ton belt hydraulic crane for deploying and retrieving sampling equipment. Operation of the sampling vessel will be the responsibility of Mr. Mark Mertz. The vessel is powered by twin V12 diesel engines, has an AC/DC electrical system and approximately 35 x 20 ft^2 of clear aft deck workspace for processing samples. The vessel conforms to U.S. Coast Guard safety standards.

4.3 Navigation and Vertical Control

Location control will be the responsibility of the boat captain and will be accomplished using a differential global positioning system (DGPS). The navigation system will be calibrated to a known survey monument in the project area, and will be used to guide the vessel to predetermined core sample locations and to identify the exact sampling location where the corer strikes the bottom. The required accuracy for horizontal positioning is ± 3 m.

Upon locating the sampling position, station depth will be measured using an on-board calibrated fathometer or a lead line, and tidal elevation will determined relative to harbor datum MLLW. The tidal elevation will be subtracted from the measured depth to determine the sediment surface elevation relative to MLLW. All vertical elevations will be reported to the nearest foot relative to zero (0) ft. MLLW, harbor datum.

In the event that the DGPS is not functioning properly because of local interference, station locations will be positioned using a laser range finder to record the perpendicular distance from at least two stationary markers located within the harbor. Interference with DGPS is not expected to be a problem at this location.

4.4 Collection of Sediment Core Samples

This section summarizes the sediment core sampling procedure. Greater detail is provided in the Standard Operating Procedure (SOP) for sediment core collection (Appendix E).

All samples will be collected using an appropriate coring device. All cores will be collected to the designated depth (Table 4-1), or refusal. Upon completion of core penetration at a station, the position will be recorded and the sampler recovered.

Once the corer is on deck, the sediment core will be extracted from the corer barrel. The core will be examined to determine compliance with acceptability criteria as follows:

1. The core penetrated and retained material to project depth, or to refusal;
2. Cored material does not extend out the top of the core tube or contact any part of the sampling apparatus at the top of the core tube; and
3. There are no obstructions in the cored material that might have blocked the subsequent entry of sediment into the core tube, resulting in incomplete core collection.

If core acceptance criteria are not achieved, the core will be rejected and the procedure repeated until acceptance criteria are met. If 3 repeated attempts within 25-50 ft in either direction of the proposed location do not yield a core that meets the appropriate acceptance criteria, the Sampling and Analysis Project Manager or field lead will select an alternate station of similar representability.

4.5 On-Board Sample Processing and Labeling

The individual cores will be cut into 2 ft sections according to the planned analysis of the sediments below the proposed project depth at 2 ft intervals. Physical characteristics of each core and core section will be noted on the individual sediment core collection log. The core section samples will sealed, labeled, and temporarily stored on ice (or frozen “blue ice”) within insulated coolers aboard the vessel.

4.5.1 Station and Sample Identification

Each individual sediment core section will be assigned a unique alphanumeric identifier using the format described below:

- The first 3 characters will identify the project, e.g., SWM = Southwest Marine;
- The next 3 characters will identify the sediment core, e.g., DU1 = Dredge Unit 1
- The next 2 characters will identify the sediment core, e.g., A
- The next 3 characters will be used to identify the depth profile:

For example, the samples to be collected for the SWM-DU1-A sediment cores will be identified as follows:

SWM-DU1-A-0/2	for the section 0-2 ft below the proposed dredge depth + overdepth
SWM-DU1-A-2/4	for the section 2-4 ft below the dredge depth + overdepth
SWM-DU1-A-4/6	for the section 4-6 ft below the dredge depth + overdepth
SWM-DU1-A-6/8	for the section 6-8 ft below the dredge depth + overdepth
SWM-DU1-A-8/10	for the section 8-10 ft below the dredge depth + overdepth
Remainder of sediment core	The remainder of the sediment core will processed following the above procedure

4.6 Field Equipment Decontamination Procedure

The deck of the vessel will be rinsed clean with site water between stations. All sampling equipment coming in contact with collected sediments will be decontaminated between stations using the following procedures:

1. Rinse with site water and wash with scrub brush until free of sediment;
2. Wash with phosphate-free biodegradable soap solution; and
3. Rinse with site water taken from 3 ft. below the surface.

Any sampling equipment that cannot be properly cleaned will not be used for subsequent sampling activity.

Acid- or solvent-washing will not be used in the field due to safety considerations and problems associated with rinsate disposal. Residue of acids and solvents on sampling equipment may affect sample integrity for chemical testing. The use of acids or organic solvents on the deck of a vessel may pose a safety hazard to the crew.

4.6.1 Waste Disposal

All sediment remaining on deck after sampling will be washed overboard at the collection site prior to moving to the next sampling station. All disposable sampling materials and personnel protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy-duty garbage bags or other appropriate containers. Disposable supplies will be removed from the vessel by sampling personnel and placed in a normal refuse container for disposal as solid waste.

4.7 Field Data Recording

The Sampling and Analysis Project Manager, or his designee, will maintain a field logbook. The field logbook will provide a description of all sampling activities (including documentation of all samples collected for analysis), conferences associated with field sampling activities, sampling personnel, weather conditions, and a record of all modifications to the procedures and plans identified in this SAP. The field logbook is intended to provide sufficient data and observations to enable readers to reconstruct events that occurred during the sampling period.

Core collection log sheets will be completed for each sediment core. In addition to standard entries of personnel, date, and time, the log sheet will also include information regarding station coordinates, core penetration, core sections, and physical characteristics of the sediment such as texture, color, odor, stratification, and sheens.

4.8 Laboratory Sample Processing

Processing of individual core sections will be performed at the PER laboratory facility in Fairfield, CA. Prior to extrusion of sediment, the outside of each core section will be carefully cleaned to preclude subsequent contamination of the sediment within. For each core section, the sediment will be extruded onto a clean surface. The extruded sediment will be examined and any features of note will be recorded. The sediment will then be homogenized in a stainless steel bowl. Appropriate volumes of each core section sediment will be collected into sample containers for shipment to the analytical laboratory (Appendix D). Sample labels will be filled out with an indelible-ink pen and affixed to the sample containers. Each label will contain the project number, sample identification number, preservation technique, requested analyses, date and time of collection and preparation, and initials of the person preparing the sample. To protect the information on the sample labels, clear tape will be placed around the labeled sample containers. The sample containers will then be placed into a sample freezer and frozen until shipped, with the exception of sediment samples slated for grain size analysis, which will be stored at 0-6˚C. An additional sub-sample of each core section sediment will be archived to allow for additional chemical analyses, if necessary (archived samples will be stored frozen at –20 ± 10˚C for up to one (1) year after sample collection).

4.9 Sample Shipping

Prior to shipping to the analytical laboratory, sample containers will be wrapped in bubble wrap and securely packed inside a cooler with ice packs or crushed ice. A temperature blank will be included in each cooler. The original signed chain-of-custody (COC) forms will be placed in a sealed plastic bag and taped to the inside lid of the cooler. Appropriate packaging tape will be wrapped completely around the cooler. A *This Side Up* arrow label will be attached on each side of the cooler, a *Glass-Handle with Care* label will be attached to the top of the cooler, and the cooler will be sealed with custody seals on both the front and the back lid seams.

Sediment samples will be shipped by overnight delivery. The Laboratory Project Manager at each laboratory will ensure that COC protocol is followed. The respective laboratory QA Officers will ensure that the temperature of the temperature blank included in each cooler is measured and recorded, and that any coolers that do not contain ice packs or are not sufficiently cold upon receipt are specifically noted.

The sub-contracting analytical laboratories will not dispose of any samples for this project until notified by PER in writing.

4.9.1 Chain-of-Custody (COC) Protocol

COC procedures will be followed for all samples throughout the collection, handling, and analyses activities. The Sampling and Analysis Project Manager, or a designee, will be responsible for all sample tracking and COC procedures. This person will be responsible for final sample inventory, maintenance of sample custody documentation, and completion of COC forms prior to transferring samples to the analytical laboratory. A COC form will accompany each cooler of samples to the respective analytical laboratories. Each person who has custody of the samples will sign the COC form; a copy of the COC form will be retained in the project file.

Each Laboratory Project Manager will ensure that COC forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms. The Laboratory Project Manager will contact the Sampling and Analysis Project Manager, or designee, immediately if discrepancies between the COC forms and the sample shipment are discovered.

5. LABORATORY ANALYSES

Chemical and conventional analyses will be performed each sample as described in Section 5.1. Each sample will be evaluated based upon previously targeted remediation goals (Weston 2007b). Each sediment core will be analyzed for the compounds identified at the bottom of the previously sampled cores from that sample location (Table 3-6).

5.1 Chemical and Conventional Analyses

All sediment chemical and conventional analyses will be conducted in accordance with USACE/EPA guidelines (USACE/EPA 1991, 1998) and as described in Section 4. The proposed methods, and targeted reporting limits are provided in Table 5-1. All sediment analytical results will be presented on a dry weight basis (e.g., mg/kg or μg/kg, dry wt). Matrix spikes and sample duplicate analyses will be performed on the site samples. All samples will be maintained according to the appropriate holding times and temperatures for each analysis (presented in Appendix D).

5.2 Quality Assurance (QA) Objectives

Quality assurance procedures to be used for sediment characterization and testing are consistent with methods described in USEPA/USACE (1991, 1995, 1998) and USEPA (1998, 2002). The methods employed in this sediment sampling and characterization program are detailed in standard guides (*e.g.*, Standard Methods, ASTM, USEPA, etc.) and Standard Operating Procedures are maintained in the bioassay and analytical laboratories.

All QA/QC records for the various testing programs are kept on file for review by regulatory personnel.

5.2.1 Chemical and Physical Analyses Quality Assurance

5.2.1.1 Accuracy - Accuracy estimates will be based on analyses of lab blanks, analytical recoveries of matrix spikes of test samples and laboratory control materials, and analysis of certified reference material. Results from spikes and/or reference materials are reported as "percent recovery", determined by comparing the measured analyte concentrations of the Standard Reference Materials, Laboratory Control Materials, or matrix spikes to the "True Value". Percent Recovery will be reported along with the corresponding acceptance ranges. Where possible, surrogate compounds will be spiked into each sample and surrogate percent recovery will be reported along with the corresponding control limits.

Matrix spikes are added prior to processing the sample and carried through the entire analytical procedure. Matrix spike data for both trace metals and organics will be provided at a frequency of one set of duplicate spikes per QA batch.

Table 5-1. List of Analytes, Methods, and Targeted Reporting Limits (dry weight)

Analyte	Reference Method	Targeted Reporting Limit
Metals		
Arsenic	Method 6020	2 mg/kg
Cadmium	Method 6020	0.3 mg/kg
Chromium	Method 6020	5 mg/kg
Copper	Method 6020	5 mg/kg
Lead	Method 6020	5 mg/kg
Mercury	Method 7471A	0.02 mg/kg
Nickel	Method 6020	5 mg/kg
Selenium	Method 6020	0.1 mg/kg
Silver	Method 6020	0.2 mg/kg
Zinc	Method 6020	1 mg/kg
Butyltins		
Mono-Butyltin	Krone 1989	10 μg/kg
Di-butyltin	Krone 1989	10 μg/kg
Tri-butyltin	Krone 1989	10 μg/kg
Tetra-butyltin	Krone 1989	10 μg/kg
Pesticides		
2,4'-DDD	Method 8081B	2 μg/kg
2,4'-DDE	Method 8081B	2 μg/kg
2,4'-DDT	Method 8081B	2 μg/kg
4,4'-DDD	Method 8081B	2 μg/kg
4,4'-DDE	Method 8081B	2 μg/kg
4,4'-DDT	Method 8081B	2 μg/kg
Total DDT	Method 8081B	2 μg/kg
Grain Size	ASTM 1992 or Plumb 1981	0.1
Total Solids	Method 160.3	0.10%
Total Organic Carbon (TOC)	Method 415.1 or Plumb 1981	0.10%

NOTES: μg/kg – microgram/kilogram
mg/kg – milligram/kilogram

5.2.1.2 Precision - Precision will be estimated by analyzing duplicate samples and matrix spike duplicate samples. Duplicate analyses are performed on actual site samples and not on reference samples. Results from duplicate analyses of the actual test samples may also indicate homogeneity of the sample matrix. Relative percent differences (RPDs) are calculated for all duplicate samples or spikes and are reported along with acceptance ranges (typically 0-30%).

5.2.1.3 Analytical Methods - All sample analyses will be performed using EPA Methods, where applicable (see above for method specification for each analyte group). Daily logs of instrument performance are maintained, including initial and continuing calibration verification.

5.2.2 Deviations from Protocol

Any deviations from approved SOPs or this SAP will be summarized and qualified with respect to how they may have affected data quality.

6. DATA MANAGEMENT

Analytical results will be provided by all subcontract analytical laboratories in both hard copy and electronic format. All data will be reviewed by the PER Project Manager to ensure that the data quality objectives for each analysis are met and that both the electronic and hard copy forms of data are accurate. Hard copies of all data reports will be placed in the project files at PER; electronic data reports will be archived on PER's server, and will be available for electronic transfer to Gambol staff and the CSTF, if requested.

7. DATA ANALYSIS AND INTERPRETATION

Data will be analyzed and presented clearly with all analytical data reviewed for accuracy prior to reporting; data will be presented in tabular form. Data analysis of sediment chemistry and conventional parameters will consist of tabulation and comparison with remediation goals consistent with previous studies (Weston 2005, 2007a, 2007b) performed at the SWM leasehold area (Table 1). Sediment chemistry results will also be used to assist in evaluating appropriate site remediation. All analytical data will be reviewed for accuracy prior to reporting; data will be presented in tabular form. All sediments below the proposed remediation goal will be considered suitable for dredging and disposal at the proposed CDF site within the SWM Parcel 4.

Table 7-1. Summary of Proposed Sediment Remediation Goals

Analyte	Proposed Remediation Goal	Units	Type	Reference
Arsenic	70	mg/kg	ER-M	Long et al 1995
Copper	254	mg/kg	Port	CSTF 2008
Lead	218	mg/kg	ER-M	Long et al 1995
Mercury	0.71	mg/kg	ER-M	Long et al 1995
Zinc	410	mg/kg	ER-M	Long et al 1995
DDD	20	µg/kg	ER-M	Long et al 1995
DDE	27	µg/kg	ER-M	Long et al 1995
Total DDT	46.1	µg/kg	ER-M	Long et al 1995
Tributyltin	100	µg/kg	Port	Weston 2007a

8. REPORTING AND DELIVERABLES

8.1 Sampling and Analysis Results

PER will prepare a Final Sampling & Analysis Data Report documenting all activities associated with the collection, transportation, handling (e.g. compositing), sample shipment, and chemical and conventional analyses of the sediment samples. All Lab Data Reports received from sub-contracting analytical laboratories will be included as appendices to the Final Data Report. At a minimum, the following will be included in the Final Data Report:

1. Summary of all field activities, including a description of any deviations from the approved SAP;
2. Locations of sediment sampling stations in latitude and longitude (in degrees and minutes to 3 decimal places). All vertical elevations of mud-line and water surface will be reported to the nearest 0.1 ft. relative to MLLW;
3. A project map with actual sampling locations;
4. Analytical data results and QA/QC review; and
5. Summary of comparison of chemical results.

9. REFERENCES

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Weston (2007a) Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine Leasehold Areas for Use in Remediation Efforts, Port of Los Angeles, San Pedro, California. Prepared by Weston Solutions, Inc. Prepared for Port of Los Angeles, Environmental Division May 2007.

Weston (2007b) Southwest Marine Aquatic Leasehold Area: Volume Estimates for Remediation. Final Report. Prepared by Weston Solutions, Inc. Prepared for Port of Los Angeles, Environmental Division May 2007.

Appendix A

Summary of Previous Chemical Characterization Relative to Project Design Depth

Table 3-1a. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 1 - 2005).

Depth of Sample	Core Location Identification																					
	1 (2005)												2 (2005)									
	Depth Below Mud Line	**As**	**Cd**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDT**	**TBT**	Depth Below Mud Line	**As**	**Cu**	**Pb**	**Hg**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDT**	**TBT**
Units (dry wt.)		mg/kg							µg/kg					mg/kg					µg/kg			
ER-L		8.2	1.2	34	46.7	0.15	20.9	150	2	2.2	1.00	NA		8.2	34	46.7	0.15	150	2	2.2	1.00	NA
ER-M		**70**	**9.6**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	**7**	NA		**70**	270	**218**	**0.71**	**410**	**20**	**27**	**7**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	NA	**100**
-22																						
-24																						
-26																						
-28																						
DL-30																						
OD-32	0	13.5	0.94	242	109	0.722	15.7	425	11	20	16	23										
-34	2												0	11.4	267	288	2.18	312	<1.4	7.2	5.1	64
-36	4	12.5	1.72	127	337	3.23	30.2	571	23	5.4	120	<4.8	2	11.2	108	52.5	0.692	185	8.4	28	19	30
-38	6	15.4	0.98	79.4	114	1.29	46.7	190	<1.6	<1.6	<1.6	<4.8	4	5.21	41.5	51.5	0.44	116	1.8	4.7	<1.2	4.1
-40	8												6									
-42																						
Termination of Boring																						

ER-L = Effect Range Low (Long et al 1995)
ER-M = Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD = Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-1b. Smmary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 1 - 2007).

Depth of Sample	Core Location Identification																	
	37 (2007)									**38 (2007)**								
	Depth Below Mud Line	**Cu**	**Hg**	**Pb**	**4, 4'-DDD**	**4, 4'-DDE**	**4, 4'-DDT**	**∑DDT**	**TBT**	Depth Below Mud Line	**As**	**Cu**	**Hg**	**Pb**	**Zn**	**4, 4'-DDE**	**∑DDT**	**TBT**
Units (dry wt.)		mg/kg			µg/kg						mg/kg					µg/kg		
ER-L		34	0.15	46.7	2.0	2.2	1	1.58	NA		8.2	34	0.15	46.7	150	2.2	1.58	NA
ER-M		270	**0.71**	**218**	**20**	**27**	**7**	**46.1**	NA		**70**	270	**0.71**	**218**	**410**	**27**	**46.1**	NA
Other*		**254**	NA	NA	NA	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	**100**
-22																		
										0	10.2	403	0.94	470	250	100	100	2100
-24																		
										2								
-26											3.35	14.1	0.064	3.63	83.8	10	10	3.9
										4								
-28											3.65	6.51	0.03	5.09	150	<1.3	0	<3.9
										6								
DL -30																		
OD -32																		
-34	0	128	0.59	59.5	<1.3	7.3	<1.3	7.3	61									
-36	2																	
-38	4																	
		76.9	0.98	28.7	5.3	11	6.1	22.4	52									
-40	6																	
		65.5	0.62	73.9	4.3	13	<1.3	17.3	29									
-42	8																	
Termination of Boring																		

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-2a. Sumary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 2 - 2005).

Depth of Sample	Core Location Identification																					
	3 (2005)											**3B (2005)**										
	Depth Below Mud Line	**As**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**TBT**	Depth Below Mud Line	**As**	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**4,4'-DDE**	**TBT**
Units (dry wt.)		mg/kg							µg/kg				mg/kg								µg/kg	
ER-L		8	81	34	47	0.15	20.9	150	2	2.2	NA		8	1.2	81	34	47	0.15	20.9	150	2.2	NA
ER-M		**70**	**370**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	NA		**70**	**9.6**	**370**	270	**218**	**0.71**	**51.6**	**410**	**27**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	NA	**100**		NA	NA	NA	**254**	NA	NA	NA	NA	NA	**100**
-36																						
	0	7.07	79.3	1190	192	2.15	6.88	831	45	<1.3	850											
-38																						
	2																					
-40												0	19	0.960	92.5	406	92.6	0.766	45.1	350	31	260
	4																					
-42		5.35	47.2	871	159	4.39	4.35	924	10	31	150	2										
	6																					
-44		19.9	257	2610	385	7.5	45.1	704	14	72	21	4										
	8												23.6	2.15	161	658	230	2.7	51.2	547	210	2800
DL-46												6										
OD-48																						
-50																						
-52																						
Termination of Boring																						

ER-L = Effect Range Low (Long et al 1995)
ER-M = Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD = Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-2b. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 2 - 2007).

Depth of Sample	Core Location Identification																																	
	3 (2007)												**39 (2007)**												**42 (2007)**									
	Depth Below Mud Line	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Pb**	**Ni**	**Zn**	**4, 4'-DDE**	**∑DDT**	**TBT**	Depth Below Mud Line	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Pb**	**Ni**	**Zn**	**4, 4'-DDD**	**4, 4'-DDE**	**∑DDT**	**TBT**	Depth Below Mud Line	**As**	**Cu**	**Hg**	**Pb**	**Ni**	**Zn**	**4, 4'-DDE**	**∑DDT**	**TBT**
Units (dry wt.)		mg/kg								µg/kg				mg/kg								µg/kg					mg/kg						µg/kg		
ER-L		8.2	1.2	81	34	0.15	46.7	20.9	150	2.2	1.58	NA		8.2	1.2	81	34	0.15	46.7	20.9	150	2	2.2	1.58	NA		8.2	34	0.15	46.7	20.9	150	2.2	1.58	NA
ER-M		**70**	**9.6**	**370**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA		**70**	**9.6**	**370**	270	**0.71**	**218**	**51.6**	**410**	**20**	**27**	**46.1**	NA		**70**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA
Other*		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	**100**		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	NA	**100**
-38	0	-	-	-	-	-	-	-	-	-	-	-	0	24.1	1.5	114	593	1.18	158	44.1	619	7.3	27	34.3	870										
-40	2												2													0	11	261	0.98	327	22.4	227	96	96	620
-42	4												4													2										
-44	6												6	31.7	2.38	221	1180	9.34	586	42.2	724	<1.9	230	230	270		4	8.17	158	1.69	73.4	13.6	156	27	27	46
DL-46	8												8	11.3	0.502	60.7	394	1.47	117	13.7	211	<1.4	64	64	36		6	2.11	6.7	0.07	2.55	9.75	79.4	<1.2	0	<3.7
OD-48		27.3	1.45	176	1970	7.83	383	31.1	671	170	170	17		2.7	<0.125	8.69	19	0.04	6.56	5.15	27.4	<1.2	12	12	-											
-50	10												10																							
-52	12	2.22	<0.123	7.25	10.8	0.0958	3.46	4.62	21.2	3.4	3.4	9																								
	14																																			
Termination of Boring																																				

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-3a. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 3 - 2005).

Core Location Identification

10 (2005)

Depth of Sample	Depth Below Mud Line	As	Cu	Pb	Hg	Ni	Zn	4,4'-DDE	4,4'-DDT	TBT
Units (dry wt.)		mg/kg						µg/kg		
ER-L		8	34	47	0.15	20.9	150	2.2	1.00	NA
ER-M		**70**	270	**218**	**0.71**	**51.6**	**410**	**27**	**7**	NA
Other*		NA	**254**	NA	NA	NA	NA	NA	NA	**100**
-38										
-40										
-42										
-44										
-46										
-48	0	21.6	953	91.4	0.906	31.3	496	25	21	3500
-50	2									
DL-52	4									
OD-54	6									
-56	8									
-58										
-60										
Termination of Boring										

13 (2005)

Depth of Sample	Depth Below Mud Line	As	Cd	Cu	Pb	Hg	Ni	Zn	DDD	4,4'-DDE	4,4'-DDT	TBT
Units (dry wt.)		mg/kg							µg/kg			
ER-L		8	1.2	34	47	0.15	20.9	150	2	2.2	1.00	NA
ER-M		**70**	**9.6**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	**7**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	NA	NA	**100**
-38												
-40												
-42												
-44												
-46												
-48	0	17	0.7	490	62.1	0.553	38.3	286	7.2	19	12	2800
-50	2											
DL-52	4	42	1.75	746	155	0.421	37.9	714	<1.9	45	<1.9	4400
OD-54	6											
-56	8											
-58												
-60												
Termination of Boring												

14 (2005)

Depth of Sample	Depth Below Mud Line	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	4,4'-DDD	4,4'-DDE	TBT
Units (dry wt.)		mg/kg								µg/kg		
ER-L		8	1.2	81	34	47	0.15	20.9	150	2	2.2	NA
ER-M		**70**	**9.6**	**370**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	NA
Other*		NA	NA	NA	**254**	NA	NA	NA	NA	NA	NA	**100**
-38												
-40												
-42												
-44	0	17.7	0.872	56	225	70.4	0.581	43	254	<2.6	17	150
-46	2											
-48	4	29.1	1.44	115	485	188	1.64	39.9	547	6.6	49	980
-50	6											
DL-52												
OD-54												
-56												
-58												
-60												
Termination of Boring												

15 (2005)

Depth of Sample	Depth Below Mud Line	As	Cd	Cu	Pb	Hg	Ni	Zn	4,4'-DDD	4,4'-DDE	TBT
Units (dry wt.)		mg/kg							µg/kg		
ER-L		8	1.2	34	47	0.15	20.9	150	2	2.2	NA
ER-M		**70**	**9.6**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	NA	**100**
-38											
-40											
-42											
-44											
-46											
-48	0	30	1.2	948	125	0.652	25.7	567	<1.8	19	3700
-50	2										
DL-52	4	17	0.5	211	71	0.682	12.8	475	6.5	21	340
OD-54	6	3.2	<0.12	42	12	0.0732	7.71	77.1	<1.3	28	71
-56											
-58											
-60											
Termination of Boring											

ER-L = Effect Range Low (Long et al 1995)
ER-M = Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD = Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-3b. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 3 - 2007).

Core Location Identification

10 (2007)

Depth of Sample	Depth Below Mud Line	As	Cu	Hg	Pb	Zn	4, 4'-DDE	∑DDT	TBT
Units (dry wt.)		mg/kg					µg/kg		
ER-L		8.2	34	0.15	46.7	150	2.2	1.58	NA
ER-M		**70**	270	**0.71**	**218**	**410**	**27**	**46.1**	NA
Other*		NA	**254**	NA	NA	NA	NA	NA	**100**
-38									
-40									
-42									
-44									
-46									
-48	0								
-50	2	-	-	-	-	-	-	-	-
DL-52	4	11.8	388	2.01	170	390	72	72	850
OD-54	6	5.49	17.9	0.05	4.62	42.7	1.4	1.4	8.2
-56	8								
-58									
-60									
Termination of Boring									

13 (2007)

Depth of Sample	Depth Below Mud Line	As	Cd	Cr	Cu	Hg	Pb	Zn	4, 4'-DDD	4, 4'-DDE	∑DDT	TBT
Units (dry wt.)		mg/kg							µg/kg			
ER-L		8.2	1.2	81	34	0.15	46.7	150	2	2.2	1.58	NA
ER-M		**70**	**9.6**	**370**	270	**0.71**	**218**	**410**	**20**	**27**	**46.1**	NA
Other*		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	**100**
-38												
-40												
-42												
-44												
-46	0	-	-	-	-	-	-	-	-	-	-	-
-48	2											
-50	4											
DL-52	6				170							
OD-54	8	170	6.91	88.1	-	0.24	693	3990	<1.3	42	42	1800
-56	10											
-58	12											
-60	14	25.5	1.37	476	1480	0.191	420	-	35	44	79	3300
Termination of Boring												

30 (2007)

Depth of Sample	Depth Below Mud Line	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn	4, 4'-DDE	∑DDT	TBT
Units (dry wt.)		mg/kg								µg/kg		
ER-L		8.2	1.2	81	34	0.15	46.7	20.9	150	2.2	1.58	NA
ER-M		**70**	**9.6**	**370**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA
Other*		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	**100**
-38												
-40												
-42												
-44												
-46												
-48	0	32.2	1.21	95.9	1330	1.05	125	39.5	650	26	26	2300
-50	2											
DL-52	4	35.7	1.67	255	1320	2.43	358	31.9	1340	97	97	2600
OD-54	6	7.59	0.287	24.7	61.2	0.22	12.3	14.3	95.7	1.8	1.8	94
-56	8											
-58												
-60												
Termination of Boring												

31 (2007)

Depth of Sample	Depth Below Mud Line	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn	4, 4'-DDE	∑DDT	TBT
Units (dry wt.)		mg/kg								µg/kg		
ER-L		8.2	1.2	81	34	0.15	46.7	20.9	150	2.2	1.58	NA
ER-M		**70**	**9.6**	**370**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA
Other*		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	**100**
-38	0	25.4	0.96	78.5	680	0.63	105	42.2	495	37	37	950
-40	2											
-42	4											
-44		22.3	1.25	115	704	3.21	210	33.7	1710	86	140	610
-46	6											
-48	8	2.06	<0.12:	6.41	15.6	0.05	2.62	4.17	21.7	2.4	2.4	30
-50												
DL-52												
OD-54												
-56												
-58												
-60												
Termination of Boring												

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-3b. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 3 - 2007). ***(continued)***

Core Location Identification

Depth of Sample	32 (2007)													33 (2007)												34 (2007)									43 (2007)				
	Depth Below Mud Line	As	Cr	Cu	Hg	Pb	Ni	Zn	4, 4'-DDD	4, 4'-DDE	4, 4'-DDT	∑DDT	TBT	Depth Below Mud Line	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn	4, 4'-DDD	4, 4'-DDE	∑DDT	TBT	Depth Below Mud Line	As	Cu	Hg	Pb	Ni	Zn	4, 4'-DDE	∑DDT	TBT	Depth Below Mud Line	Hg	4, 4'-DDE	∑DDT	TBT
Units (dry wt.)		mg/kg							µg/kg						mg/kg								µg/kg					mg/kg						µg/kg				mg/kg	µg/kg			
ER-L		8.2	81	34	0.15	46.7	20.9	150	2	2.2	2	1.58	NA		8.2	1.2	81	34	0.15	46.7	20.9	150	2	2.2	1.58	NA		8.2	34	0.15	46.7	20.9	150	2.2	1.58	NA		0.15	2.2	1.58	NA
ER-M		**70**	**370**	270	**0.71**	**218**	**51.6**	**410**	**20**	**27**	**20**	**46.1**	NA		**70**	**9.6**	**370**	270	**0.71**	**218**	**51.6**	**410**	**20**	**27**	**46.1**	NA		**70**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA		**0.71**	**27**	**46.1**	NA
Other*		NA	N/A	**254**	NA	NA	NA	NA	NA	NA	NA	NA	**100**		NA	N/A	N/A	**254**	NA	NA	NA	NA	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	NA	**100**		NA	NA	NA	**100**
-38																																									
-40																																									
-42																																									
-44																																						0	0.05	3.3	3.3	12
-46	0	23.3	87.9	1160	0.63	83.4	43.6	506	<2.2	33	<2.2	33	4200	0	28.4	1.13	83.6	1150	1.08	102	43.6	567	<2.3	32	32	650	0	17.6	244	0.62	57.6	42.7	281	17	17	140	2				
-48	2													2													2									4	0.41	<1.2	0	<3.7
-50	4													4	76.2	2.99	117	1350	1.33	272	40.8	1600	<2.4	36	36	670	4									6				
PD-52		12	80.1	625	0.53	98.8	13.8	676	8.1	36	14	58.1	490															21.7	641	0.6	81.7	27.2	366	22	22	580					
	6													6													6													
OD-54		3.05	14.8	54.9	0.17	20.9	4.95	79.6	<1.2	13	<1.2	13	600		35.2	1.72	124	997	3.22	248	37.1	1100	23	78	101	2600		9.67	163	0.51	37.8	13.2	198	31	31	230					
	8													8													8													
-56														10	2.01	2.97	6.73	11.4	<0.02	2.42	5.71	33.4	<1.2	1.3	1.3	94	10														
-58														12													12													
-60																																									
Termination of Boring																																									

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-4a. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 4 - 2005).

Depth of Sample	Core Location Identification																																
	9 (2005)										**11 (2005)**						**12 (2005)**											**16 (2005)**					
	Depth Below Mud Line	**As**	**Cr**	**Cu**	**Pb**	**Hg**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**TBT**	Depth Below Mud Line	**Cu**	**Pb**	**Hg**	**4,4'-DDE**	**TBT**	Depth Below Mud Line	**As**	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**TBT**	Depth Below Mud Line	**Cu**	**Hg**	**4,4'-DDE**	**4,4'-DDT**	**TBT**
Units (dry wt.)		mg/kg						µg/kg				mg/kg			µg/kg			mg/kg							µg/kg				mg/kg		µg/kg		
ER-L		8	81	34	47	0.15	150	2	2.2	NA		34	47	0.15	2.2	NA		8	1.2	81	34	47	0.15	150	2	2.2	NA		34	0.15	2.2	1.00	NA
ER-M		**70**	**370**	270	**218**	**0.71**	**410**	**20**	**27**	NA		270	**218**	**0.71**	**27**	NA		**70**	**9.6**	**370**	270	**218**	**0.71**	**410**	**20**	**27**	NA		270	**0.71**	**27**	**7**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	**100**		**254**	NA	NA	NA	**100**		NA	NA	NA	**254**	NA	NA	NA	NA	NA	**100**		**254**	NA	NA	NA	**100**
-22																	0	10.4	0.749	116	465	593	5.37	840	22	160	1100						
-24	0	13.1	187	440	320	13.8	653	8	58	280							2																
-26	2																4																
-28	4																6	12	1.77	157	1140	1100	54.8	2050	<1.5	<1.5	61	0	48.3	0.186	11	2.8	25
DL-30	6	3.89	29.3	100	60.8	28.9	112	<1.2	<1.2	29							8											2					
OD-32	8	3.2	8.15	18.7	7.23	3.27	37	<1.3	4.2	13							10	4.25	0.142	9.89	16.2	13.8	1.21	388	<1.3	3.9	8.6	4					
-34	10										0	171	27.8	0.184	12	310												6	10.6	0.135	1.6	<1.2	4.4
-36	12										2																	8					
-38											4																						
-40											6	21.7	1.9	<0.0241	<1.2	8.8																	
-42											8																						
Termination of Boring																																	

ER-L = Effect Range Low (Long et al 1995)
ER-M = Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD = Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-4b. Summary of the chemical analysis of Southwest Marine sediment core sample results (Dredge Unit 4 - 2007).

Depth of Sample	Core Location Identification																								
	26 (2007)										**27 (2007)**						**44 (2007)**								
	Depth Below Mud Line	**As**	**Cu**	**Hg**	**Pb**	**Ni**	**Zn**	**4, 4'-DDD**	**∑DDT**	**TBT**	Depth Below Mud Line	**Cu**	**Hg**	**4, 4'-DDD**	**∑DDT**	**TBT**	Depth Below Mud Line	**As**	**Cu**	**Hg**	**Pb**	**Zn**	**4, 4'-DDE**	**∑DDT**	**TBT**
Units (dry wt.)		mg/kg						µg/kg				mg/kg		µg/kg				mg/kg					µg/kg		
ER-L		8.2	34	0.15	46.7	20.9	150	2.2	1.58	NA		34	0.15	2.2	1.58	NA		8.2	34	0.15	46.7	150	2.2	1.58	NA
ER-M		**70**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA		**270**	**0.71**	**27**	**46.1**	NA		**70**	270	**0.71**	**218**	**410**	**27**	**46.1**	NA
Other*		NA	**254**	NA	NA	NA	NA	NA	NA	**100**		254	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	**100**
-22																	0	11.6	343	1.29	293	391	<1.4	0	420
-24																	2								
-26																	4								
																		13.5	422	16	854	-	<1.3	0	240
-28																	6								
	0	3.95	40.7	0.61	49.1	6.83	125	5.3	5.3	50	0	51.3	0.61	9.6	9.6	38		11.2	377	0.131	276	659	<1.3	0	92
DL-30																	8								
	2										2							2.86	4.14	<0.120	3.31	14.6	-	-	-
OD-32		13.9	91.6	0.348	42.3	22.5	219	50	50	160							10								
	4										4														
-34		3.98	40	0.1	10.6	6.61	61.5	2.2	2.2	18		8.36	0.14	<1.2	0	<3.7									
	6										6														
-36																									
-38																									
-40																									
-42																									
Termination of Boring																									

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Table 3-5. Summary of the chemical analysis of Southwest Marine sediment core sample results (Optional Dredge Unit 2005/2007).

Depth of Sample	Core Location Identification																										
	1 (2005)												**42 (2007)**										**43 (2007)**				
	Depth Below Mud Line	**As**	**Cd**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDT**	**TBT**	Depth Below Mud Line	**As**	**Cu**	**Hg**	**Pb**	**Ni**	**Zn**	**4, 4'-DDE**	**∑DDT**	**TBT**	Depth Below Mud Line	**Hg**	**4, 4'-DDE**	**∑DDT**	**TBT**
Units (dry wt.)		mg/kg							µg/kg					mg/kg						µg/kg				mg/kg	µg/kg		
ER-L		8.2	1.2	34	46.7	0.15	20.9	150	2	2.2	1.00	NA		8.2	34	0.15	46.7	20.9	150	2.2	1.58	NA		0.15	2.2	1.58	NA
ER-M		**70**	**9.6**	270	**218**	**0.71**	**51.6**	**410**	**20**	**27**	**7**	NA		**70**	270	**0.71**	**218**	**51.6**	**410**	**27**	**46.1**	NA		**0.71**	**27**	**46.1**	NA
Other*		NA	NA	**254**	NA	NA	NA	NA	NA	NA	NA	**100**		NA	**254**	NA	NA	NA	NA	NA	NA	**100**		NA	NA	NA	**100**
-22																											
-24																											
-26																											
-28																											
DU 1 DL-30																											
DU 1 OD-32	0	13.5	0.94	242	109	0.72	15.7	425	11	20	16	23															
-34	2																										
-36	4	12.5	1.72	127	337	3.23	30.2	571	23	5.4	120	<4.8															
-38	6	15.4	0.98	79.4	114	1.29	46.7	190	<1.6	<1.6	<1.6	<4.8															
-40	8												0	11	261	0.98	327	22.4	227	96	96	620					
-42													2														
-44													4	8.17	158	1.69	73.4	13.6	156	27	27	46	0	0.05	3.3	3.3	12
DU 2 DL-46																											
DU 2 OD-48													6	2.11	6.7	0.07	2.55	9.75	79.4	<1.2	0	<3.7	2				
-50																							4	0.41	<1.2	0	<3.7
DU 3 DL-52																							6				
DU 3 OD-54																											
-56																											
-58																											
-60																											
Termination of Boring																											

ER-L = Effect Range Low (Long et al 1995)
ER-M Effects Range Median (Long et al 1995)
DL = Design Depth Dredge Limit
OD =Over Dredge
*Other: -copper = CSTF 2008, TBT = Weston 2007a

Appendix B

Report
Southwest Marine Aquatic Leasehold Area: Volume Estimates for Remediation

Southwest Marine Aquatic Leasehold Area: Volume Estimates for Remediation Final Report

Prepared For:

Port of Los Angeles
Environmental Division

Prepared By:

Weston Solutions, Inc.
2433 Impala Drive
Carlsbad, California 92010

May 2007

PURPOSE AND NEED

Southwest Marine (SWM) has vacated their leasehold at 985 Seaside Avenue on Terminal Island in the Port of Los Angeles (Port). Initial land and waterside evaluations for environmental pollutants have been completed by the Port. Results of these evaluations show contaminated sediments and soils requiring remediation. The Port is currently engaged in developing a strategy for management of the contaminated material in the leasehold area. This document is intended to facilitate the Port's development of a scope and cost estimate for management of contaminated sediments in the waterside portions of the leasehold. Maps and volumes of material that require management are presented. Volume estimates are based on sediment characterization studies conducted by Weston (Weston 2005; 2007) on behalf of the Port.

VOLUME ESTIMATES FOR MATERIAL REQUIRING REMEDIATION

The area requiring remediation within Parcel 4 and adjacent to Parcels 5 and 6 of the leasehold area was defined by the relative sediment concentrations of specific contaminants within these parcels, as measured by Weston (2005).

Depth and Extent of Sediment Requiring Remediation

Multiple endpoints were used to assist the Port in determining the appropriate depths for sediment removal or remediation for the affected sediments. Specifically, contamination in sediment from the SWM leasehold area was assessed by the following: (1) exceedance of the toxicity threshold limit concentration (TTLC) levels, (2) exceedance of copper concentrations greater than 254 mg/kg, and (3) exceedance of TBT concentrations greater than 100 µg/kg, based on an extensive literature review conducted by Weston (Appendix A). The rationale for why these endpoints were used to estimate sediment requiring remediation is described in detail below.

Chemistry results from the sediment investigations (Weston 2005; 2007) were used to determine the deepest core segment where the constituent of concern exceeded the criteria. Core locations were plotted in GIS and the deepest depth of contamination for each criterion was assigned to each location. A surface of interpolated depth values using the natural neighbor technique was created in GIS for the three criteria. Natural neighbor interpolation finds the closest subset of input samples to a point and applies weights to them based on proportionate areas in order to interpolate a value. It does not infer trends and will not produce peaks, pits, ridges or valleys that are not already represented by the input samples. The surface represented the depth that dredging would to need to be done to remove the contamination to below the exceedance criteria. A volume of dredge material was calculated in GIS for each criterion. A 625 square foot grid size with two foot depth intervals was chosen to represent the remediation unit (1,250 cubic feet = 46.3 cubic yards [cy]).

TTLC

Exceedance of a TTLC is indicative of material that must be managed as hazardous waste in accordance with the Title 40 Code of Federal Regulations (CFR) part 261 and Title 22 of the California Code of Regulations. From Weston (2005; 2007), copper, mercury, lead, and zinc exceeded their respective TTLC values at specific stations within and adjacent to the aquatic leasehold areas. The volume of hazardous material within and adjacent to the aquatic leasehold

areas is shown in Figure 1. Based on interpolation of the deepest sediments with TTLC exceedances, approximately 47,500 cy of material will require remediation.

Copper

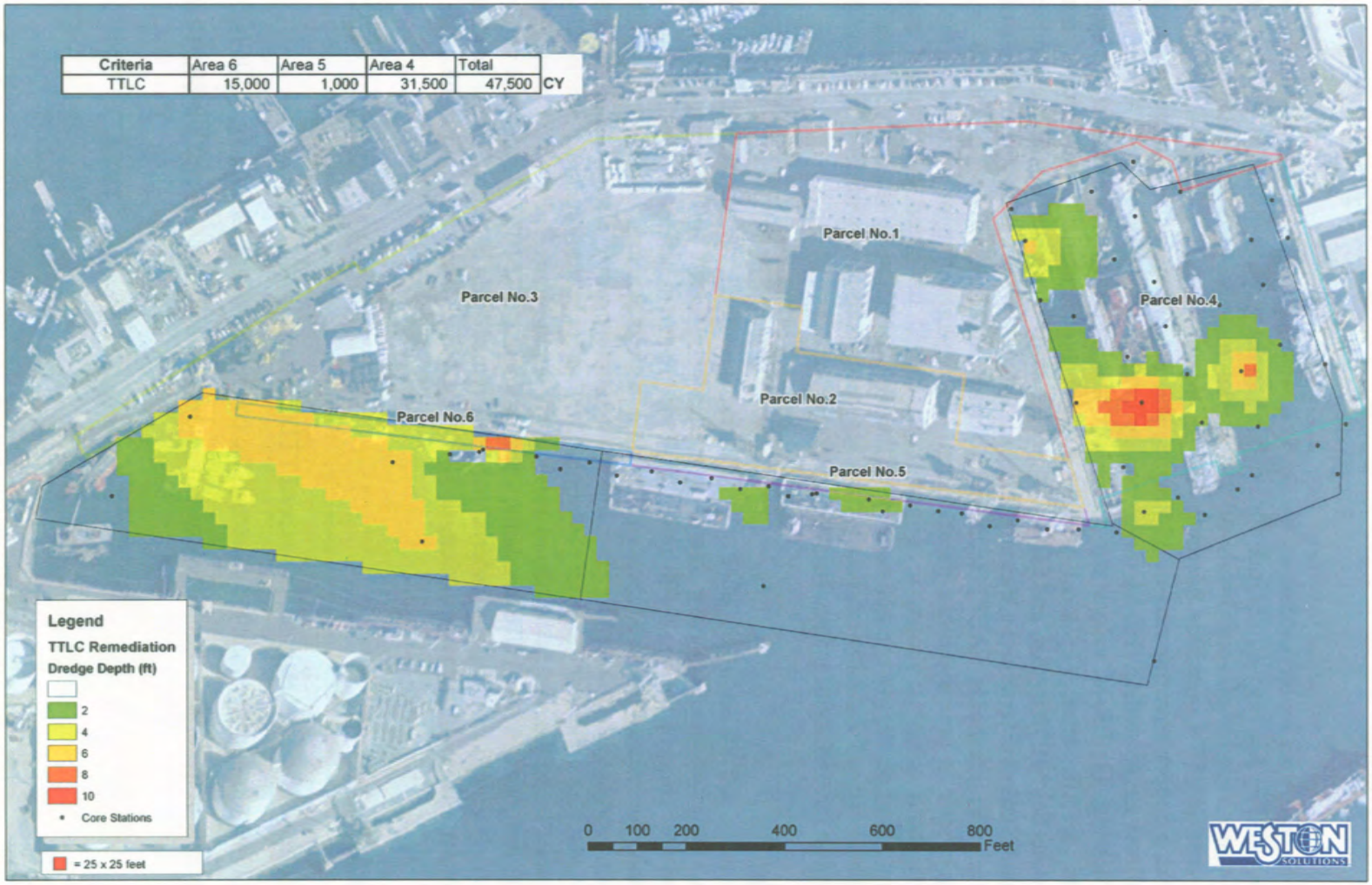
Based on the previous recommendations by the Los Angeles Region Contaminated Sediments Task Force (CSTF) Advisory Committee for dredging in the vicinity of Berths 48-52 in the Port of Los Angeles, copper cleanup levels of 254 mg/kg may be recommended for the SWM leasehold area (CSTF Committee Meeting Record, March 18, 2003). The CSTF committee decided that a copper concentration of 254 mg/kg was a more appropriate target cleanup level than the effects range-median (ER-M, developed by Long et al., 1995) value (270 mg/kg) based on the following: (1) ER-M values are derived from a nationwide database and may not be relevant to specific sites, (2) local studies suggest bioaccumulation of copper occur at concentrations below 270 mg/kg, and (3) a site-specific study conducted by the Navy at the Long Beach Naval Station determined a cleanup level of 254 mg/kg was more appropriate (using an apparent effects thresholds [AET] sediment toxicity approach). The volume of material containing copper at concentrations greater than 254 mg/kg within or adjacent to the SWM aquatic leasehold areas is shown in Figure 2. It should be noted the material requiring remediation based on copper encompasses all of the material requiring remediation based on the TTLC criteria. Based on interpolation of the deepest sediments with copper exceedances, approximately 106,000 cy of material will require remediation.

Tributyltin

Currently there are no sediment quality objectives, guidelines, or target cleanup levels for tributyltin. However, an extensive literature review conducted by Weston (Appendix A) determined that concentrations of 100 μg/kg TBT or greater in sediment have the potential to cause toxicity, or meaningful ecological effects, to aquatic organisms. Consequently, 100 μg/kg (or greater) was used as an alternate guideline for estimating remediation volumes in the SWM leasehold area. The volume of material containing TBT at concentrations greater than 100 μg/kg, within or adjacent to the aquatic leasehold areas, is shown in Figure 3. Based on interpolation of the deepest sediments with TBT exceedances, approximately 80,510 cy of material will require remediation. It should be noted the material requiring remediation based on copper encompasses 89% of the material requiring remediation, or 71,000 cy, based on the TBT guideline.

SUMMARY

- Total volume of material estimated to exceed TTLC criteria is 47,500 cy.
- Total volume of material estimated to exceed the copper criteria of 254 mg/kg is 106,000 cy.
- Total volume of material estimated to exceed the TBT guideline of 100 μg/kg is 80,510 cy.



Criteria	Area 6	Area 5	Area 4	Total	
TTLC	15,000	1,000	31,500	47,500	CY

Figure 1: Footprint and volumes of material requiring remediation based on TTLC exceedances.

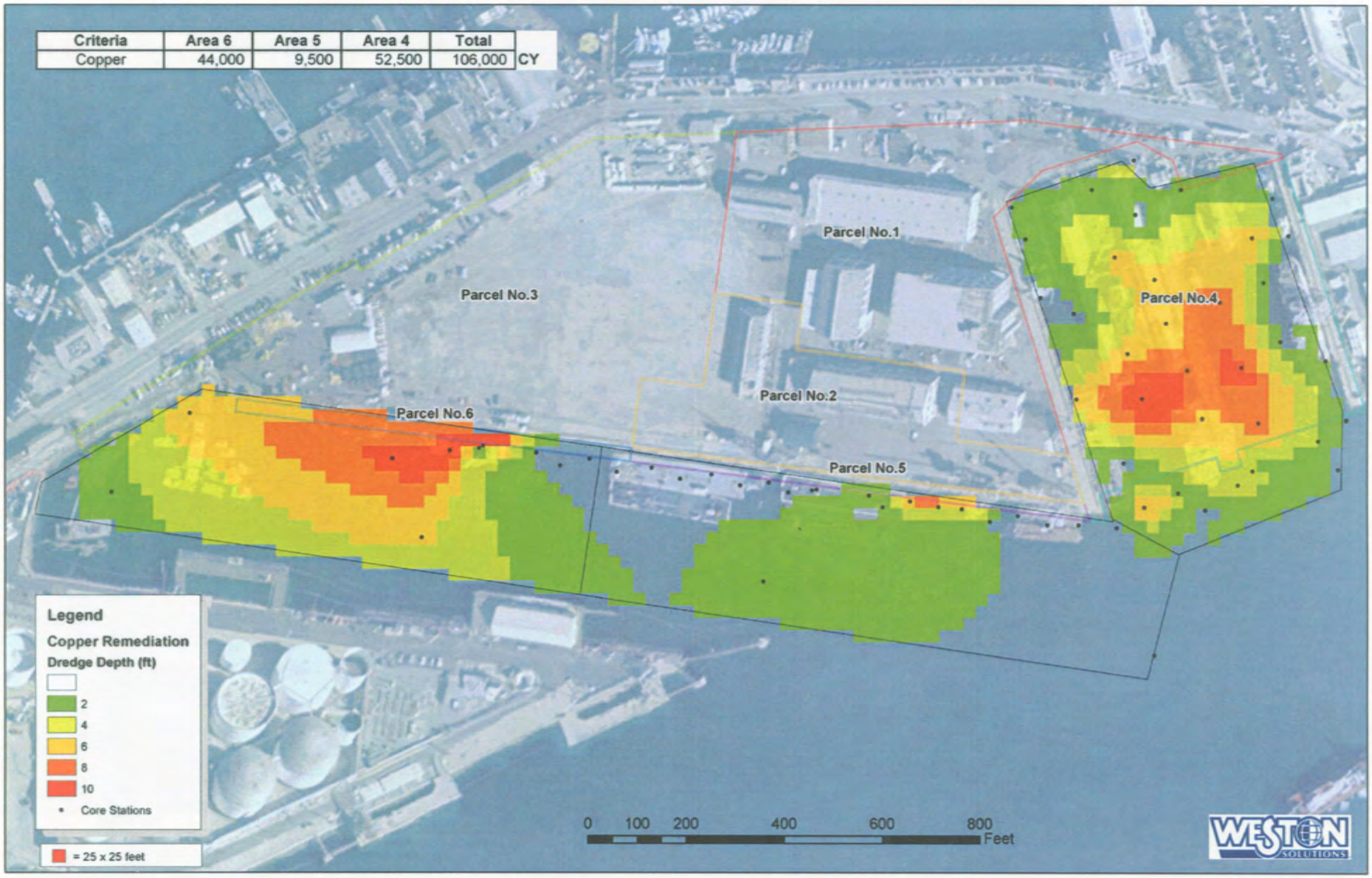


Figure 2: Footprint and volumes of material requiring remediation based on copper exceedances.

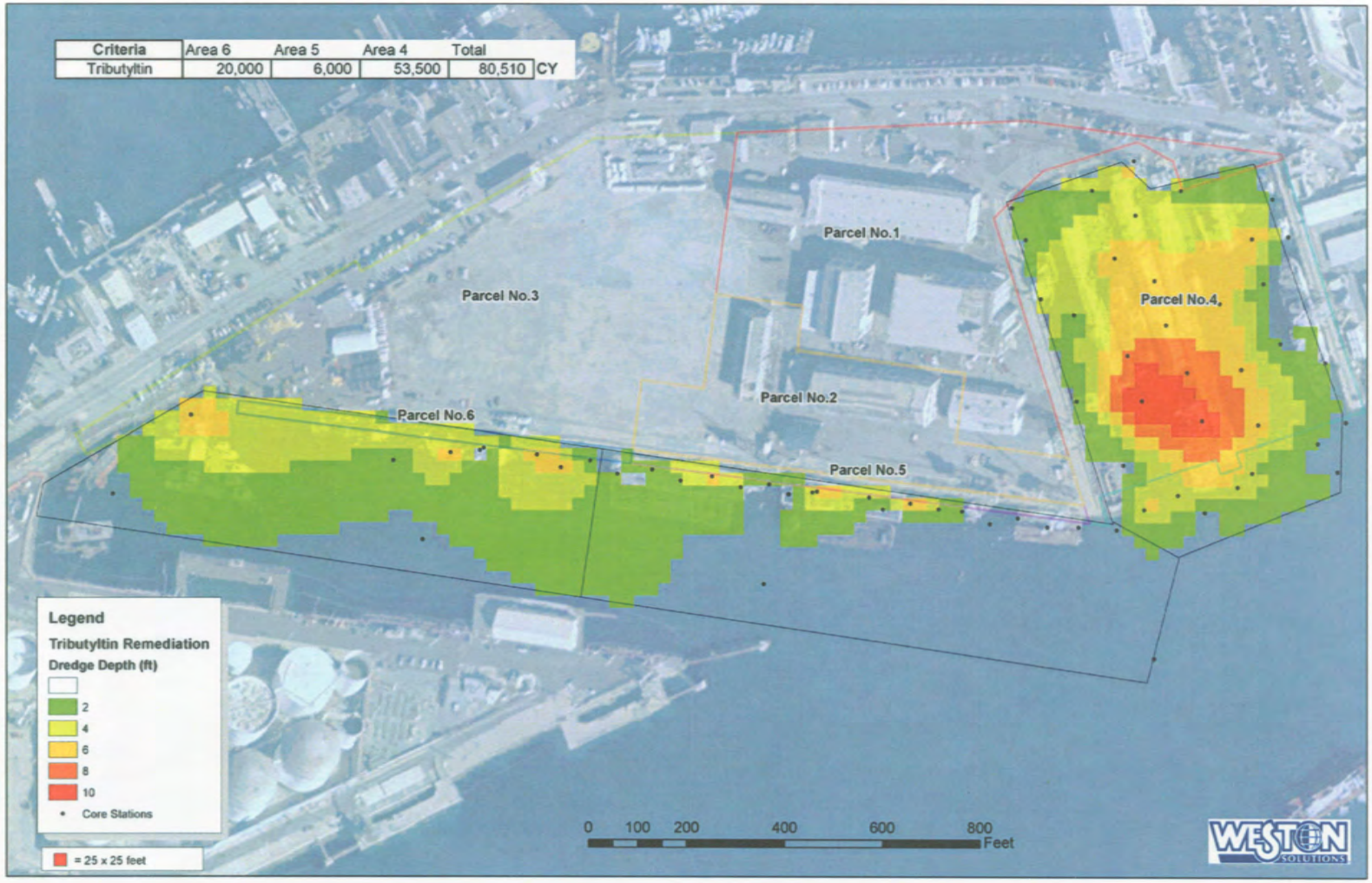


Figure 3: Footprint and volumes of material requiring remediation based on tributyltin exceedances.

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APPENDIX A: TRIBUTYLTIN LITERATURE REVIEW

Numerous recent publications have demonstrated that TBT-contaminated marine sediments cause toxicity to exposed aquatic organisms. The range of TBT concentrations causing toxicity in these studies varies from 100 to 7000 µg/kg, however, because toxicity is dependent on the toxicity test organism/community, duration of exposure, the type of exposure (i.e., TBT-spiked sediment or natural sediment), endpoint of interest (e.g., growth), the sediment type (sandy/muddy/fine), and the amount of total organic carbon (TOC) found within the sediment. When comparing studies that used TBT-spiked sediment, the most sensitive test found when reviewing the literature was the 42-day growth (sublethal) test using the polychaete *Armandia brevis* (Meador and Rice, 2001). Here, *A. brevis* exposed to TBT-spiked sediment demonstrated 21-day and 42-day Lowest Observable Effect Concentrations (LOEC) of 191 µg/kg and 101 µg/kg, respectively, whereas 21-day and 42-day No Observable Effect Concentrations (NOEC) were 101 µg/kg and 43 µg/kg, respectively (Table 1). In acute toxicity tests where organisms were exposed to TBT-spiked sediment for 10 days, *A. brevis* and two amphipod species (*Rhepoxynius abronius and Eohaustorius washingtonianus*) showed much higher estimates for LOEC and NOEC values (Meador et al., 1997). Specifically, approximated LOECs for *A. brevis, R. abronius, and E. washingtonianus* were 2000 µg/kg, 7000 µg/kg, and 4000 µg/kg, respectively, whereas approximated NOEC values were 1500 µg/kg, 3000 µg/kg, and 2500 µg/kg, respectively. Additional acute toxicity tests with a sea urchin *Echinocardium cordatum* and amphipod *Corophium volutator* found NOEC values for all species and test durations at 1,144 µg/kg (Stronkhorst et al., 1999).

Austen and McEvoy (1997) evaluated changes in the dominant nematode component of the meiobenthos (organisms between 0.5 and 0.062 mm in size) in response to TBT-spiked sediment exposures with microcosms. Here, multivariate (and a few univariate) statistics were used to demonstrate that there were changes in the abundance of dominant species and species compositions within TBT-spiked sediment, however, estimated LOEC and NOEC values were dependent on the type of sediment. For sandy, sandy-mud, and muddy sediment types, approximated LOEC values were 300 µg/kg, 900, µg/kg, and 600 µg/kg, respectively, whereas approximated NOEC values were <300 µg/kg, 600 µg/kg, and 300 µg/kg, respectively.

Toxicity endpoints have also been evaluated in organisms and following exposure to natural sediment contaminated with TBT. In a study where the amphipod *Hyalella azteca* was exposed for 10 days to natural sediment containing various concentrations of TBT, no effects on survival were found at sediment TBT concentrations as high as 240 µg/kg (McGee et al., 1995). However, increases in length of amphipods, thought to be a hormetic-type response, were found at lower TBT concentrations in sediment. Here, the estimated LOEC and NOEC values for 10-day increased growth of *H. azteca* were 222 µg/kg and 15 µg/kg, respectively. The benthic community was also assessed at the same locations from which TBT-contaminated sediment was collected for use in the 10-day *H. azteca* growth and survival tests. Diversity of species was reduced in TBT-contaminated sediments and demonstrated estimated LOEC and NOEC values of 122 µg/kg and 75 µg/kg, respectively.

Finally, toxicity has been measured in organisms collected from sites containing varying levels of TBT. Many field studies were found in which toxicity, measured as imposex, was assessed; however, in only one of these studies was TBT measured in sediment. Instead, most studies

measured TBT levels in the tissue of field-collected organisms (Horiguchi et al., 1995, Barreiro et al., 2001, Birchenough et al., 2002, Cheung et al., 2003). Nonetheless, in a study done by Hallers-Tjabbes et al. (2003), two whelks (*Buccinum undatum* and *Neptunea antiqua*) were evaluated for TBT concentrations in a variety of sites found in the North Sea and the Skagerrak. LOEC and NOEC values were approximated from this study because data was presented as toxicity per microgram total organic carbon in fine sediment. The estimated LOEC values for imposex in *B. undatum* and *N. antiqua* were 3067 µg/kg fine sediment and 1000 µg/kg fine sediment, respectively, whereas the estimated NOECs for imposex were 1000 µg/kg fine sediment, and 333 µg/kg fine sediment, respectively.

Table 1. Toxicity and approximated LOEC and NOEC associated with exposure to tributylin (TBT) in sediment.

Test Organism/Other	Test Endpoint	*LOEC (µg TBT/kg sed.)	*NOEC (µg TBT/kg sed.)	Reference
Armandia brevis	21-day and 42-day growth	21-day ~ 191 42-day ~ 101	21-day ~ 101 42-day ~ 43	Meador and Rice, 2001
Armandia brevis	10-day survival	2000	1500	Meador et al., 1997
B. undatum	Imposex	3067	1000	Hallers-Tjabbes et al., 2003
Benthic Community Structural Changes	Abundance & Species Composition, 2 month Exposure in microcosms	Sandy sed. = 300, Sandy Mud Sed. = 900 Muddy Sed. = 600	Sandy sed. < 300, Sandy mud Sed. = 600, Muddy Sed. = 300	Austen and McEvoy, 1997
Benthic Community Structural Changes	Diversity	122	75	McGee et al., 1995
Corophium volutator	10-day	2,383	1,144	Stronkhorst et al., 1999
Echinocardium cordatum	14-day 28-day	10-day = 2,383 42-day = 2,383	10-day = 1,144 42-day = 1,144	Stronkhorst et al., 1999
Eohaustorius washingtonianus	10-day survival	4000	1500	Meador et al., 1997
Hyalella azteca	Survival	>240	>240	McGee et al., 1995
Hyalella azteca	Growth	222 (for increased growth)**	15 (for increased growth)**	McGee et al., 1995
N. antiqua	Imposex	1000	333	Hallers-Tjabbes et al., 2003
Rhepoxynius abronius	10-day survival	7000	3000	Meador et al., 1997

* = In some cases these values were estimated from data presented in the papers because the authors did not provide these values.
**=The increased growth found in TBT-contaminated sediments was thought to be a hormetic-type response.

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Appendix C

Previous Results for the Chemical Characterization of Sediments Within the Southwest Marine Leasehold Area

Analytical Results from

Weston (2005) Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles, San Pedro, California.

Environmental Management Division, Port of Los Angeles, California

Final Report

Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles

Prepared for

Port of Los Angeles
Environmental Management
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December 2005

Figure 1. Project area with sample locations at Southwest Marine, Port of Los Angeles

3. RESULTS

3.1. Overview of Field Activities and Analyses

Samples were collected between the 16th and 20th of May, 2005. Field coordinates, number of cores per station, depth of penetration relative to the mudline (*i.e.,* the sediment surface), depth of recovery relative to the mudline, and core length retained for each station location are summarized in Table 1. Field core logs and core photos are provided in Appendix B.

Sediment cores were sectioned into two foot depth horizons and homogenized. Initial chemical and geotechnical analysis were performed on sediments from two depth horizons, surface (0-2 ft) and subsurface[1] (primarily 4-6 ft). In order to minimize the total number of samples analyzed and to delineate the depth of the contaminated sediments, analyses were performed in phases. If preliminary chemistry data suggested that subsurface material was elevated in contaminants, then deeper sediments were analyzed (*i.e.,* 6-8 ft). If preliminary chemistry data suggested that subsurface material was not elevated in contaminants and the surface sediments were elevated, then intermediate sediments were analyzed (*i.e.,* 2-4 ft). An additional core was collected and archived. Archived samples of each two foot section were frozen and are maintained at Weston for possible future analyses.

Parcel 4

Within Parcel 4, the water depth ranged from 22 to 50 feet. Vibratory sediment cores were collected at eight sites (SWM2-6, 9, 11, 12), and core lengths ranged from 6 to 11 feet. Piston and diver sediment cores were collected at three locations inaccessible by boat (SWM7, 8, 10); core lengths ranged from 2 to 4 feet.

Parcel 5 and 6

Adjacent to Parcels 5 and 6 the water depth ranged from 23 to 61 feet. Vibratory sediment cores were collected at 11 sample locations in the slip channel along Berths 240X-Z (SWM17-23) and in the channel adjacent to Parcel 4 or Berth 241 (SWM1, 2, 14-16). Core lengths ranged from 5 to 13 feet. A reference sample was collected from the Main Channel (SWM24) and was processed the same as other samples.

Table 1. Field Coordinates and Sample Depths for Sediment Core Samples

Core ID	Attempt	Latitude (NAD83)	Longitude (NAD83)	Water Depth (feet MLLW)	Core Length (ft)	Pene-tration (ft)	Target Sampling Depth (ft MLLW)	Actual Depth Sampled (ft MLLW)	Core Length Retained for Processing & Analysis (ft)	Comments
SWM 1	1 of 2	33 43.730	118 16.240	32.8	11.0	11.0	41.4	42.4	11.0	No refusal
SWM 1	2 of 2	33 44.730	118 16.240	33.5	10.0	11.0	41.0	41.0	10.0	Refusal @ 11' Archived
SWM2	1 of 2	33 43.745	118.16.241	34.5	8.0	9.0	42.9	40.9	8.0	Refusal @ 10'
SWM2	2 of 2	33 43.745	118 16.241	34.6	7.0	9.5	40.9	39.9	7.0	Refusal @ 9'; Archived
SWM3	1 of 4	33 43.770	118 16.206	40.6	10.5	12	47.0	47.5	10.5	Refusal @ 12'

[1] Subsurface samples submitted for analysis varied by location. Predominantly, the 4-6 depth horizon was analyzed.

Core ID	Attempt	Latitude (NAD83)	Longitude (NAD83)	Water Depth (feet MLLW)	Core Length (ft)	Pene-tration (ft)	Target Sampling Depth (ft MLLW)	Actual Depth Sampled (ft MLLW)	Core Length Retained for Processing & Analysis (ft)	Comments
SWM3	2 of 4	33 43.770	118 16.206	40.6	0.0	10.0	47.0	NA	0.0	Sample lost during retrieval
SWM3B	3 of 4	33 43.767	118 16.210	41.1	8.0	7.0-8.0	47.7	46.7	7.0	Material within this core was predominantly fines; different than previous SWM3 core; Archived
SWM3B	4 of 4	33 43.768	118 16.210	43.0	10.0	10.0	50.0	50.0	10.0	Refusal @ 10’
SWM4	1 of 3	33 43.757	118 16.180	35.5	0.0	6.0	41.5	NA	0.0	Sediment washed out upon retrieval
SWM4	2 of 3	33 43.757	118 16.180	37.4	11.0	11.0	43.3	44.3	11.0	No refusal
SWM4	3 of 3	33 43.757	118 16.180	37.4	11.0	11.0	43.3	44.3	11.0	No refusal; Archived
SWM5	1 of 3	33 43.777	118 16.159	40.0	5.0	10.0	47.2	NA	0.0	Sample lost
SWM5	2 of 3	33 43.777	118 16.159	40.5	11.0	11.5	47.2	48.2	11.0	No refusal
SWM5	3 of 3	33 43.777	118 16.159	40.5	8.0	11.0	45.0	45.0	8.0	No refusal; Archived
SWM6	1 of 2	33 43.760	118 16.134	25.0	9.3	10.0	32.7	31.7	9.0	No refusal
SWM6	2 of 2	33 43.760	118 16.134	25.5	8.0	8.0	30.7	30.7	8.0	No refusal
SWM7	1 of 2	33 43.789	118 16.139	26.0	3.0	3.0	35.1	28.1	3.0	Refusal @ 4’; Archived
SWM7	2 of 2	33 43.789	118 16.139	26.5	4.0	4.0	34.0	28.0	4.0	Refusal @ 5’
SWM8	1 of 4	33 43.819	118 16.139	38.0	0.0	0.0	47.4	NA	0.0	Location too deep
SWM8	2 of 4	33 43.819	118 16.139	41.0	0.0	0.0	50.0	NA	0.0	Sample washed out
SWM8	3 of 4	33 43.819	118 16.139	40.9	0.0	0.0	50.0	NA	0.0	Sample washed out
SWM8	4 of 4	33 43.819	118 16.139	47.0	2.3	4.0	53.9	45.9	2.0	Divers pushed core in; no archive
SWM9	1 of 3	33 44.834	118 16.161	24.5	10.5	10.5	33.8	34.3	10.5	Refusal @ 11’
SWM9	2 of 3	33 44.834	118 16.161	24.5	9.5	9.5	33.8	33.3	6.0	Not enough; Resampled for archive
SWM9	3 of 3	33 44.834	118 16.161	27.0	11.0	11.0	34.5	35.5	11.0	Refusal @ 11’; Archived
SWM10	1 of 1	33 43.833	118 16.169	50.0	2.3	2.3	57.3	49.6	2.0	Divers pushed core in as far as possible; soft sediment
SWM11	1 of 2	33 43.822	118 16.195	33.5	9.0	9.0	42.5	41.5	9.0	Refusal @ 9’
SWM11	2 of 2	33 43.822	118 16.195	33.4	7.0	8.0	40.5	39.5	7.0	Archived
SWM12	1 of 2	33 43.824	118 16.224	23.0	9.5	9.5	33.0	32.5	9.5	Refusal @9.5’
SWM12	2 of 2	33 43.824	118 16.224	23.0	8.5	10.0	32.0	30.0	8.5	Archived
SWM13	1 of 2	33 43.802	118 16.223	51.0	10.5	14.0	57.4	57.9	10.5	Refusal @ 15’
SWM13	2 of 2	33 43.802	118 16.223	51.0	10.0	12.0	57.4	57.4	10.0	Archived
SWM14	1 of 2	33 43.777	118 16.256	46.0	8.5	10.0	54.3	52.3	8.5	
SWM14	2 of 2	33 43.777	118 16.256	46.3	9.0	9.5	54.0	53.0	9.0	Archived
SWM15	1 of 4	33 43.790	118 16.268	41.0	0.0	10.0	48.0	NA	0.0	Core bent, sample lost; resampled
SWM15	2 of 4	33 43.790	118 16.268	42.0	0.0	10.0	49.3	NA	0.0	Core bent, sample lost; resampled
SWM15	3 of 4	33 43.789	118 16.259	49.0	10.0	11.0	56.7	56.7	10.0	Refusal @ 10’

Core ID	Attempt	Latitude (NAD83)	Longitude (NAD83)	Water Depth (feet MLLW)	Core Length (ft)	Pene-tration (ft)	Target Sampling Depth (ft MLLW)	Actual Depth Sampled (ft MLLW)	Core Length Retained for Processing & Analysis (ft)	Comments
SWM15	4 of 4	33 43.789	118 16.259	48.7	8.0	10.0	56.7	54.7	8.0	Refusal @ 10'; Archived
SWM16	1 of 3	33 43.812	118 16.273	31.5	0.0	0.0	37.9	NA	0.0	Cater lost, sample lost,; resampled
SWM16	2 of 3	33 43.812	118 16.273	31.6	11.0	11.5	37.9	37.9	10.0	Refusal @ 11.5'
SWM16	3 of 3	33 43.814	118 16.273	29.5	10.0	10.0	38.9	38.9	10.0	Archived
SWM17	1 of 6	33 43.873	118 16.272	28.0	0.0	10.5	37.0	NA	0.0	Barrel cracked; sample compromised, resampled
SWM17	2 of 6	33 43.873	118 16.272	27.5	1.0	3.0	37.2	28.2	0.0	Equipment failure; resampled
SWM17	3 of 6	33 43.874	118 16.272	27.4	3.0	6.0	36.8	29.8	0.0	Equipment failure; resampled
SWM17	4 of 6	33 43.874	118 16.272	28.5	6.0-7.0	6.0-7.0	36.9	NA	0.0	Equipment failure; resampled
SWM17	5 of 6	33 43.874	118 16.272	29.3	11.5	11.5	37.0	38.5	11.5	Refusal @ 11.5
SWM17	6 of 6	33 43.873	118 16.271	29.7	10.0	12.0	37.0	37.0	10.0	Archived
SWM18	1 of 4	33 43.904	118 16.264	27.9	0.0	0.0	36.9	NA	0.0	Debris on bottom; unable to penetrate; resampled
SWM18	2 of 4	33 43.904	118 16.264	28.2	0.0	1.0	37.2	NA	0.0	Debris on bottom; unable to penetrate; resampled
SWM18	3 of 4	33 43.906	118 16.265	29.0	9.5	9.5	38.0	37.5	9.5	Refusal @ 9.5'
SWM18	4 of 4	33 43.906	118 16.265	29.0	11.0	11.0	37.8	38.8	11.0	Refusal @ 11'; Archived
SWM19	1 of 2	33 44.014	118 16.247	32.4	12.0	12.0	40.4	42.4	12.0	Refusal @ 12'
SWM19	2 of 2	33 44.014	118 16.247	32.9	12.0	12.0	40.4	42.4	12.0	Refusal @ 12'; Archived
SWM20	1 of 2	33 44.112	118 16.239	23.0	7.0	7.0	30.5	26.5	6.0	Refusal @ 7';
SWM20	2 of 2	33 44.112	18 16.239	23.9	6.0	7.0	30.4	26.4	6.0	Refusal @ 6'
SWM21	1 of 4	33 44.132	118 16.265	28.5	13.0	15.0	36.8	39.8	13.0	No refusal
SWM21	2 of 4	33 44.132	118 16.265	28.0	0.0	15.0	36.8	NA	0.0	Catcher lost, sample lost; resampled
SWM21	3 of 4	33 44.132	118 16.265	28.0	0.0	10.5	36.8	NA	0.0	Resampled again
SWM21	4 of 4	33 44.132	118 16.265	29.9	7.0	13.5	36.9	33.9	7.0	Archived
SWM22	1 of 2	33 44.044	118 16.278	43.0	5.0	8.5	51.3	46.3	5.0	Refusal @ 5'
SWM22	2 of 2	33 44.044	118 16.278	42.0	5.0	7.0	50.6	45.6	5.0	Refusal @ 7'
SWM23	1 of 3	33 43.928	118 16.301	42.1	11.5	13	49.2	50.7	11.5	
SWM23	2 of 3	33 43.925	118 16.299	42.1	0.0	0.0	49.2	NA	0.0	Core bent, sample possibly compromised; resampled
SWM23	3 of 3	33 43.925	118 16.299	42.0	9.0	11.0	49.9	48.9	9.0	Archived
SWM24	1 of 2	33 43.792	118 16.305	61.0	7.5	8.0	65.5	65.0	7.5	No refusal; Sample saturated with water so low recovery
SWM24	2 of 2	33 43.792	118 16.305	61.0	4.0	8.0	65.5	61.5	4.0	Archived

3.2.Analytical Results

Results of physical and chemical analyses for SWM project sediments are presented in Table 2. All results are per unit dry weight of sediment unless otherwise indicated. Target detection limits are provided in the Sampling and Analysis Plan (Weston 2005). The actual detection limits and raw data for the analyses are provided in Appendix C. The measured chemical constituents in surface and subsurface sediments are presented in Table 2. The average concentrations of the two upper most sediment samples (*i.e.,* the surface sample and the next deeper) were mapped to illustrate the distribution of nine major contaminants or groups of contaminants in the SWM leasehold and surrounding areas (Figure 3 through Figure 11).

The discussion section and maps present the results of the major contaminants in comparison to relevant biologic screening criteria. Results of chemical analyses of sediment contaminants were compared to effects range-low (ER-L) and effects range-median (ER-M) values developed by Long *et al.* (1995)[2], and total threshold limit concentration (TTLC) values for the determination of hazardous waste (Title 22 in 40 CFR). These sediment screening criteria are provided to aid in management decisions. For several pesticide compounds (dieldrin and chlordane for example) the ER-L (0.02 μg/kg and 0.5 μg/kg, respectively) and ER-M levels (8 μg/kg and 6 μg/kg, respectively) are so low as to make it largely impractical to detect them in typical harbor sediments using routine analytical procedures. In addition, several polycyclic aromatic hydrocarbons (PAH) had detection limits higher than the screening criteria. The elevated detection limits were due to elevated levels of similar target compounds that prevent accurate quantification. As a result, re-analysis is not recommended for compounds where non-detect results that are greater than the ER-L, ER-M, or MDLs.

Analytes detected at concentrations greater ER-L values are bolded and concentrations greater than ER-M values are bolded and underlined in the sediment chemistry tables, while analytes detected at concentrations greater than TTLCs are highlighted in yellow.

While there are no ER-L or ER-M values to use as guidelines for assessing the potential biological impacts of tributyltin (TBT) concentrations in sediment, a number of studies have demonstrated that TBT-contaminated sediment causes toxicity to test organisms or changes in benthic communities at concentrations ranging from 100 to 7000 ug/kg (McGee *et al.*, 1995, Austen and McEvoy, 1997, Meader *et al.*, 1997, Stronkhorst *et al.*, 1999, Meador and Rice, 2001, Hallers-Tjabbes *et al.*, 2003). Using the data from these studies, ranges were established to provide a means for relating TBT concentrations found in the SWM leasehold area to values that were associated with toxicity of TBT-contaminated sediment. The following ranges were established for TBT: below the no observable effect concentration (NOEC) for community structure changes (<280 ug/kg), between the NOEC and the lowest observable effect concentration (LOEC) for

[2] The effects range values are helpful in assessing the potential significance of elevated sediment-associated contaminants of concern, in conjunction with corresponding biological effects. Briefly, these values were developed from a large data set where results of both benthic organism effects (*e.g.,* amphipod tests) and chemical analysis were available for individual samples. The ER-L was then calculated as the lower tenth percentile of the observed effects concentrations and the ER-M as the 50th percentile of the observed effects concentrations. While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. The ER-M sediment quality values are included in tables for comparative purposes only.

community structure changes (280-480 ug/kg), greater than the LOEC for community structure changes (480-2980 ug/kg), and greater than LOEC for acute toxicity (>2980 ug/kg). Specifically, to establish the NOEC concentrations for community structure changes, the NOECs from previous studies (Austen and McEvoy, 1997; McGee *et al.*, 1995) were averaged and this average was the value used to indicate the NOEC value used on maps generated in the present study. Similarly, to establish the LOEC concentrations for community structure changes (*i.e.,* sublethal effects) the LOECs from previous studies that measured community structure changes were averaged (Austen and McEvoy, 1997; McGee *et al.*, 1995). To establish the LOEC concentrations for acute toxicity (*i.e.,* mortality) the LOECs from previous studies that measured acute toxicity were averaged (McGee *et al.*, 1995; Meador *et al.*, 1997; Stronkhorst *et al.*, 1999).

Table 2a. Physical and chemical data for samples collected within and adjacent to Southwest Marine leasehold areas.

Analyte	TTLC	ER-L	ER-M	SWM1	SWM1	SWM1	SWM2	SWM2	SWM2	SWM3	SWM3	SWM3	SWM3B	SWM3B	SWM4	SWM4	SWM5	SWM5	SWM5	SWM6	SWM6	SWM6	SWM7	SWM7	SWM8	SWM9	SWM9	SWM9	SWM10	SWM11	SWM11	SWM12
Depth (ft.)	-	-	-	0-2	4-6	6-8	0-2	2-4	4-6	0-2	4-6	6-8	0-2	4-6	0-2	4-6	0-2	4-6	6-8	0-2	2-4	4-6	0-2	2-4	0-2	0-2	4-6	6-10	0-2	0-2	4-9	0-2
Physical Analyses																																
Gravel (%)	-	-	-	10.902	0.654	5.57	5.138	0.639	1.575	2.572	0.825	4.761	0.899	1.068	1.982	1.358	0.223	0.27	2.844	4.978	1.786	3.286	3.197	0.456	0.387	1.264	1.293	2.005	0.863	0.719	5.006	1.895
Sand (%)	-	-	-	63.728	50.731	36.646	68.978	81.115	80.851	92.373	82.593	89.749	2.578	3.257	87.361	95.571	20.01	28.186	91.121	62.841	95.608	93.827	89.9	90.977	33.685	86.275	94.411	95.688	13.89	90.863	92.696	84.983
Silt (%)	-	-	-	14.206	30.802	35.301	15.841	12.145	10.777	2.025	8.435	4.434	49.337	53.28	4.964	1.448	41.446	43.786	3.072	15.392	1.357	0.808	2.998	4.071	30.174	5.717	1.601	0.671	43.067	3.101	0.996	6.899
Clay (%)	-	-	-	11.164	17.811	22.482	10.042	6.1	6.797	3.03	8.147	4.057	47.186	42.395	5.694	1.623	38.32	27.758	2.964	16.789	1.248	2.079	3.905	4.496	35.754	6.745	2.695	1.636	42.181	5.317	1.301	6.223
Solids, Total (%)		-	-	69.8	65.4	63.6	71.6	74.5	78.1	79	80.9	79.4	42.4	47.3	77.6	83	48.5	55.7	80.2	64.2	80.1	77.3	72.3	80.2	50.7	74.3	79.6	78.7	46.8	75.3	82.2	74
General Chemistry																																
% Solids	-	-	-	73.3	68.8	67.1	76.8	81.6	82.7	84.7	87.9	84.6	43.7	47.2	84.5	87.2	50.8	53.1	84.8	65.1	82.7	84.2	75	83.7	54.3	78.2	86.6	85.2	47.9	80.1	85.8	81.4
Ammonia	-	-	-	5.2	39	21	1.6	3.8	2.1	11	10	14	11	31	4.2	0.36	12	33	6.1	7.9	<0.26	1.1	4.5	3.5	13	1.1	0.68	<0.25	14	1.1	0.34	<0.28
Oil and Grease	-	-	-	410	1000	2500	180	340	140	890	980	2600	380	970	67	37	220	1900	240	430	85	27	300	<13	420	170	66	42	180	40	<12	220
Solids, Total	-	-	-	69.5	62.5	62.2	69.7	74.2	80.8	75.5	79	78.4	43.7	46	74.3	77.2	47.3	58.2	77.7	63.6	78.5	80.4	74	79.4	50.5	77.2	82.2	78.6	51.3	76.6	83.3	72.3
Solids, Volatile	-	-	-	1.1	2.2	3.8	1.4	1.6	0.81	0.67	0.72	1.3	3.4	4.2	0.6	0.44	2.4	3.4	1.2	1.8	0.7	0.25	1.5	0.35	2.9	3.5	0.4	0.45	8.6	0.5	0.18	1.7
Sulfide, Dissolved	-	-	-	<0.14	<0.16	<0.16	<0.14	<0.14	<0.12	<0.13	0.63	<0.13	<1.1	<1.1	<0.14	<0.13	<0.21	<0.17	<0.13	<0.16	<0.13	<0.13	0.14	<0.13	<0.20	<0.13	<0.12	<0.13	<0.20	<0.13	<0.12	<0.14
Sulfide, Total	-	-	-	130	650	24	<0.14	8.1	<0.12	340	150	<0.13	240	1600	32	1.6	850	1000	<0.13	1600	8.4	5	490	0.83	660	780	<0.12	1	370	<0.13	<0.12	380
Metals (mg/kg)																																
Aluminum	-	-	-	7230	11900	19900	6060	8010	4250	2730	1250	1740	25400	25200	4860	2580	15800	11100	5920	8590	3140	3160	6520	4170	10100	6460	2890	2870	12600	5480	2530	5040
Antimony	500	-	-	1.02	1.66	<0.806	0.98	<0.676	<0.617	<0.500	<0.500	1.51	<1.14	<1.09	<0.676	<0.649	<1.06	2.28	1.26	1.69	<0.634	<0.625	2.35	<0.634	1.39	5.96	2.03	<0.634	<0.980	<0.649	<0.602	5.49
Arsenic	500	8.2	70	**13.5**	**12.5**	**15.4**	**11.4**	**11.2**	5.21	7.07	5.35	**19.9**	**19**	**23.6**	6.8	3.79	**24.4**	**28.1**	8.18	**21**	3.94	3.45	**16.5**	4.33	**21.3**	**13.1**	3.89	3.2	**21.6**	7.57	2.53	**10.4**
Barium	10000c	-	-	114	197	296	121	92.9	60.8	52.9	149	104	286	399	54.9	21	327	555	96.5	175	27.9	30.2	111	38.9	213	107	29.1	14.1	225	66	11.7	105
Beryllium	75	-	-	0.267	0.383	0.637	0.22	0.288	0.14	<0.100	<0.100	<0.128	0.796	0.745	0.161	<0.130	0.626	0.404	0.245	0.316	<0.127	<0.125	0.284	0.138	0.429	0.229	<0.122	<0.127	0.474	0.195	<0.120	0.192
Boron	-	-	-	<35.7	<39.7	<40.3	<35.7	<33.8	<30.9	<25.0	<25.0	<32.1	<57.0	<54.5	<33.8	<32.5	<53.0	<43.1	<32.1	<39.1	<31.7	<31.3	<33.8	<31.7	<49.0	<32.5	<30.5	<31.7	<49.0	<32.5	<30.1	<34.7
Cadmium	100	1.2	9.6	0.938	**1.72**	0.98	0.656	0.685	0.308	0.449	0.426	0.468	0.961	**2.15**	0.194	<0.130	**1.28**	**1.65**	0.366	0.988	<0.127	<0.125	0.641	<0.127	0.669	0.708	0.139	<0.127	0.726	0.2	<0.120	0.749
Chromium	2500	81	370	35.3	68	55.8	41.3	30.5	17.5	79.3	47.2	**257**	**92.5**	**161**	18.3	5.73	**83.1**	**116**	36.4	70	9.44	6.85	**249**	8.27	44.6	**187**	29.3	8.15	49.5	19.3	4.29	**116**
Chromium, Hexavalent	500	-	-	<1.1	<1.3	<1.3	<1.1	<1.1	<0.99	<1.1	<1.0	6	<1.8	<1.7	<1.1	<1.0	<1.7	<1.4	<1.0	<1.3	<1.0	<1.0	<1.1	<1.0	<1.6	<1.0	2.1	<1.0	<1.6	<1.0	<0.96	<1.1
Cobalt	8000	-	-	8.1	10.7	12.8	6.21	6.56	3.73	4.72	1.53	4.67	15.7	18.2	4.94	2.27	15.3	10.1	4.33	11.6	2.23	2.67	7.65	3.45	13.6	6.88	2.59	2.15	12.9	5.15	2.37	9.39
Copper	2500	34	270	**242**	**127**	**79.4**	**267**	**108**	**41.5**	**1190**	**871**	**2610**	**406**	**658**	**162**	25.5	**520**	**998**	**192**	**576**	28.1	16.7	**1000**	10.9	**1770**	**440**	**100**	18.7	**953**	**171**	21.7	**465**
Iron	-	-	-	19900	28700	39200	15000	16500	9400	12700	7140	30100	42100	51600	11400	5320	41500	28700	11100	28400	5690	6780	24900	9210	38100	19300	6540	4960	34500	13100	5830	23200
Lead	1000	46.7	218	**109**	**337**	**114**	**288**	**52.5**	**51.5**	**192**	**159**	**385**	**92.6**	**230**	27	5.88	**188**	**381**	**80.2**	**180**	9.37	6.05	**294**	5.45	**108**	**320**	**60.8**	7.23	**91.4**	27.8	1.9	**593**
Manganese	-	-	-	166	289	378	152	187	120	223	71.7	176	419	671	125	69.1	448	318	139	264	80.9	102	1340	120	260	676	124	71.9	312	146	73.6	445
Mercury	20	0.15	0.71	**0.722**	**3.23**	**1.29**	**2.18**	**0.692**	**0.44**	**2.15**	**4.39**	**7.5**	**0.766**	**2.7**	**0.41**	0.0497	**1.9**	**12.5**	**2.91**	**2.51**	**0.223**	0.0591	**4.98**	<0.0253	**0.958**	**13.8**	**28.9**	**3.27**	**0.906**	**0.184**	<0.0241	**5.37**
Molybdenum	3500e	-	-	24.1	2.77	5.97	10.5	12.5	1.55	10.1	0.552	11.3	7.08	27.7	5.51	2.98	10.4	6.2	1.51	25.2	1.15	0.583	12.7	0.557	21.6	6.19	1.58	0.501	28.2	3.17	1.34	22.3
Nickel	2000	20.9	51.6	15.7	**30.2**	**46.7**	13.1	17.5	9.61	6.88	4.35	**45.1**	**45.1**	**51.2**	9.64	4.07	**39.5**	**30.8**	10.4	20.7	4.74	5.12	**21.8**	7.06	**26.8**	16.3	5.69	4.1	**31.3**	10.7	3.97	13.7
Selenium	100	-	-	<0.714	1.15	5.36	0.929	1.94	<0.617	1.03	<0.500	1.6	5.34	7.84	<0.676	<0.649	6.08	4.51	1.26	1.33	0.889	<0.625	2.92	<0.634	4.24	1.57	<0.610	0.908	3.5	<0.649	<0.602	1.65
Silver	500	1	3.7	0.207	0.393	0.339	0.155	<0.135	<0.123	0.13	<0.100	<0.128	<0.228	**1.2**	<0.135	<0.130	0.932	0.645	<0.128	0.358	<0.127	<0.125	0.317	<0.127	0.468	0.24	<0.122	<0.127	0.473	<0.130	<0.120	0.176
Strontium	-	-	-	200	114	197	82.2	69.4	59.1	33.1	14.4	161	152	1200	45.4	26.9	89.6	70.6	58.7	78.6	46.9	34.7	69.9	34.2	63.1	67.8	33.8	57.5	80.6	59.2	55.7	101
Thallium	700	-	-	0.196	0.343	0.336	<0.143	0.18	<0.123	<0.100	<0.100	<0.128	0.346	0.579	<0.135	<0.130	0.48	0.358	0.146	0.203	<0.127	<0.125	0.136	<0.127	0.204	<0.130	<0.122	<0.127	0.241	<0.130	<0.120	<0.139
Tin	-	-	-	8.79	12.3	137	5.38	3.54	2.03	2.18	1	10.5	9.67	20	3.22	1.2	14.2	8.31	2.66	11.8	0.561	0.321	214	1.04	39.4	11.6	1.88	0.911	11.5	3	0.457	10.8
Titanium	-	-	-	564	826	1380	479	655	364	165	74.1	116	1540	1550	372	206	863	653	508	568	294	332	460	356	582	528	276	259	684	476	226	405
Vanadium	2,400	-	-	27.8	44.1	76.2	23.6	35.6	17.1	11.2	5.28	5.36	87.7	93.3	18.5	9.58	56.2	42.2	24.7	34.5	11.8	11.4	38.6	15.4	38	32.6	11	10.2	45.7	19.6	9.3	28.2
Zinc	5,000	150	410	**425**	**571**	**190**	**312**	**185**	116	**831**	**924**	**704**	**350**	**547**	123	47.6	**518**	**852**	**151**	**3310**	**288**	144	**2300**	31.6	**768**	**653**	112	37	**496**	147	18.5	**840**
PCBs (ug/kg)																																
2',3,4,4',5-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2',3,4-Trichlorobiphenyl (B	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3',4,5-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3,3',4',5,6-Heptachlor	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	9.99	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3,3',4,4' Hexachlorobi	-	-	-	<0.34	<0.36	<0.37	<0.33	<0.31	<0.30	<1.48	<0.28	<0.3	<0.57	<0.53	<0.30	<0.29	<0.49	<0.47	<0.29	<0.38	<0.30	<0.3	<0.33	<0.30	<0.46	<0.32	<0.29	<0.29	<0.52	<0.31	<0.29	<3.07
2,2',3,3',4,4',5 Heptachlor	-	-	-	<0.57	<0.61	<0.63	2.88	<0.51	<0.51	<2.48	<0.48	<0.5	<0.96	<0.89	<0.50	<0.48	<0.83	6.09	<0.49	<0.65	<0.51	<0.5	<0.56	<0.50	<0.77	11.9	7.5	<0.49	<0.88	<0.52	<0.49	<5.16
2,2',3,3',4,4',5,5',6 Nonac	-	-	-	<0.48	<0.51	<0.52	<0.46	<0.43	<0.42	<2.07	<0.40	<0.41	<0.8	<0.74	<0.41	<0.40	<0.69	<0.66	<0.41	<0.54	<0.42	<0.42	<0.47	<0.42	<0.64	<0.45	<0.4	<0.41	<0.73	<0.44	<0.41	<4.30
2,2',3,3',4,4',5,5',6,6' Dc	-	-	-	<0.5	<0.54	<0.55	<0.48	<0.45	<0.45	<2.18	<0.42	<0.44	<0.85	<0.78	<0.44	<0.42	<0.73	<0.70	<0.44	<0.57	<0.45	<0.44	<0.49	<0.44	<0.68	<0.47	<0.43	<0.43	<0.77	<0.46	<0.43	<4.55
2,2',3,3',4,4',5,5'-Octachl	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	4.52	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3,3',4,4',5,6 Octachlo	-	-	-	<0.78	<0.83	<0.85	<0.74	<0.7	<0.69	<3.36	<0.65	<0.67	<1.3	<1.21	<0.67	<0.65	<1.12	<1.07	<0.67	<0.88	<0.69	<0.68	<0.76	<0.68	<1.05	<0.73	<0.66	<0.67	<1.19	<0.71	<0.66	<7.00
2,2',3,3',4,5',6,6'-Octachl	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3,3',4,5,5',6'-Octachl	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,2',3,3',4,6'-Hexachlorobi	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	87.8	3.66	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	31.5	18.1	<2.35	<4.18	<2.5	<2.33	181

Table 2a. Continued.

Analyte	TTLC	ER-L	ER-M	SWM1	SWM1	SWM1	SWM2	SWM2	SWM2	SWM3	SWM3	SWM3	SWM3B	SWM3B	SWM4	SWM4	SWM5	SWM5	SWM5	SWM6	SWM6	SWM6	SWM7	SWM7	SWM8	SWM9	SWM9	SWM9	SWM10	SWM11	SWM11	SWM12
Depth (ft.)	-	-	-	0-2	4-6	6-8	0-2	2-4	4-6	0-2	4-6	6-8	0-2	4-6	0-2	4-6	0-2	4-6	6-8	0-2	2-4	4-6	0-2	2-4	0-2	0-2	4-6	6-10	0-2	0-2	4-9	0-2
2,2',3,4',5 Pentachlorobiph	-	-	-	<0.68	<0.73	<0.75	<0.65	<0.61	<0.60	<2.95	<0.57	<0.59	<1.14	<1.06	<0.59	<0.57	<0.98	<0.94	<0.59	-	<0.60	<0.59	<0.67	<0.60	<0.92	-	<0.58	<0.59	<1.04	<0.62	<0.58	<6.14
2,2',3,4',5',6-Hexachlorobi	-	-	-	<2.73	<2.91	<2.98	3.86	<2.45	<2.42	98.7	7.22	5.37	<4.58	<4.24	<2.37	<2.29	<3.94	6.99	<2.36	4.82	<2.42	<2.37	3.58	<2.39	<3.68	38	21	<2.35	<4.18	<2.5	<2.33	209
2,2',3,4',5,5',6 Heptachlor	-	-	-	<0.45	<0.48	<0.49	<0.43	<0.4	<0.40	<1.95	<0.38	<0.39	<0.76	<0.7	<0.39	<0.38	<0.65	<0.62	<0.39	<0.51	<0.40	<0.39	<0.44	<0.39	<0.61	8.71	3.5	<0.39	<0.69	<0.41	<0.38	29.5
2,2',3,4,4',5' Hexachlorobi	-	-	-	<0.4	<0.42	<0.43	9.96	<0.36	<0.35	<1.71	8.05	<0.34	<0.66	<0.61	<0.34	<0.33	<0.57	<0.55	<0.34	<0.45	<0.35	<0.34	<0.39	<0.35	9.24	<0.37	<0.33	<0.34	<0.61	<0.36	<0.34	<3.56
2,2',3,4,4',5',6 Heptachlor	-	-	-	<0.42	<0.45	<0.46	<0.40	<0.38	<0.37	<1.83	<0.35	<0.37	<0.71	<0.66	<0.37	<0.36	<0.61	<0.58	<0.37	<0.48	<0.37	<0.37	<0.41	<0.37	<0.57	5.54	<0.36	<0.36	<0.65	<0.39	<0.36	<3.81
2,2',3,4,4',5,5' Heptachlor	-	-	-	<0.68	<0.73	<0.75	5.09	<0.61	<0.60	27.5	8.63	<0.59	<1.14	<1.06	<0.59	<0.57	<0.98	8.54	<0.59	5.24	<0.60	<0.59	<0.67	<0.60	<0.92	21.9	7.22	<0.59	<1.04	<0.62	<0.58	80.4
2,2',3,4,4',6,6' Heptachlor	-	-	-	<0.56	<0.6	<0.61	<0.53	<0.5	<0.50	<2.42	<0.47	<0.48	<0.94	<0.87	<0.49	<0.47	<0.81	<0.77	<0.48	<0.63	<0.50	<0.49	<0.55	<0.49	<0.76	<0.52	<0.47	<0.48	<0.86	<0.51	<0.48	<5.04
2,2',3,4,5' Pentachlorobiph	-	-	-	<0.35	<0.38	<0.39	<0.34	<0.32	3.74	111	<0.30	<0.31	<0.6	<0.55	<0.31	<0.30	<0.51	<0.49	<0.31	8.54	<0.31	<0.31	7.39	<0.31	6.35	37.8	24.6	<0.31	<0.54	<0.32	<0.3	200
2,2',3,4,5,5'-Hexachlorobip	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	33.5	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	4.05	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	16.2	7.8	<2.35	<4.18	<2.5	<2.33	65
2,2',3,5' Tetrachlorobiphen	-	-	-	<0.31	<0.33	<0.34	<0.30	<0.28	<0.28	<1.36	<0.26	<0.27	<0.53	<0.49	<0.27	<0.26	<0.45	<0.43	<0.27	<0.35	<0.28	<0.27	3.05	<0.27	<0.42	<0.29	9.26	<0.27	<0.48	<0.29	<0.27	<2.83
2,2',3,5',6-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	102	9.36	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	7.18	<2.36	3.26	<2.42	<2.37	3.23	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	83.1
2,2',4,4',5,5' Hexachlorobi	-	-	-	<0.82	<0.87	<0.89	8.68	<0.74	2.84	123	17.5	9.69	<1.37	<1.27	<0.71	<0.69	<1.18	17.6	<0.71	10.2	<0.73	<0.71	6.42	<0.72	6.44	56.3	30.3	<0.70	<1.25	<0.75	<0.7	257
2,2',4,4',5-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	28.5	18.2	<2.35	<4.18	<2.5	<2.33	166
2,2',4,5' Tetrachlorobiphen	-	-	-	<0.19	<0.2	<0.21	<0.18	<0.17	<0.17	<0.83	<0.16	<0.17	<0.32	<0.3	<0.17	<0.16	<0.28	<0.26	<0.16	<0.22	<0.17	<0.17	<0.19	<0.17	<0.26	<0.18	<0.16	<0.16	<0.29	<0.17	<0.16	<1.72
2,2',4,5,5' Pentachlorobiph	-	-	-	<0.68	<0.73	<0.75	7.01	<0.61	5.12	237	29.7	<0.59	<1.14	<1.06	<0.59	<0.57	<0.98	<0.94	<0.59	15.5	<0.60	<0.59	11.2	<0.60	10.8	68.2	49.7	<0.59	<1.04	<0.62	<0.58	438
2,2',5 Trichlorobiphenyl (B	-	-	-	<0.61	<0.65	<0.67	<0.59	<0.55	<0.54	<2.66	<0.51	<0.53	<1.03	<0.95	<0.53	<0.52	<0.89	<0.85	<0.53	<0.69	<0.54	<0.53	<0.60	<0.54	<0.83	<0.58	<0.52	<0.53	<0.94	<0.56	<0.52	<5.53
2,2',5,5' Tetrachlorobiphen	-	-	-	<0.41	<0.44	<0.45	<0.39	<0.37	<0.36	<1.77	<0.34	<0.35	<0.69	<0.64	<0.36	<0.34	<0.59	<0.56	<0.35	<0.46	<0.36	<0.36	5.46	<0.36	<0.55	34.1	24.2	<0.35	<0.63	<0.37	<0.35	254
2,3',4',5-Tetrachlorobiphen	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	115	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	11.6	<2.36	<3.07	<2.42	<2.37	7.02	<2.39	<3.68	48.1	33.9	<2.35	<4.18	<2.5	<2.33	256
2,3',4,4' Tetrachlorobiphen	-	-	-	<0.72	<0.77	<0.79	<0.69	<0.65	<0.64	<3.13	8.72	<0.63	<1.21	<1.12	<0.63	<0.61	<1.04	<1.00	<0.62	<0.81	<0.64	<0.63	<0.71	<0.63	<0.98	11.4	5.73	<0.62	<1.11	<0.66	<0.62	64
2,3',4,4',5 Pentachlorobiph	-	-	-	<0.56	<0.6	<0.61	<0.53	<0.5	<0.50	86.1	6.45	4.93	<0.94	<0.87	<0.49	<0.47	<0.81	4.37	<0.48	4.43	<0.50	<0.49	3.05	<0.49	<0.76	27.4	17.2	<0.48	<0.86	<0.51	<0.48	170
2,3',4,4',5',6-Hexachlorobi	-	-	-	3.5	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,3',4,4',5,5'-Hexachlorobi	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	11.1	2.38	<2.35	<4.18	<2.5	<2.33	<24.6
2,3',4,4',6-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,3,3',4',6-Pentachlorobiph	-	-	-	<2.73	<2.91	<2.98	3.05	<2.45	<2.42	169	22.2	8.88	<4.58	<4.24	<2.37	<2.29	<3.94	13.8	<2.36	8.74	<2.42	<2.37	6.27	<2.39	5.9	53.4	32.9	<2.35	<4.18	<2.5	<2.33	323
2,3,3',4,4' Pentachlorobiph	-	-	-	<0.87	<0.93	<0.95	<0.83	<0.78	<0.77	<3.78	3.56	<0.76	<1.47	<1.36	<0.76	<0.73	<1.26	4.04	<0.75	<0.98	<0.77	<0.76	2.89	<0.76	<1.18	25.3	14.7	<0.75	<1.34	<0.8	<0.75	<7.86
2,3,3',4,4',5 Hexachlorobip	-	-	-	<0.57	<0.61	<0.63	<0.55	<0.51	<0.51	34.2	<0.48	<0.5	<0.96	<0.89	<0.50	<0.48	<0.83	<0.79	<0.49	<0.65	<0.51	<0.5	<0.56	<0.50	<0.77	12.5	7.36	<0.49	<0.88	<0.52	<0.49	59.6
2,3,3',4,4',5'-Hexachlorobi	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,3,3',4,4',5,5'-Heptachlor	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,3,3',4,4',6-Hexachlorobip	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	8.43	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	4.49	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,3,4,4',5-Pentachlorobiphe	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	31.8
2,4' Dichlorobiphenyl (BZ#	-	-	-	<0.7	<0.74	<0.76	<0.66	<0.62	<0.62	<3.01	<0.58	<0.6	<1.17	<1.08	<0.60	<0.58	<1.00	<0.96	<0.6	<0.78	<0.62	<0.61	<0.68	<0.61	<0.94	<0.65	<0.59	<0.60	<1.06	<0.64	<0.59	<6.27
2,4',5-Trichlorobiphenyl (B	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	9.03	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
2,4,4' Trichlorobiphenyl (B	-	-	-	<0.66	<0.7	<0.72	<0.62	<0.59	<0.58	<2.83	7.2	<0.57	<1.1	<1.02	<0.57	<0.55	<0.94	<0.90	<0.57	<0.74	<0.58	<0.57	<0.64	<0.57	<0.88	5.33	<0.55	<0.56	<1.00	<0.6	<0.56	<5.90
2,4,4',5-Tetrachlorobipheny	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
3,3',4,4' Tetrachlorobiphen	-	-	-	<1.36	<1.45	<1.49	<1.30	<1.23	<1.21	<5.90	<1.14	<1.18	<2.29	<2.12	<1.18	<1.15	<1.97	<1.88	<1.18	<1.54	<1.21	<1.19	<1.33	<1.19	<1.84	<1.28	<1.15	<1.17	<2.09	<1.25	<1.17	<12.3
3,3',4,4',5 Pentachlorobiph	-	-	-	<0.82	<0.87	<0.89	<0.78	<0.74	<0.73	<3.54	<0.68	<0.71	<1.37	<1.27	<0.71	<0.69	<1.18	<1.13	<0.71	<0.92	<0.73	<0.71	<0.80	<0.72	<1.10	5.93	2.37	<0.70	<1.25	<0.75	<0.7	<7.37
3,3',4,4',5,5' Hexachlorobi	-	-	-	<0.57	<0.61	<0.63	<0.55	<0.51	<0.51	<2.48	<0.48	<0.5	<0.96	<0.89	<0.50	<0.48	<0.83	<0.79	<0.49	<0.65	<0.51	<0.5	<0.56	<0.50	<0.77	<0.54	<0.48	<0.49	<0.88	<0.52	<0.49	<5.16
3,4,4',5-Tetrachlorobipheny	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	17.5	<2.56	<2.31	<2.35	11.6	<2.5	<2.33	<24.6
3,4,4'-Trichlorobiphenyl (B	-	-	-	<2.73	<2.91	<2.98	<2.60	<2.45	<2.42	<11.8	<2.28	<2.36	<4.58	<4.24	<2.37	<2.29	<3.94	<3.77	<2.36	<3.07	<2.42	<2.37	<2.67	<2.39	<3.68	<2.56	<2.31	<2.35	<4.18	<2.5	<2.33	<24.6
Total PCBs	50,000	-	-	3.5	0	0	40.53	0	11.7	1224.8	141.28	37.3	0	0	0	0	0	84.26	0	60.73	0	0	59.56	0	60.72	573.62	337.92	0	11.6	0	0	2867.4
Aroclor (ug/kg)																																
Aroclor-1016	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Aroclor-1221	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Aroclor-1232	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Aroclor-1242	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Aroclor-1248	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	130	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	150	<13	<20	1400	<12	<13	<98	<13	<12	<14
Aroclor-1254	-	-	-	17	<16	<16	19	57	<12	3100	120	200	<23	280	24	<13	160	3200	36	590	30	<12	210	<13	260	1200	1900	17	99	44	<12	1200
Aroclor-1260	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Aroclor-1262	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Pesticides (ug/kg)																																
2,4'-DDD	1000	2	20	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	**<2.3**	**<2.2**	<1.4	<1.3	**<2.1**	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<2.0	<1.3	<1.2	<1.4
2,4'-DDE	1000	2.2	27	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	**<2.3**	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<2.0	<1.3	<1.2	<1.4
2,4'-DDT	1000	1	7	**<1.4**	**<1.6**	**<1.6**	**<1.4**	**<1.4**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<2.3**	**<2.2**	**<1.4**	**<1.3**	**<2.1**	**<1.7**	**<1.3**	**<1.6**	**<1.3**	**<1.2**	**<1.4**	**<1.3**	**<2.0**	**<1.3**	**<1.2**	**<1.3**	**<2.0**	**<1.3**	**<1.2**	**<1.4**
4,4'-DDD	1000	2	20	**11**	**23**	<1.6	<1.4	**8.4**	1.8	**45**	**10**	**14**	**<2.3**	**<2.2**	1.8	<1.3	**8.4**	**20**	<1.3	**7.2**	<1.3	<1.2	**23**	<1.3	<2.0	**8**	<1.2	<1.3	**<9.8**	<1.3	<1.2	**22**
4,4'-DDE	1000	2.2	27	**20**	**5.4**	<1.6	**7.2**	**28**	**4.7**	<1.3	**31**	**72**	**31**	**210**	**11**	**2.3**	**78**	**290**	**15**	**45**	**11**	**2.4**	**65**	<1.3	**53**	**58**	<1.2	**4.2**	**25**	**12**	<1.2	**160**

Table 2a. Continued.

Analyte	TTLC	ER-L	ER-M	SWM1	SWM1	SWM1	SWM2	SWM2	SWM2	SWM3	SWM3	SWM3	SWM3B	SWM3B	SWM4	SWM4	SWM5	SWM5	SWM5	SWM6	SWM6	SWM6	SWM7	SWM7	SWM8	SWM9	SWM9	SWM9	SWM10	SWM11	SWM11	SWM12
Depth (ft.)	-	-	-	0-2	4-6	6-8	0-2	2-4	4-6	0-2	4-6	6-8	0-2	4-6	0-2	4-6	0-2	4-6	6-8	0-2	2-4	4-6	0-2	2-4	0-2	0-2	4-6	6-10	0-2	0-2	4-9	0-2
4,4'-DDT	1000	1	7	**16**	**120**	**<1.6**	**5.1**	**19**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<2.3**	**<2.2**	**<1.4**	**<1.3**	**<2.1**	**<1.7**	**<1.3**	**<1.6**	**<1.3**	**<1.2**	**33**	**<1.3**	**<2.0**	**<1.3**	**<1.2**	**<1.3**	**21**	**<1.3**	**<1.2**	**<1.4**
Aldrin	1400	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Alpha-BHC	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Beta-BHC	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Chlordane	2500	0.5	6	**<14**	**<16**	**<16**	**<14**	**<14**	**<12**	**<13**	**<13**	**<13**	**<23**	**<22**	**<14**	**<13**	**<21**	**<17**	**<13**	**<16**	**<13**	**<12**	**<14**	**<13**	**<20**	**<13**	**<12**	**<13**	**<98**	**<13**	**<12**	**<14**
Delta-BHC	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Dieldrin	8000	0.02	8	**<1.4**	**<1.6**	**<1.6**	**<1.4**	**<1.4**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<2.3**	**<2.2**	**<1.4**	**<1.3**	**<2.1**	**<1.7**	**<1.3**	**<1.6**	**<1.3**	**<1.2**	**<1.4**	**<1.3**	**<2.0**	**<1.3**	**<1.2**	**<1.3**	**<9.8**	**<1.3**	**<1.2**	**<1.4**
Endosulfan I	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Endosulfan II	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Endosulfan Sulfate	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Endrin	200	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Endrin Aldehyde	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Endrin Ketone	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Gamma-BHC	4000	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Heptachlor	4700	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Heptachlor Epoxide	-	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Methoxychlor	100000	-	-	<1.4	<1.6	<1.6	<1.4	<1.4	<1.2	<1.3	<1.3	<1.3	<2.3	<2.2	<1.4	<1.3	<2.1	<1.7	<1.3	<1.6	<1.3	<1.2	<1.4	<1.3	<2.0	<1.3	<1.2	<1.3	<9.8	<1.3	<1.2	<1.4
Toxaphene	5000	-	-	<29	<32	<32	<29	<27	<25	<26	<25	<26	<45	<43	<27	<26	<43	<34	<26	<31	<25	<25	<27	<25	<40	<26	<24	<25	<200	<26	<24	<28
Total Chlordane	-	-	-	<14	<16	<16	<14	<14	<12	<13	<13	<13	<23	<22	<14	<13	<21	<17	<13	<16	<13	<12	<14	<13	<20	<13	<12	<13	<98	<13	<12	<14
Organotins (ug/kg)																																
Dibutyltin	-	-	-	16	<4.8	<4.8	58	23	<3.7	1200	280	15	110	1300	35	6.3	360	260	55	150	19	8.9	140	<3.8	1400	190	19	6.4	410	180	5.1	110
Monobutyltin	-	-	-	<4.3	<4.8	<4.8	4.7	<4.1	<3.7	200	46	<3.8	<6.8	46	27	<3.9	51	44	8.2	28	6.4	<3.8	24	<3.8	<1200	41	<3.7	<3.8	180	49	<3.6	30
Tetrabutyltin	-	-	-	<4.3	<4.8	<4.8	<4.3	<4.1	<3.7	25	<3.8	<3.8	<6.8	52	<4.1	<3.9	6.5	10	<3.8	8.7	<3.8	<3.8	<4.1	<3.8	260	4.9	<3.7	<3.8	30	<3.9	<3.6	18
Tributyltin	-	-	-	23	<4.8	<4.8	64	30	4.1	850	150	21	260	2800	93	13	290	340	53	760	40	13	300	<3.8	46000	280	29	13	3500	310	8.8	1100
PAHs (ug/kg)																																
1-Methylnaphthalene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	46	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Methylnaphthalene	-	70.00	670.00	**<290**	<32	**<160**	**<290**	**<140**	<25	**<270**	**<250**	63	**<230**	**<870**	<27	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	<25	**<270**	<25	**<400**	**<260**	**<240**	<25	**<390**	**<260**	<24	**<280**
Acenaphthene	-	16.00	500.00	**<290**	**55**	**<160**	**<290**	**<140**	**<25**	**<270**	**<250**	**41**	**<230**	**<870**	**<27**	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	**<25**	**<270**	**<25**	**510**	**<260**	**<240**	**<25**	**<390**	**340**	**<24**	**<280**
Acenaphthylene	-	44.00	640.00	**<290**	<32	**<160**	**<290**	**<140**	<25	**<270**	**<250**	<26	**<230**	**<870**	<27	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	<25	**<270**	<25	**<400**	**<260**	**<240**	<25	**<390**	**<260**	<24	**<280**
Anthracene	-	85.30	1100.00	**<290**	54	**<160**	**<290**	**<140**	<25	**<270**	**340**	72	**<230**	**970**	<27	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	<25	**<270**	<25	**<400**	**<260**	**<240**	<25	**<390**	**<260**	<24	**<280**
Benzo (a) Anthracene	-	261.00	1600.00	**<290**	92	<160	**<290**	<140	<25	**820**	**520**	180	<230	**3000**	50	<260	**520**	**<350**	<130	**410**	<130	<25	**530**	<25	**790**	<260	<240	<25	**<390**	**510**	<24	**400**
Benzo (a) Pyrene	-	430.00	1600.00	<290	130	<160	**460**	250	60	**870**	**490**	160	230	**3600**	110	<260	**1400**	410	<130	**700**	<130	<25	**940**	<25	**930**	<260	<240	<25	<390	**560**	<24	**520**
Benzo (b) Fluoranthene	-	-	-	290	140	<160	460	270	76	1000	550	150	280	3700	140	<260	1500	450	<130	820	<130	<25	1300	<25	1000	460	<240	<25	420	570	<24	630
Benzo (g,h,i) Perylene	-	-	-	<290	100	<160	<290	150	35	280	<250	160	<230	1300	35	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Benzo (k) Fluoranthene	-	-	-	350	130	<160	460	250	60	950	610	140	280	3500	140	<260	1300	<350	<130	830	<130	<25	1200	<25	1000	460	<240	<25	<390	650	<24	590
Chrysene	-	384.00	2800.00	370	140	<160	340	170	32	**930**	**620**	220	<230	**3900**	91	<260	**810**	<350	<130	**600**	<130	<25	**840**	<25	**990**	290	<240	<25	**<390**	**620**	<24	**490**
Dibenz (a,h) Anthracene	-	63.40	260.00	**<290**	<32	**<160**	**<290**	**<140**	<25	**<270**	**<250**	58	**<230**	**<870**	<27	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	<25	**<270**	<25	**<400**	**<260**	**<240**	<25	**<390**	**<260**	<24	**<280**
Fluoranthene	-	600.00	5100.00	600	85	<130	540	240	34	**1700**	**1100**	280	<180	**5200**	72	<210	**930**	400	<100	**870**	<100	<20	**1300**	<20	**2300**	430	400	23	470	**1300**	<19	**1100**
Fluorene	-	19.00	540.00	**<290**	**<32**	**<160**	**<290**	**<140**	**<25**	**<270**	**<250**	**61**	**<230**	**<870**	**<27**	**<260**	**<430**	**<350**	**<130**	**<310**	**<130**	**<25**	**<270**	**<25**	**<400**	**<260**	**<240**	**<25**	**<390**	**<260**	**<24**	**<280**
Indeno (1,2,3-c,d) Pyrene	-	-	-	<290	76	<160	<290	<140	25	<270	<250	130	<230	1100	31	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Naphthalene	-	160.00	2100.00	**<290**	<32	<160	**<290**	<140	<25	**<270**	**<250**	56	**<230**	**<870**	<27	**<260**	**<430**	**<350**	<130	**<310**	<130	<25	**<270**	<25	**<400**	**<260**	**<240**	<25	**<390**	**<260**	<24	**<280**
Phenanthrene	-	240.00	1500.00	**<290**	85	<160	**<290**	190	<25	**1100**	**920**	**360**	<230	**1400**	52	**<260**	**460**	**<350**	<130	**600**	<130	<25	**500**	<25	**1400**	**<260**	**300**	<25	**<390**	**890**	<24	**560**
Pyrene	-	665.00	2600.00	**860**	630	310	420	410	54	**2200**	**1400**	**800**	<230	**7500**	86	<260	**1400**	560	210	**1400**	<130	42	**1100**	<25	**1500**	590	470	33	440	**1300**	<24	**1200**
Total HMW PAHs	-	1700.00	9600.00	2470	1523	310	2680	1740	376	8750	5290	2278	790	32800	755	0	7860	1820	210	5630	0	42	7210	0	8510	2230	870	56	1330	5510	0	4930
Total LMW PAHs	-	552.00	3160.00	0	194	0	0	190	0	1100	1260	592	0	2370	52	0	460	0	0	600	0	0	500	0	1910	0	300	0	0	1230	0	560
Total PAH	-	4022.00	44792.00	2470	1717	310	2680	1930	376	9850	6550	2870	790	35170	807	0	8320	1820	210	6230	0	42	7710	0	10420	2230	1170	56	1330	6740	0	5490
Semi-Volatiles (ug/kg)																																
1,2,4-Trichlorobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
1,2-Dichlorobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
1,3-Dichlorobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
1,4-Dichlorobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	470
2,4,5-Trichlorophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2,4,6-Trichlorophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2,4-Dichlorophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2,4-Dimethylphenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280

Table 2a. Continued.

Analyte	TTLC	ER-L	ER-M	SWM1	SWM1	SWM1	SWM2	SWM2	SWM2	SWM3	SWM3	SWM3	SWM3B	SWM3B	SWM4	SWM4	SWM5	SWM5	SWM5	SWM6	SWM6	SWM6	SWM7	SWM7	SWM8	SWM9	SWM9	SWM9	SWM10	SWM11	SWM11	SWM12
Depth (ft.)	-	-	-	0-2	4-6	6-8	0-2	2-4	4-6	0-2	4-6	6-8	0-2	4-6	0-2	4-6	0-2	4-6	6-8	0-2	2-4	4-6	0-2	2-4	0-2	0-2	4-6	6-10	0-2	0-2	4-9	0-2
2,4-Dinitrophenol	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
2,4-Dinitrotoluene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2,6-Dinitrotoluene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Chloronaphthalene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Chlorophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Methylphenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Nitroaniline	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
2-Nitrophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
3,3'-Dichlorobenzidine	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
3-Nitroaniline	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
3/4-Methylphenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4,6-Dinitro-2-Methylphenol	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
4-Bromophenyl-Phenyl Ether	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4-Chloro-3-Methylphenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4-Chloroaniline	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4-Chlorophenyl-Phenyl Ether	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4-Nitroaniline	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
4-Nitrophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Aniline	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Azobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Benzidine	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
Benzoic Acid	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
Benzyl Alcohol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Bis(2-Chloroethoxy) Methane	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Bis(2-Chloroethyl) Ether	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
Bis(2-Chloroisopropyl) Ethe	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Bis(2-Ethylhexyl) Phthalate	-	-	-	150	56	<81	<140	140	23	<130	<130	21	110	<440	40	2300	<210	<170	<64	320	<64	200	160	<13	760	320	340	17	230	540	<12	320
Butyl Benzyl Phthalate	-	-	-	<140	<16	<81	<140	<68	22	<130	<130	<13	<110	<440	<14	<130	<210	<170	<64	<160	<64	<13	<140	<13	<200	<130	<120	<13	<200	<130	<12	<140
Di-n-Butyl Phthalate	-	-	-	<140	<16	<81	<140	<68	<12	<130	<130	<13	<110	<440	<14	<130	<210	<170	<64	<160	<64	<13	<140	<13	<200	<130	<120	<13	<200	<130	<12	<140
Di-n-Octyl Phthalate	-	-	-	<140	<16	<81	<140	<68	<12	<130	<130	<13	<110	<440	<14	<130	<210	<170	<64	<160	<64	<13	<140	<13	<200	<130	<120	<13	<200	<130	<12	<140
Dibenzofuran	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	32	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Diethyl Phthalate	-	-	-	<140	<16	<81	<140	<68	<12	<130	<130	<13	<110	<440	<14	<130	<210	<170	<64	<160	<64	<13	<140	<13	<200	<130	<120	<13	<200	<130	<12	<140
Dimethyl Phthalate	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Hexachloro-1,3-Butadiene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Hexachlorobenzene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Hexachlorocyclopentadiene	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Hexachloroethane	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Isophorone	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
N-Nitroso-di-n-propylamine	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
N-Nitrosodimethylamine	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
N-Nitrosodiphenylamine	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Nitrobenzene	-	-	-	<1400	<160	<810	<1400	<680	<120	<1300	<1300	<130	<1100	<4400	<140	<1300	<2100	<1700	<640	<1600	<640	<130	<1400	<130	<2000	<1300	<1200	<130	<2000	<1300	<120	<1400
Pentachlorophenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Phenol	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
Pyridine	-	-	-	<290	<32	<160	<290	<140	<25	<270	<250	<26	<230	<870	<27	<260	<430	<350	<130	<310	<130	<25	<270	<25	<400	<260	<240	<25	<390	<260	<24	<280
TPH (ug/kg)																																
C7	-	-	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
C8	-	-	-	<	<	<	<	<	<	<	<	3.4	<	<	<	<	<	<	<	0.54	<	<	<	<	<	<	<	<	<	<	<	<
C9-C10	-	-	-	0.38	<	<	<	<	<	9.4	8.7	38	<	<	<	<	<	<	<	5.1	0.12	<	0.62	<	0.72	0.55	0.74	<	<	<	<	0.6

Table 2a. Continued.

Analyte	**TTLC**	**ER-L**	**ER-M**	**SWM1**	**SWM1**	**SWM1**	**SWM2**	**SWM2**	**SWM2**	**SWM3**	**SWM3**	**SWM3**	**SWM3B**	**SWM3B**	**SWM4**	**SWM4**	**SWM5**	**SWM5**	**SWM5**	**SWM6**	**SWM6**	**SWM6**	**SWM7**	**SWM7**	**SWM8**	**SWM9**	**SWM9**	**SWM9**	**SWM10**	**SWM11**	**SWM11**	**SWM12**
Depth (ft.)	-	-	-	0-2	4-6	6-8	0-2	2-4	4-6	0-2	4-6	6-8	0-2	4-6	0-2	4-6	0-2	4-6	6-8	0-2	2-4	4-6	0-2	2-4	0-2	0-2	4-6	6-10	0-2	0-2	4-9	0-2
C11-C12	-	-	-	4.1	1.6	11	<	2.2	<	20	22	78	<	2.3	<	<	<	<	1.1	9.9	1.4	1.3	3.5	<	2.2	5	4.8	0.9	<	0.87	<	3.1
C13-C14	-	-	-	3.9	3.7	20	0.19	3.6	0.094	7.3	8.9	50	1.1	5.7	0.21	<	0.9	1	1.8	11	1.3	1.7	1.5	<	2	4.2	1.9	0.95	0.27	1.2	0.35	0.28
C15-C16	-	-	-	13	9.3	45	2	7.9	0.83	12	18	64	6.2	19	1.3	<	6.5	4.3	3.5	23	3.9	2.3	5.6	0.39	8.6	10	4.8	1.7	1.6	2.5	0.74	2.1
C17-C18	-	-	-	24	22	77	5.2	13	2	32	41	94	14	36	3.5	0.45	14	10	6	91	7.7	2.1	15	0.76	37	21	16	2.7	5.8	2	1	6.7
C19-C20	-	-	-	30	35	120	8.8	23	4.1	110	220	370	24	60	5.1	1.7	21	18	9.5	110	10	4.3	34	2	38	42	31	2.9	12	4.5	1	15
C21-C22	-	-	-	29	41	190	12	21	6.1	110	150	280	36	71	10	4.3	24	21	9.2	120	15	7.7	41	3.5	43	41	32	4	14	12	4.3	17
C23-C24	-	-	-	34	31	210	11	23	3.6	190	250	480	23	71	6.6	0.59	20	18	8.6	96	10	3.8	34	1.6	40	37	29	3.8	14	<	2.1	15
C25-C28	-	-	-	65	61	450	30	57	10	260	290	440	66	120	15	0.85	46	46	21	230	21	8.3	66	3.6	78	77	64	8.1	28	17	4.5	29
C29-C32	-	-	-	77	96	500	33	66	10	240	260	550	56	130	17	2.1	50	51	23	250	22	13	59	4.5	81	100	76	8.6	32	13	3.4	33
C33-C36	-	-	-	52	46	240	26	33	4.2	130	130	290	44	90	8.7	1.1	27	28	12	130	10	14	30	3.4	61	73	36	6.4	20	9	6.4	21
C37-C40	-	-	-	25	31	190	20	30	4.6	81	83	180	30	53	8	2	23	26	9.5	110	7.3	6.8	23	3.5	49	31	36	7.2	18	13	3.6	20
C41-C44	-	-	-	32	28	130	14	24	4.6	51	66	110	23	36	6.3	1.9	18	16	10	86	7.1	11	14	2.1	31	36	22	8.5	9.5	7.3	6.3	9.3
C7-C44 Total	-	-	-	390	410	2200	160	300	51	1300	1500	3000	320	690	81	15	250	240	120	1300	120	77	330	25	470	480	350	56	160	83	34	170
TRPH	-	-	-	390	910	1300	140	170	100	410	780	1500	240	620	62	40	190	1500	160	410	56	42	210	<13	290	160	63	36	140	44	<12	170
Mean ER-M Qs																																
Metal ERMq	-	-	-	0.47	1.02	0.51	0.75	0.30	0.18	1.21	1.41	2.85	0.60	1.22	0.22	0.05	0.94	2.98	0.67	1.74	0.15	0.08	2.13	0.04	1.27	2.81	4.65	0.55	0.85	0.20	0.03	1.66
PCB ERMq	-	-	-	0.06	0.04	0.01	0.06	0.04	0.01	0.22	0.15	0.07	0.02	0.79	0.02	0.00	0.19	0.04	0.00	0.14	0.00	0.00	0.17	0.00	0.23	0.05	0.03	0.00	0.03	0.15	0.00	0.12
Pesticide ERMq	-	-	-	0.02	0.00	0.00	0.23	0.00	0.07	6.80	0.78	0.21	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.34	0.00	0.00	0.33	0.00	0.34	3.19	1.88	0.00	0.06	0.00	0.00	15.93
PAH ERMq	-	-	-	1.02	3.22	0.00	0.27	1.20	0.14	0.98	0.89	1.87	0.67	4.56	0.28	0.05	1.87	6.72	0.33	1.13	0.24	0.05	2.62	0.00	1.15	1.43	0.00	0.09	1.00	0.26	0.00	3.95
Overall ER-M Q	-	-	-	0.39	1.07	0.13	0.33	0.39	0.10	2.30	0.81	1.25	0.32	1.64	0.13	0.03	0.75	2.55	0.25	0.84	0.10	0.03	1.31	0.01	0.75	1.87	1.64	0.16	0.49	0.15	0.01	5.41

Table 2b. Continuation of physical and chemical data for samples collected within and adjacent to Southwest Marine leasehold areas.

Analyte	TTLC	ER-L	ER-M	SWM12	SWM12	SWM13	SWM13	SWM14	SWM14	SWM15	SWM15	SWM15	SWM16	SWM16	SWM17	SWM17	SWM17	SWM18	SWM18	SWM18	SWM19	SWM19	SWM20	SWM20	SWM21	SWM21	SWM22	SWM22	SWM23	SWM23	SWM24
Depth (ft.)	-	-	-	4-6	8-10	0-2	4-6	0-2	2-5	0-2	4-6	2-4	0-2	4-6	0-2	5-8	8-12	0-2	2-4	4-9	0-2	4-6	0-2	4-6	0-2	4-13	0-2	2-5	0-2	2-6	0-2
Physical Analyses																															
Gravel (%)	-	-	-	3.216	1.979	0.484	1.327	2.148	12.156	0.405	0.085	0.13	1.731	1.559	5.364	5.925	2.067	2.545	1.271	1.403	1.949	2.701	2.387	1.885	0.23	4.724	0.204	0.717	0.802	5.557	0.047
Sand (%)	-	-	-	77.656	95.364	6.967	11.656	8.29	21.729	33.069	88.981	76.901	89.704	95.715	82.224	76.793	94.338	89.875	68.127	91.899	90.143	94.613	87.492	87.105	54.35	72.238	13.973	25.898	81.881	90.757	89.542
Silt (%)	-	-	-	10.594	0.683	43.839	40.606	45.327	35.599	33.147	7.002	12.302	3.846	1.271	7.228	9.88	1.85	2.82	18.859	3.576	4.275	1.128	5.393	5.7	24.028	12.642	41.236	40.388	9.283	1.695	4.903
Clay (%)	-	-	-	8.534	1.974	48.71	46.41	44.234	30.516	33.379	3.931	10.668	4.709	1.455	5.183	7.402	1.744	4.76	11.743	3.122	3.633	1.559	4.728	5.31	21.393	10.397	44.587	32.997	8.034	1.991	5.508
Solids, Total (%)		-	-	72.2	76.5	42.2	49	41.4	49.3	55.2	81.2	72.8	75.6	80.7	76.2	71.7	80.4	76.2	72.1	81.7	79.6	81.7	76.6	83.3	59.5	74.8	47.2	62.2	77.1	85.2	78.2
General Chemistry																															
% Solids	-	-	-	78.9	84.9	44.4	45.1	44.7	52.8	58.3	73.8	85.5	80.8	85	83.6	79.6	87.9	83.2	75.7	87.5	84.9	86.1	87.4	81.8	55	76.7	52.5	62.5	79.5	88	83.7
Ammonia	-	-	-	9.1	1.5	14	30	7.9	32	4.5	1	3	2.6	1.4	2.2	7.6	<0.25	0.55	3.9	1.8	1.3	0.52	6.7	8.9	2.9	1.1	10	61	1.4	0.67	2.2
Oil and Grease	-	-	-	590	32	180	320	120	1500	150	230	39	110	71	220	320	260	140	320	30	270	58	310	1300	450	19	550	1700	90	23	40
Solids, Total	-	-	-	67.6	75.2	45.3	53.3	38.9	50.5	55.9	83.9	80.4	73.9	80.7	76	77.1	80	75.6	71.8	79.5	77.8	81.3	79.9	78.8	57.8	74.2	46.5	57.9	80.4	84	77.3
Solids, Volatile	-	-	-	2.2	0.52	6.8	11	1.9	7.5	2.2	2.1	0.44	0.44	3.3	1.1	1.2	0.63	1.6	2.1	0.47	1.5	0.87	0.86	1.8	1.9	1.3	2.4	3.1	0.78	0.33	0.46
Sulfide, Dissolved	-	-	-	<0.15	<0.13	<0.22	<0.19	<0.26	<0.20	<0.18	<0.12	<0.63	<0.14	<0.12	<0.13	<0.13	<0.13	<0.13	<0.14	<0.13	<0.64	<0.62	<0.13	<0.13	<0.17	<0.14	<0.22	<0.17	<0.13	<0.12	<0.13
Sulfide, Total	-	-	-	970	11	580	890	210	90	450	29	0.75	<0.14	0.25	1300	260	6.3	130	250	3.8	83	<0.12	61	<0.13	43	<0.14	110	1300	<0.13	<0.12	<0.13
Metals (mg/kg)																															
Aluminum	-	-	-	4140	4360	15100	14400	16800	20700	11600	6820	4360	4830	3620	3370	6540	3540	7060	7610	2550	3840	2410	5330	6410	12400	10100	17500	13700	6070	2750	5100
Antimony	500	-	-	26.6	3.06	<1.11	4.42	<1.28	2.76	3.25	1.75	<0.625	<0.676	<0.617	2.38	9.29	<0.625	12.1	5.65	<0.625	0.696	<0.617	<0.633	3.31	<0.862	<0.676	<1.06	<0.862	3.5	<0.595	<0.649
Arsenic	500	8.2	70	**12**	4.25	**17.2**	**42.1**	**17.7**	**29.1**	**29.8**	**16.7**	3.15	5.37	4.24	**8.62**	**18.1**	3.92	**12.8**	**12.7**	2.41	7.93	3.89	7.37	**33.6**	**17.1**	5.68	**20.6**	**27**	**31.1**	1.23	3.65
Barium	10000c	-	-	175	35.9	239	244	290	346	189	107	50.9	66.9	53.4	60.9	180	34.5	186	190	18.5	374	172	57.7	290	301	72.4	452	203	763	21.9	61.5
Beryllium	75	-	-	0.167	0.169	0.6	0.605	0.684	0.828	0.417	0.297	0.147	0.161	0.124	0.155	0.244	<0.125	0.262	0.293	<0.125	<0.128	<0.123	0.194	0.225	0.418	0.348	0.641	0.466	0.22	<0.119	0.162
Boron	-	-	-	<36.8	<33.4	<55.5	<47.2	<64.0	<52.0	<44.7	<29.8	<31.3	<33.8	<30.9	<32.9	<32.5	<31.3	48.9	<34.7	<31.3	<32.1	<30.9	<31.7	<31.7	<43.1	<33.8	<53.0	<43.1	<31.3	<29.8	<32.5
Cadmium	100	1.2	9.6	**1.77**	0.142	0.708	**1.75**	0.872	**1.44**	**1.22**	0.528	<0.125	0.215	0.125	0.599	**2.21**	<0.125	0.653	**1.34**	<0.125	0.33	<0.123	0.146	**1.59**	0.664	<0.135	1.08	**1.62**	1.17	<0.119	<0.130
Chromium	2500	81	370	**157**	9.89	51.4	65.7	55.8	**115**	44.7	31.1	10.7	16.9	7.41	**94.5**	**86.8**	9.48	**559**	**136**	6.61	25.9	9.21	16.9	**138**	**84.3**	18.6	75	**95.9**	**90.5**	6.99	10.6
Chromium, Hexavalent	500	-	-	<1.2	<1.1	<1.8	<1.5	<2.1	<1.6	<1.4	<0.95	<1.0	<1.1	<0.99	<1.1	<1.0	<1.0	<1.1	<1.1	<1.0	<1.0	<0.99	<1.0	<1.0	2.1	<1.1	<1.7	<1.4	<1.0	<0.95	<1.0
Cobalt	8000	-	-	8.18	3.91	14	20	14.5	15.9	14.1	7.27	4.47	4.3	3.09	4.78	10	2.74	9.82	8.23	2.14	3.48	3.24	4.8	6.87	9.89	6.33	14.5	10.9	11.8	2.39	4.35
Copper	2500	34	270	**1140**	16.2	**490**	**746**	**225**	**485**	**948**	**211**	**42**	**48.3**	10.6	**430**	**261**	**35.1**	**380**	**309**	6.61	**145**	**40.4**	**160**	**1560**	**617**	15.1	**468**	**1100**	**1180**	8.13	15.3
Iron	-	-	-	20500	8320	37900	45300	38500	40100	31400	17100	10400	11100	7870	14000	21200	6860	44800	22700	4640	9070	5860	12200	22200	27500	14700	41400	32100	25500	5450	9930
Lead	1000	46.7	218	**1100**	13.8	**62.1**	**155**	**70.4**	**188**	**125**	**70.5**	12.2	38.2	23.6	**858**	**368**	29.6	**298**	**455**	4.55	**110**	21.5	21.3	**1820**	**184**	5.68	**194**	**341**	**292**	9.12	6.69
Manganese	-	-	-	189	126	388	379	424	510	266	229	166	147	114	195	189	89.1	3230	552	75.8	92.7	70.8	133	224	265	192	408	324	206	84.9	151
Mercury	20	0.15	0.71	**54.8**	**1.21**	**0.553**	**0.421**	**0.581**	**1.64**	**0.652**	**0.682**	0.0732	**0.186**	0.135	**2.4**	**2.33**	**0.405**	**0.656**	**1.86**	0.106	**5.42**	**0.534**	**0.925**	**18.6**	**7.96**	0.0981	**7.14**	**24.4**	**10.4**	0.0404	0.0814
Molybdenum	3500e	-	-	7.24	0.402	6.6	86.3	5.2	22.9	33.2	17	3.6	2.25	0.28	6.29	2.81	0.473	29.6	7.54	0.283	10.1	12.6	2.49	10.7	2.52	0.52	3.62	3.12	25.8	0.259	0.851
Nickel	2000	20.9	51.6	17.4	6.26	**38.3**	**37.9**	**43**	**39.9**	**25.7**	12.8	7.71	10.1	6.96	18.5	**26.4**	8.82	**22.7**	**42.2**	3.88	9.12	7.11	10.1	**45.7**	**28.2**	12.3	**46.6**	**37.2**	**26.4**	4.89	8.93
Selenium	100	-	-	2.36	0.873	4.8	4.44	5.09	4.88	2.04	1.42	<0.625	<0.676	<0.617	<0.658	1.78	0.924	1.47	2.05	<0.625	1.41	0.834	<0.633	2.6	1.2	1.37	2.27	2.42	1.08	<0.595	<0.649
Silver	500	1	3.7	0.252	<0.133	0.488	0.704	0.562	0.827	0.627	0.164	<0.125	<0.135	<0.123	<0.132	0.286	<0.125	0.392	0.356	<0.125	<0.128	<0.123	<0.127	0.584	0.371	<0.135	0.625	0.608	0.419	<0.119	<0.130
Strontium	-	-	-	86.5	48	112	100	133	387	60.2	44.8	37.1	82.5	52.5	78.8	55.3	46.6	202	68.2	48.4	79.2	38.7	71.5	273	61.2	60.8	86.5	85.4	93.1	52.2	35.5
Thallium	700	-	-	<0.147	<0.133	0.324	0.452	0.452	0.483	0.276	0.145	<0.125	<0.135	<0.123	<0.132	0.169	<0.125	0.258	0.258	<0.125	<0.128	<0.123	<0.127	0.134	0.264	<0.135	0.354	0.315	<0.125	<0.119	<0.130
Tin	-	-	-	21.6	1.22	8.42	25.3	6.33	12.2	18.6	5.06	0.76	1.42	0.78	2.94	7.7	1.23	16	8.59	0.44	2.93	1.92	2.34	24.3	6.87	0.97	9.1	8.82	13.7	0.543	0.9
Titanium	-	-	-	305	500	814	777	922	1290	611	518	349	441	386	270	485	298	583	514	219	258	183	453	452	848	782	1020	874	421	234	408
Vanadium	2,400	-	-	18.8	16.3	55.3	49.7	59.7	80.3	37.3	27.1	14.6	18.7	13.8	17.1	35.8	19.2	68.9	48.9	11	19.2	9.44	19.2	75.9	50.7	31.8	65.5	52.6	48.2	10.4	17.7
Zinc	5,000	150	410	**2050**	**388**	**286**	**714**	**254**	**547**	**567**	**475**	77.1	85.4	60.9	**680**	**3850**	78.5	**1480**	**434**	15.7	**186**	68.4	108	**1120**	**389**	40.1	**418**	**610**	**835**	24.3	37.1
PCBs (ug/kg)																															
2',3,4,4',5-Pentachlorobiph	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2',3,4-Trichlorobiphenyl (B	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	12.3	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3',4,5-Pentachlorobiph	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	7.89	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,3',4',5,6-Heptachlor	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,3',4,4' Hexachlorobi	-	-	-	<3.17	<0.29	<0.56	<0.55	<0.56	<0.47	<0.43	<0.34	<0.29	<0.31	<0.29	<0.3	<0.31	<0.28	<0.30	<0.33	<0.29	<0.29	<0.29	<0.29	<0.31	<0.45	<0.33	<0.48	<0.4	<0.31	<0.28	<0.30
2,2',3,3',4,4',5 Heptachlor	-	-	-	<5.32	<0.49	<0.95	<0.93	<0.94	<0.8	<0.72	<0.57	3.91	<0.52	<0.49	2.83	<0.53	<0.48	<0.51	<0.55	<0.48	<0.49	<0.49	8.42	4.62	<0.76	<0.55	<0.8	<0.67	<0.53	<0.48	<0.50
2,2',3,3',4,4',5,5',6 Nonac	-	-	-	<4.44	<0.41	<0.79	<0.78	<0.78	<0.66	<0.60	<0.47	2.68	<0.43	<0.41	<0.42	<0.44	<0.40	<0.42	<0.46	<0.4	<0.41	<0.41	<0.4	<0.43	<0.64	<0.46	<0.67	<0.56	<0.44	<0.4	<0.42
2,2',3,3',4,4',5,5',6,6' Dc	-	-	-	<4.69	<0.44	<0.83	<0.82	<0.83	<0.7	<0.63	<0.5	<0.43	<0.46	<0.44	<0.44	<0.46	<0.42	<0.44	<0.49	<0.42	<0.44	<0.43	<0.42	<0.45	<0.67	<0.48	<0.71	<0.59	<0.47	<0.42	<0.44
2,2',3,3',4,4',5,5'-Octachl	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	3.34	<2.64	<2.29	<2.36	<2.32	3.27	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,3',4,4',5,6 Octachlo	-	-	-	<7.22	<0.67	<1.28	<1.26	<1.28	<1.08	<0.98	<0.77	<0.67	<0.71	<0.67	<0.68	<0.72	<0.65	<0.69	<0.75	<0.65	<0.67	<0.66	<0.65	<0.70	<1.04	<0.74	<1.09	<0.91	<0.72	<0.65	<0.68
2,2',3,3',4,5',6,6'-Octachl	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,3',4,5,5',6'-Octachl	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	3.1	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,3',4,6'-Hexachlorobi	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	5.25	<2.51	<2.28	11.6	3.9	<2.29	<2.36	<2.32	4.66	3.59	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39

Table 2b. Continued.

	TTLC	ER-L	ER-M	SWM12	SWM12	SWM13	SWM13	SWM14	SWM14	SWM15	SWM15	SWM15	SWM16	SWM16	SWM17	SWM17	SWM17	SWM18	SWM18	SWM18	SWM19	SWM19	SWM20	SWM20	SWM21	SWM21	SWM22	SWM22	SWM23	SWM23	SWM24
Depth (ft.)	-	-	-	4-6	8-10	0-2	4-6	0-2	2-5	0-2	4-6	2-4	0-2	4-6	0-2	5-8	8-12	0-2	2-4	4-9	0-2	4-6	0-2	4-6	0-2	4-13	0-2	2-5	0-2	2-6	0-2
2,2',3,4',5 Pentachlorobiph	-	-	-	<6.34	<0.59	<1.13	<1.11	<1.12	<0.95	<0.86	<0.68	<0.58	<0.62	<0.59	<0.6	<0.63	<0.57	<0.60	<0.66	<0.57	<0.59	<0.58	<0.57	<0.61	<0.91	<0.65	<0.65	<0.8	<0.63	<0.57	<0.60
2,2',3,4',5',6-Hexachlorobi	-	-	-	61.6	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	6.73	<2.48	<2.35	7.56	<2.51	<2.28	18.8	4.1	<2.29	<2.36	<2.32	9.59	8.24	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,4',5,5',6 Heptachlor	-	-	-	<4.18	<0.39	<0.74	<0.73	<0.74	<0.62	<0.57	<0.45	2.79	<0.41	<0.39	<0.39	<0.41	<0.38	8.25	<0.44	<0.38	<0.39	<0.38	3.76	<0.40	<0.6	<0.43	<0.63	<0.53	<0.42	<0.38	<0.39
2,2',3,4,4',5' Hexachlorobi	-	-	-	<3.68	<0.34	8.42	6.6	<0.65	<0.55	<0.50	<0.39	<0.34	<0.36	<0.34	<0.35	3.16	<0.33	<0.35	<0.38	<0.33	<0.34	<0.34	11.1	<0.35	4.05	<0.38	<0.55	6.19	<0.36	<0.33	<0.35
2,2',3,4,4',5',6 Heptachlor	-	-	-	<3.93	<0.36	<0.70	<0.69	<0.69	<0.59	<0.53	<0.42	<0.36	<0.38	<0.36	<0.37	<0.39	<0.35	5.46	<0.41	<0.35	<0.37	<0.36	<0.35	<0.38	<0.56	<0.40	<0.59	<0.5	<0.39	<0.35	<0.37
2,2',3,4,4',5,5' Heptachlor	-	-	-	55	<0.59	<1.13	<1.11	<1.12	<0.95	<0.86	<0.68	6.17	<0.62	<0.59	<0.6	<0.63	<0.57	27.3	<0.66	<0.57	<0.59	<0.58	<0.57	6.11	<0.91	<0.65	<0.95	3.27	<0.63	<0.57	<0.60
2,2',3,4,4',6,6' Heptachlor	-	-	-	<5.20	<0.48	<0.92	<0.91	<0.92	<0.78	<0.70	<0.56	<0.48	<0.51	<0.48	<0.49	<0.52	<0.47	<0.49	<0.54	<0.47	<0.48	<0.48	<0.47	<0.50	<0.74	<0.53	<0.78	<0.66	<0.52	<0.47	<0.49
2,2',3,4,5' Pentachlorobiph	-	-	-	42.5	<0.31	<0.59	<0.58	<0.58	<0.49	<0.45	<0.35	3.95	<0.32	<0.31	12.2	<0.33	<0.30	10.4	4.42	<0.3	2.56	<0.3	20.1	11.3	10.3	<0.34	<0.5	7.75	<0.33	<0.3	<0.31
2,2',3,4,5,5'-Hexachlorobip	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	4.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',3,5' Tetrachlorobiphen	-	-	-	<2.92	<0.27	<0.52	<0.51	<0.51	<0.44	<0.39	<0.31	<0.27	<0.28	<0.27	<0.28	<0.29	<0.26	<0.28	<0.30	<0.26	8.79	<0.27	14.5	<0.28	<0.42	<0.30	<0.44	4.41	<0.29	<0.26	<0.27
2,2',3,5',6-Pentachlorobiph	-	-	-	45.4	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	4.41	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	9.74	4.58	4.89	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',4,4',5,5' Hexachlorobi	-	-	-	95.8	<0.71	8.02	<1.33	<1.34	<1.14	<1.03	<0.81	12.5	<0.74	<0.71	17.6	<0.75	<0.68	36.4	7.05	<0.69	<0.71	<0.7	22.9	12.1	5.92	<0.78	<1.14	7.78	<0.75	<0.68	<0.72
2,2',4,4',5-Pentachlorobiph	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	11.3	<2.51	<2.28	<2.41	3.56	<2.29	<2.36	<2.32	<2.29	4.14	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,2',4,5' Tetrachlorobiphen	-	-	-	<1.77	<0.16	<0.32	<0.31	<0.31	<0.27	<0.24	<0.19	<0.16	<0.17	<0.16	<0.17	<0.18	<0.16	<0.17	<0.18	<0.16	<0.16	<0.16	4.57	<0.17	<0.25	<0.18	<0.27	<0.22	<0.18	<0.16	<0.17
2,2',4,5,5' Pentachlorobiph	-	-	-	145	3.2	<1.13	7.12	<1.12	<0.95	<0.86	<0.68	10.3	<0.62	<0.59	29.5	<0.63	2.38	25.6	11.7	<0.57	5.95	<0.58	27.8	14.8	13	<0.65	<0.95	16.3	<0.63	<0.57	<0.60
2,2',5 Trichlorobiphenyl (B	-	-	-	<5.70	<0.53	<1.01	<1.00	<1.01	<0.85	<0.77	<0.61	<0.53	<0.56	<0.53	<0.54	<0.57	<0.51	<0.54	<0.59	<0.51	<0.53	<0.52	<0.52	<0.55	<0.82	<0.59	<0.86	<0.72	<0.57	<0.51	<0.54
2,2',5,5' Tetrachlorobiphen	-	-	-	<3.80	<0.35	<0.68	<0.67	<0.67	<0.57	<0.51	<0.41	<0.35	<0.37	<0.35	13.3	<0.38	<0.34	<0.36	<0.40	<0.34	14.1	<0.35	13.2	<0.37	3.9	<0.39	<0.57	<0.48	<0.38	<0.34	<0.36
2,3',4',5-Tetrachlorobiphen	-	-	-	90.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	16.7	<2.51	<2.28	6.99	5.4	<2.29	17.9	<2.32	<2.29	<2.45	8.74	<2.61	<3.81	9.37	<2.52	<2.27	<2.39
2,3',4,4' Tetrachlorobiphen	-	-	-	27.2	<0.62	<1.19	<1.18	<1.19	<1	<0.91	<0.72	<0.62	<0.66	<0.62	<0.63	<0.67	<0.60	<0.64	<0.70	<0.61	11.6	<0.62	7.16	2.92	<0.96	<0.69	<1.01	4.76	<0.67	<0.6	<0.63
2,3',4,4',5 Pentachlorobiph	-	-	-	45.9	<0.48	<0.92	<0.91	<0.92	<0.78	<0.70	<0.56	3.58	<0.51	<0.48	7.03	<0.52	<0.47	6.74	3.29	<0.47	<0.48	<0.48	9.57	4.54	<0.74	<0.53	<0.78	4.28	<0.52	<0.47	<0.49
2,3',4,4',5',6-Hexachlorobi	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3',4,4',5,5'-Hexachlorobi	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3',4,4',6-Pentachlorobiph	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3,3',4',6-Pentachlorobiph	-	-	-	85.5	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	6.11	<2.48	<2.35	18.8	<2.51	<2.28	<2.41	6.76	<2.29	<2.36	<2.32	18	9.29	6.37	<2.61	<3.81	8.78	<2.52	<2.27	<2.39
2,3,3',4,4' Pentachlorobiph	-	-	-	<8.11	<0.75	<1.44	<1.42	<1.43	<1.21	<1.10	<0.87	2.5	<0.79	<0.75	4.39	<0.8	<0.73	14.2	<0.84	<0.73	<0.75	<0.74	5.96	3.4	<1.16	<0.83	<1.22	<1.02	<0.81	<0.73	<0.76
2,3,3',4,4',5 Hexachlorobip	-	-	-	<5.32	<0.49	<0.95	<0.93	<0.94	<0.8	<0.72	<0.57	<0.49	<0.52	<0.49	<0.5	<0.53	<0.48	6.82	<0.55	<0.48	<0.49	<0.49	6.51	<0.51	<0.76	<0.55	<0.8	<0.67	<0.53	<0.48	<0.50
2,3,3',4,4',5'-Hexachlorobi	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3,3',4,4',5,5'-Heptachlor	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3,3',4,4',6-Hexachlorobip	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,3,4,4',5-Pentachlorobiphe	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	8.3	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,4' Dichlorobiphenyl (BZ#	-	-	-	<6.46	<0.6	<1.15	<1.13	<1.14	<0.97	<0.87	<0.69	<0.60	<0.63	<0.6	<0.61	<0.64	<0.58	<0.61	<0.67	<0.58	21.4	<0.59	<0.58	<0.62	<0.93	<0.66	<0.97	<0.82	<0.64	<0.58	<0.61
2,4',5-Trichlorobiphenyl (B	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	29.1	3.14	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
2,4,4' Trichlorobiphenyl (B	-	-	-	<6.08	<0.57	<1.08	<1.06	<1.07	<0.91	<0.82	<0.65	<0.56	<0.59	<0.56	<0.57	<0.6	<0.55	<0.58	<0.63	<0.55	23.4	2.6	3.56	<0.59	<0.87	<0.63	<0.91	<0.77	<0.6	<0.55	<0.57
2,4,4',5-Tetrachlorobipheny	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	6.24	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
3,3',4,4' Tetrachlorobiphen	-	-	-	<12.7	<1.18	<2.25	<2.22	<2.24	<1.89	<1.72	<1.36	<1.17	<1.24	<1.18	<1.2	<1.26	<1.14	<1.20	<1.32	<1.14	<1.18	<1.16	<1.14	<1.22	<1.82	<1.30	<1.91	<1.6	<1.26	<1.14	<1.19
3,3',4,4',5 Pentachlorobiph	-	-	-	<7.60	<0.71	<1.35	<1.33	<1.34	<1.14	<1.03	<0.81	<0.70	<0.74	<0.71	<0.72	<0.75	<0.68	<0.72	<0.79	<0.69	<0.71	<0.7	<0.69	<0.73	<1.09	<0.78	<1.14	<0.96	<0.75	<0.68	<0.72
3,3',4,4',5,5' Hexachlorobi	-	-	-	<5.32	<0.49	<0.95	<0.93	<0.94	<0.8	<0.72	<0.57	<0.49	<0.52	<0.49	<0.5	<0.53	<0.48	<0.51	<0.55	<0.48	<0.49	<0.49	<0.48	<0.51	<0.76	<0.55	<0.8	<0.67	<0.53	<0.48	<0.50
3,4,4',5-Tetrachlorobipheny	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	7.22	<2.28	<2.41	<2.64	<2.29	<2.36	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
3,4,4'-Trichlorobiphenyl (B	-	-	-	<25.3	<2.35	<4.50	<4.43	<4.47	<3.79	<3.43	<2.71	<2.34	<2.48	<2.35	<2.39	<2.51	<2.28	<2.41	<2.64	<2.29	13.1	<2.32	<2.29	<2.45	<3.63	<2.61	<3.81	<3.2	<2.52	<2.27	<2.39
Total PCBs	50,000	-	-	694.2	3.2	16.44	13.72	0	0	0	7.89	68.73	0	0	150.85	10.38	2.38	181.9	50.18	0	166.44	5.74	212.67	89.63	57.17	0	0	72.89	0	0	0
Aroclor (ug/kg)																															
Aroclor-1016	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Aroclor-1221	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Aroclor-1232	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Aroclor-1242	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	240	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Aroclor-1248	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<280	<13	<13	<12	<13	<13	<17	<14	<22	3600	<12	<12	<13
Aroclor-1254	-	-	-	5200	19	<22	290	<26	110	100	66	100	<14	<12	1900	750	17	3600	2100	14	77	<12	850	200	350	<14	78	2300	<12	<12	<13
Aroclor-1260	-	-	-	<15	<13	<22	1100	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	8200	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Aroclor-1262	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Pesticides (ug/kg)																															
2,4'-DDD	1000	2	20	<1.5	<1.3	**<2.2**	<1.9	**<2.6**	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	**<2.2**	<1.7	<1.2	<1.2	<1.3
2,4'-DDE	1000	2.2	27	<1.5	<1.3	<2.2	<1.9	**<2.6**	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
2,4'-DDT	1000	1	7	**<1.5**	**<1.3**	**<2.2**	**<1.9**	**<2.6**	**<2.0**	**<1.8**	**<1.2**	**<1.3**	**<1.4**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<1.3**	**<1.4**	**<1.3**	**<1.3**	**<1.2**	**<1.3**	**<1.3**	**<1.7**	**<1.4**	**<2.2**	**<1.7**	**<1.2**	**<1.2**	**<1.3**
4,4'-DDD	1000	2	20	<1.5	<1.3	**7.2**	<1.9	**<2.6**	**6.6**	<1.8	**6.5**	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	**9**	<1.3	**3.1**	<1.2	**16**	**32**	**13**	<1.4	**6**	**120**	<1.2	<1.2	<1.3
4,4'-DDE	1000	2.2	27	<1.5	**3.9**	**19**	**45**	**17**	**49**	**19**	**21**	**28**	**11**	1.6	**87**	**47**	**5.6**	<1.3	**120**	**5.4**	**28**	<1.2	**28**	**56**	**31**	<1.4	**27**	**180**	**11**	1.3	1.8

Table 2b. Continued.

Analyte	TTLC	ER-L	ER-M	SWM12	SWM12	SWM13	SWM13	SWM14	SWM14	SWM15	SWM15	SWM15	SWM16	SWM16	SWM17	SWM17	SWM17	SWM18	SWM18	SWM18	SWM19	SWM19	SWM20	SWM20	SWM21	SWM21	SWM22	SWM22	SWM23	SWM23	SWM24
Depth (ft.)	-	-	-	4-6	8-10	0-2	4-6	0-2	2-5	0-2	4-6	2-4	0-2	4-6	0-2	5-8	8-12	0-2	2-4	4-9	0-2	4-6	0-2	4-6	0-2	4-13	0-2	2-5	0-2	2-6	0-2
4,4'-DDT	1000	1	7	**<1.5**	**<1.3**	**12**	**<1.9**	**<2.6**	**<2.0**	**<1.8**	**<1.2**	**<1.3**	**2.8**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<1.3**	**<1.4**	**<1.3**	**<1.3**	**<1.2**	**<1.3**	**<1.3**	**<1.7**	**<1.4**	**<2.2**	**<1.7**	**<1.2**	**<1.2**	**<1.3**
Aldrin	1400	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Alpha-BHC	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Beta-BHC	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Chlordane	2500	0.5	6	**<15**	**<13**	**<22**	**<19**	**<26**	**<20**	**<18**	**<12**	**<13**	**<14**	**<12**	**<13**	**<13**	**<13**	**<13**	**<14**	**<13**	**<13**	**<12**	**<13**	**<13**	**<17**	**<14**	**<22**	**<17**	**<12**	**<12**	**<13**
Delta-BHC	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Dieldrin	8000	0.02	8	**<1.5**	**<1.3**	**<2.2**	**<1.9**	**<2.6**	**<2.0**	**<1.8**	**<1.2**	**<1.3**	**<1.4**	**<1.2**	**<1.3**	**<1.3**	**<1.3**	**<1.3**	**<1.4**	**<1.3**	**<1.3**	**<1.2**	**16**	**<1.3**	**<1.7**	**<1.4**	**<2.2**	**<1.7**	**<1.2**	**<1.2**	**<1.3**
Endosulfan I	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Endosulfan II	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Endosulfan Sulfate	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Endrin	200	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Endrin Aldehyde	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Endrin Ketone	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Gamma-BHC	4000	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Heptachlor	4700	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Heptachlor Epoxide	-	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Methoxychlor	100000	-	-	<1.5	<1.3	<2.2	<1.9	<2.6	<2.0	<1.8	<1.2	<1.3	<1.4	<1.2	<1.3	<1.3	<1.3	<1.3	<1.4	<1.3	<1.3	<1.2	<1.3	<1.3	<1.7	<1.4	<2.2	<1.7	<1.2	<1.2	<1.3
Toxaphene	5000	-	-	<29	<27	<44	<38	<51	<40	<36	<24	<25	<27	<25	<26	<26	<25	<26	<28	<25	<26	<25	<25	<25	<35	<27	<43	<35	<25	<24	<26
Total Chlordane	-	-	-	<15	<13	<22	<19	<26	<20	<18	<12	<13	<14	<12	<13	<13	<13	<13	<14	<13	<13	<12	<13	<13	<17	<14	<22	<17	<12	<12	<13
Organotins (ug/kg)																															
Dibutyltin	-	-	-	29	<4.0	150	1100	30	350	500	250	19	19	<3.7	53	<3.9	<3.8	450	48	<3.8	25	4.8	57	93	36	<4.1	15	<5.2	9.7	<3.6	<3.9
Monobutyltin	-	-	-	6.3	<4.0	26	29	11	16	100	22	7.1	<4.1	<3.7	<3.9	<3.9	<3.8	35	12	<3.8	<3.8	<3.7	<3.8	8.9	<5.2	<4.1	<6.5	<5.2	<3.8	<3.6	<3.9
Tetrabutyltin	-	-	-	<4.4	<4.0	25	37	<7.7	17	80	<3.6	<3.8	<4.1	<3.7	30	<3.9	<3.8	120	6.5	<3.8	<3.8	<3.7	<3.8	<3.8	<5.2	<4.1	<6.5	<5.2	<3.8	<3.6	<3.9
Tributyltin	-	-	-	61	8.6	2800	4400	150	980	3700	340	71	25	4.4	710	<3.9	<3.8	5500	320	<3.8	51	11	64	130	27	<4.1	30	<5.2	16	<3.6	5.8
PAHs (ug/kg)																															
1-Methylnaphthalene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	350	<25	<24	<26
2-Methylnaphthalene	-	70	670	**<290**	<27	<44	<38	<52	**<400**	<36	**<120**	<25	<27	<25	**<260**	**<260**	**<130**	**<260**	**<280**	<25	**<130**	<25	**<250**	**<130**	**<350**	<27	**<430**	**610**	<25	<24	<26
Acenaphthene	-	16	500	**370**	**<27**	**<44**	**<38**	**<52**	**540**	**42**	**<120**	**<25**	**<27**	**<25**	**<260**	**<260**	**<130**	**<260**	**<280**	**<25**	**<130**	**<25**	**<250**	**<130**	**<350**	**<27**	**<430**	**820**	**<25**	**<24**	**<26**
Acenaphthylene	-	44	640	**<290**	<27	<44	<38	**<52**	**<400**	<36	**<120**	<25	<27	<25	**<260**	**<260**	**<130**	**<260**	**<280**	<25	**<130**	<25	**<250**	**<130**	**<350**	<27	**<430**	**<350**	<25	<24	<26
Anthracene	-	85.3	1100	**850**	<27	<44	<38	61	**2600**	57	**<120**	<25	<27	<25	**<260**	**<260**	**<130**	**<260**	**<280**	<25	**<130**	<25	**<250**	**210**	**<350**	<27	**<430**	**<350**	<25	<24	<26
Benzo (a) Anthracene	-	261	1600	**2000**	<27	75	110	130	**2200**	200	130	<25	29	<25	<260	**380**	<130	<260	**<280**	<25	<130	<25	**340**	**750**	**<350**	<27	**<430**	**780**	31	<24	<26
Benzo (a) Pyrene	-	430	1600	**1400**	<27	130	180	200	**1400**	260	290	29	58	<25	320	**550**	<130	270	<280	34	270	39	**890**	**1200**	**450**	<27	<430	**800**	65	<24	<26
Benzo (b) Fluoranthene	-	-	-	1800	<27	160	220	240	1600	290	310	33	69	<25	440	660	<130	310	<280	40	400	59	1100	1300	660	<27	450	930	78	<24	<26
Benzo (g,h,i) Perylene	-	-	-	<290	<27	65	110	<52	520	120	200	<25	34	<25	<260	<260	<130	<260	<280	<25	<130	<25	330	1300	<350	<27	<430	<350	30	<24	<26
Benzo (k) Fluoranthene	-	-	-	1700	<27	110	200	250	1600	320	280	32	66	<25	350	600	<130	290	<280	32	340	48	920	1000	500	<27	520	770	66	<24	<26
Chrysene	-	384	2800	**2100**	28	120	150	210	**2700**	260	190	<25	41	<25	280	**420**	<130	**420**	<280	<25	160	<25	**430**	**1100**	<350	<27	**<430**	**930**	44	<24	<26
Dibenz (a,h) Anthracene	-	63.4	260	**<290**	<27	<44	<38	<52	**<400**	<36	**<120**	<25	<27	<25	**<260**	**<260**	**<130**	**<260**	**<280**	<25	**<130**	<25	**<250**	**250**	**<350**	<27	**<430**	**<350**	<25	<24	<26
Fluoranthene	-	600	5100	**6300**	47	170	240	190	**4100**	450	270	32	42	<20	600	**810**	<100	**980**	240	<20	190	<20	420	**1500**	<280	<22	<340	**1600**	39	<19	<21
Fluorene	-	19	540	**420**	**<27**	**<44**	**<38**	**<52**	**500**	**39**	**<120**	**<25**	**<27**	**<25**	**<260**	**<260**	**<130**	**<260**	**<280**	**<25**	**<130**	**<25**	**<250**	**<130**	**<350**	**<27**	**<430**	**840**	**<25**	**<24**	**<26**
Indeno (1,2,3-c,d) Pyrene	-	-	-	<290	<27	55	93	<52	550	110	170	<25	29	<25	<260	<260	<130	<260	<280	<25	<130	<25	290	890	<350	<27	<430	<350	<25	<24	<26
Naphthalene	-	160	2100	**370**	<27	<44	<38	<52	**<400**	<36	<120	<25	<27	<25	**<260**	**<260**	<130	**<260**	**<280**	<25	<130	<25	**<250**	<130	**<350**	<27	**<430**	**1300**	<25	<24	<26
Phenanthrene	-	240	1500	**3200**	<27	53	130	110	**1300**	**300**	190	<25	35	<25	**460**	**580**	<130	**520**	**<280**	<25	130	<25	**<250**	**320**	**<350**	<27	**<430**	**2200**	27	<24	<26
Pyrene	-	665	2600	**5600**	230	240	400	290	**11000**	500	500	41	140	<25	**1400**	**1900**	130	**670**	<280	75	330	43	**2000**	**6000**	<350	<27	<430	**2200**	150	<24	<26
Total HMW PAHs	-	-	-	20900	305	1125	1703	1510	25670	2510	2340	167	508	0	3390	5320	130	2940	240	181	1690	189	6720	15290	1610	0	970	8010	503	0	0
Total LMW PAHs	-	-	-	4790	0	53	130	171	4440	399	190	0	35	0	460	580	0	520	0	0	130	0	0	530	0	0	0	4930	27	0	0
Total PAH	-	-	-	25690	305	1178	1833	1681	30110	2909	2530	167	543	0	3850	5900	130	3460	240	181	1820	189	6720	15820	1610	0	970	12940	530	0	0
Semi-Volatiles (ug/kg)																															
1,2,4-Trichlorobenzene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
1,2-Dichlorobenzene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
1,3-Dichlorobenzene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
1,4-Dichlorobenzene	-	-	-	2200	75	68	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2,4,5-Trichlorophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2,4,6-Trichlorophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2,4-Dichlorophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2,4-Dimethylphenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26

Table 2b. Continued.

Analyte	**TTLC**	**ER-L**	**ER-M**	**SWM12**	**SWM12**	**SWM13**	**SWM13**	**SWM14**	**SWM14**	**SWM15**	**SWM15**	**SWM15**	**SWM16**	**SWM16**	**SWM17**	**SWM17**	**SWM17**	**SWM18**	**SWM18**	**SWM18**	**SWM19**	**SWM19**	**SWM20**	**SWM20**	**SWM21**	**SWM21**	**SWM22**	**SWM22**	**SWM23**	**SWM23**	**SWM24**
Depth (ft.)	-	-	-	4-6	8-10	0-2	4-6	0-2	2-5	0-2	4-6	2-4	0-2	4-6	0-2	5-8	8-12	0-2	2-4	4-9	0-2	4-6	0-2	4-6	0-2	4-13	0-2	2-5	0-2	2-6	0-2
2,4-Dinitrophenol	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
2,4-Dinitrotoluene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2,6-Dinitrotoluene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2-Chloronaphthalene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2-Chlorophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2-Methylphenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2-Nitroaniline	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
2-Nitrophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
3,3'-Dichlorobenzidine	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
3-Nitroaniline	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
3/4-Methylphenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4,6-Dinitro-2-Methylphenol	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
4-Bromophenyl-Phenyl Ether	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4-Chloro-3-Methylphenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4-Chloroaniline	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4-Chlorophenyl-Phenyl Ether	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4-Nitroaniline	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
4-Nitrophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Aniline	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Azobenzene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Benzidine	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
Benzoic Acid	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
Benzyl Alcohol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Bis(2-Chloroethoxy) Methane	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Bis(2-Chloroethyl) Ether	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
Bis(2-Chloroisopropyl) Ethe	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Bis(2-Ethylhexyl) Phthalate	-	-	-	480	37	110	380	310	<200	130	130	20	200	160	1600	<130	<63	830	1000	180	<64	25	140	75	420	<14	420	<170	96	<12	19
Butyl Benzyl Phthalate	-	-	-	<150	<13	<22	<19	<26	<200	<18	<60	<13	<14	<13	<130	<130	<63	<130	<140	<13	<64	<12	<130	<63	<170	<14	<220	<170	<13	<12	<13
Di-n-Butyl Phthalate	-	-	-	<150	<13	26	<19	<26	<200	<18	<60	<13	<14	<13	<130	<130	<63	<130	<140	<13	<64	<12	<130	<63	<170	<14	<220	<170	<13	<12	<13
Di-n-Octyl Phthalate	-	-	-	<150	<13	53	<19	51	<200	<18	<60	<13	<14	<13	<130	<130	<63	<130	<140	<13	<64	<12	<130	<63	<170	<14	<220	<170	<13	<12	<13
Dibenzofuran	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	700	<25	<24	<26
Diethyl Phthalate	-	-	-	<150	<13	<22	<19	<26	<200	<18	<60	<13	<14	<13	<130	<130	<63	<130	<140	<13	<64	<12	<130	<63	<170	<14	<220	<170	<13	<12	<13
Dimethyl Phthalate	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Hexachloro-1,3-Butadiene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Hexachlorobenzene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Hexachlorocyclopentadiene	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Hexachloroethane	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Isophorone	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
N-Nitroso-di-n-propylamine	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
N-Nitrosodimethylamine	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
N-Nitrosodiphenylamine	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Nitrobenzene	-	-	-	<1500	<130	<220	<190	<260	<2000	<180	<600	<130	<140	<130	<1300	<1300	<630	<1300	<1400	<130	<640	<120	<1300	<630	<1700	<140	<2200	<1700	<130	<120	<130
Pentachlorophenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Phenol	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
Pyridine	-	-	-	<290	<27	<44	<38	<52	<400	<36	<120	<25	<27	<25	<260	<260	<130	<260	<280	<25	<130	<25	<250	<130	<350	<27	<430	<350	<25	<24	<26
TPH (ug/kg)																															
C7	-	-	-	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
C8	-	-	-	<	<	<	<	<	<	<	<	<	<	<	1.5	0.11	<	0.39	<	<	<	<	<	<	<	<	<	0.13	<	<	<
C9-C10	-	-	-	2.2	<	<	<	<	0.092	15	0.14	<	0.078	<	1.1	<	<	4.8	0.46	<	<	<	0.41	<	<	<	<	2.9	0.16	<	<
C11-C12	-	-	-	3.7	<	<	<	<	2.2	6.8	2.2	<	3	0.3	2.3	1.3	1.1	2.8	3.2	<	<	<	13	12	24	<	3.6	8.6	2	<	<
C13-C14	-	-	-	1.7	0.32	0.51	0.34	0.072	4.3	0.45	3.8	<	0.95	1.4	4.5	2.8	2	3.1	4	<	1.8	0.094	3.9	18	11	0.089	1.9	11	1.7	<	<
C15-C16	-	-	-	5.9	1.6	2.9	2.1	2.3	9	2.9	8.1	0.71	4.7	4.1	7.9	7.1	5	4.1	6.5	0.37	6.5	1	12	45	42	0.71	14	23	3.4	0.93	0.34

Table 2b. Continued.

Analyte	TTLC	ER-L	ER-M	SWM12	SWM12	SWM13	SWM13	SWM14	SWM14	SWM15	SWM15	SWM15	SWM16	SWM16	SWM17	SWM17	SWM17	SWM18	SWM18	SWM18	SWM19	SWM19	SWM20	SWM20	SWM21	SWM21	SWM22	SWM22	SWM23	SWM23	SWM24
Depth (ft.)	-	-	-	4-6	8-10	0-2	4-6	0-2	2-5	0-2	4-6	2-4	0-2	4-6	0-2	5-8	8-12	0-2	2-4	4-9	0-2	4-6	0-2	4-6	0-2	4-13	0-2	2-5	0-2	2-6	0-2
C17-C18	-	-	-	17	3.5	8.2	6.4	4.1	19	17	18	1	5.4	5.8	13	14	6.7	9.7	8.6	0.64	13	2.4	35	88	54	1.1	22	40	8.5	0.59	0.39
C19-C20	-	-	-	30	6.2	11	8.7	8.3	28	21	23	2.7	11	13	33	22	12	16	13	0.82	22	5.4	60	160	140	1	48	64	18	3.3	0.78
C21-C22	-	-	-	39	8.5	18	14	12	39	24	27	3.9	14	28	25	25	13	18	17	1.2	26	7.4	72	190	140	2.1	45	71	17	7.3	2.6
C23-C24	-	-	-	25	8.8	15	11	7.9	34	27	31	1.5	3.8	25	26	23	13	24	13	1.2	20	4.2	84	240	170	1.9	34	50	17	2	0.49
C25-C28	-	-	-	55	45	38	29	15	100	53	57	2.4	26	29	73	56	29	42	37	2.6	75	15	170	450	340	4	88	100	36	5.1	0.54
C29-C32	-	-	-	51	<	38	28	15	10	64	65	3.2	33	71	67	61	34	45	29	3.5	24	2.7	180	520	430	4.7	97	120	37	7.7	1.4
C33-C36	-	-	-	25	8.5	24	16	10	26	38	32	1.5	12	10	42	47	19	21	16	2.7	34	5.9	120	280	250	3.7	49	79	25	7.4	0.47
C37-C40	-	-	-	19	6.3	12	11	7.9	19	30	22	1.2	7.1	43	21	29	14	19	15	3	22	6.2	95	180	210	3.6	63	61	17	6.4	1
C41-C44	-	-	-	14	9.1	16	13	6.8	16	24	17	1.1	20	28	41	23	13	16	9.4	4.2	19	5.6	61	150	130	4.5	39	30	27	4.5	1.7
C7-C44 Total	-	-	-	290	91	180	140	89	310	320	310	19	140	260	360	310	160	230	170	20	260	56	910	2300	1900	27	510	670	210	45	9.8
TRPH	-	-	-	410	26	140	240	120	760	150	160	38	99	68	200	290	130	110	230	31	170	40	280	940	390	18	450	1400	100	34	40
Mean ER-M Qs																															
Metal ERMq	-	-	-	10.29	0.33	0.55	0.85	0.45	0.91	0.86	0.43	0.08	0.13	0.08	1.26	1.85	0.14	1.07	0.95	0.04	1.06	0.15	0.29	5.01	1.83	0.08	1.71	4.80	2.65	0.04	0.06
PCB ERMq	-	-	-	0.58	0.01	0.03	0.04	0.04	0.68	0.07	0.06	0.00	0.01	0.00	0.09	0.13	0.00	0.08	0.01	0.00	0.04	0.00	0.15	0.35	0.04	0.00	0.02	0.32	0.01	0.00	0.00
Pesticide ERMq	-	-	-	3.86	0.02	0.09	0.08	0.00	0.00	0.00	0.04	0.38	0.00	0.00	0.84	0.06	0.01	1.01	0.28	0.00	0.92	0.03	1.18	0.50	0.32	0.00	0.00	0.40	0.00	0.00	0.00
PAH ERMq	-	-	-	0.00	0.08	0.83	0.98	0.37	1.21	0.41	0.60	0.61	0.30	0.03	1.89	1.02	0.12	0.00	2.80	0.12	0.67	0.00	0.95	1.91	0.95	0.00	0.72	6.51	0.24	0.03	0.04
Overall ER-M Q	-	-	-	3.68	0.11	0.37	0.49	0.21	0.70	0.33	0.28	0.27	0.11	0.03	1.02	0.76	0.07	0.54	1.01	0.04	0.67	0.05	0.64	1.94	0.78	0.02	0.61	3.01	0.72	0.02	0.02

3.3.Geotechnical Results for Surface Sediment (0-2 ft)

Surface Sediment Composition

Surface sediment samples (0-2ft) were analyzed for grain size, total solids, specific gravity, and total organic carbon (TOC). The greatest percentage of coarse grain material (gravel and sand) were found at those sampling stations near the wharf face along Berths 240X-Z (SWM17, 18, and 19) with an average range of between 87.6% and 92.1% coarse grain material. Those areas sampled adjacent to the dry dock near Parcel 4 (SWM 4, 5, 6, 9, 11, and 12) had the greatest fine grain sediment composition, with an average of 54.89% of the sampled material being comprised of silt and clay.

Total Solids, Specific Gravity, TOC

Total solids were found to be highest in the sampling areas located near the wharf face (Berths 240X-Z) (SWM17, 18, 19) at 77.33%. The average Specific Gravity ranged from 1.45 adjacent to the dry docks in Parcel 4 (SWM3, 3B, 7, 8, 10, 13) to 1.90 at those sampling areas near the wharf face (Berths 240X-Z) (SWM17,18,19). Total Organic Carbon (TOC) was found to have relatively little variability with TOC percentages ranging from 1.75% at those areas sampled under the dry docks (SWM 8, 10, 13, 3, 3B, and 7) to 1.23% in the channel near berths 240X-Z (SWM20-23)

3.4.Chemistry of Surface Sediment Samples (0-2 ft)

Metals in Surface Sediment

Metals were detected at high concentrations within many surface sediment samples. Mercury, copper, lead, chromium, and zinc were detected at concentrations in surface sediment greater than ER-M values.

Mercury concentrations in surface sediment were detected above ER-M values at five sampling locations that were under dry docks in Parcel 4 (SWM3, 3B, 7, 8, 10), four sampling locations adjacent to a dry dock in Parcel 4 (SWM5, 6, 9, 12), four sampling locations in the slip channel near Berths 240 X-Z (SWM20-23), two locations adjacent to Parcel 4, or in the channel adjacent Berth 241 (SWM1-2), and two wharf face sampling locations at Berths 240 X-Z (SWM17, 19). Mercury concentrations in surface sediment samples ranged from 0.08 mg/kg at SWM24, the reference station, to 13.8 mg/kg in SWM9, located adjacent to the dry docks in Parcel 4.

Copper concentrations in surface sediment samples from all locations under dry docks in Parcel 4 (SWM3, 3B, 7, 8, 10, 13) were above ER-M values. Copper concentrations in surface sediment were also higher than ER-M values at four locations adjacent to a dry dock (SWM9, 12, 5, 6), three sampling locations in the slip channel (SWM21-23), two wharf face sampling locations (SWM17, 18), and one location adjacent to Parcel 4 (SWM15). Copper concentrations in surface sediment ranged from 15.3 mg/kg at SWM24, or the reference station, to 1770 mg/kg at SWM8, a location under a dry dock in Parcel 4.

Lead concentrations in surface sediment were above ER-M values at the following sampling locations: adjacent to Parcel 4 (SWM2), adjacent to a dry dock in Parcel 4 (SWM9, 12), in the slip channel (SWM23); under a dry dock in Parcel 4 (SWM7), and along a wharf face (SWM17,

18). Lead concentrations in surface sediment ranged from 6.69 mg/kg at SWM24, the reference location, to 858 mg/kg at SWM17, located along a wharf face.

Zinc concentrations in surface sediment were detected above ER-M values at four sampling locations under dry docks in Parcel 4 (SWM3, 7, 8, 10), four sampling locations adjacent to a dry dock in Parcel 4 (SWM5, 6, 9, 12), two sampling locations in the slip channel (SWM22, 23), two locations adjacent to Parcel 4(SWM1, 15), and two wharf face sampling locations (SWM17, 19). Zinc concentrations ranged from 37.1 mg/kg at SWM9, adjacent to a dry dock in Parcel 4, to 3310 mg/kg at SWM18.

Chromium concentrations in surface sediment were only higher than ER-M values at SWM18, located along a wharf face. Chromium concentrations ranged from 10.6 mg/kg in the sample from SWM24, the reference station, to 559 mg/kg in the sample from SWM18, a wharf face sampling location.

Tributyltin in Surface Sediment

Concentrations of tributyltin (TBT) in surface sediment samples ranged from 5.8 ug/kg at SWM24, the reference station, to 46,000 ug/kg at SWM8, located under a dry dock in Parcel 4. TBT concentrations in surface sediment were higher than 100 ug/kg at all of the samples taken from under a dry dock in Parcel 4 (SWM3, 3B, 7, 8, 10, 13), five sampling locations adjacent to a dry dock in Parcel 4 (SWM5, 6, 9, 11, 12), two locations adjacent to Parcel 4 (SWM14, 15), and two wharf face sampling locations (SWM17, 18). While there are no ER-L or ER-M values to use as guidelines for assessing the potential biological significance of TBT concentrations in sediment, a number of studies have demonstrated that TBT-contaminated sediment causes toxicity to test organisms or changes in benthic communities at concentrations ranging from 100 to 7000 ug/kg (McGee *et al.*, 1995, Austen and McEvoy, 1997, Meader *et al.*, 1997, Stronkhorst *et al.*, 1999, Meador and Rice, 2001, Hallers-Tjabbes *et al.*, 2003). The concentration of TBT causing toxicity in previous studies was dependent on the toxicity test organism/benthic community used, duration of exposure, the type of exposure (*i.e.,* TBT-spiked sediment or natural sediment contaminated with TBT), endpoint of interest (*e.g.,* growth), the sediment type (sandy/muddy/fine), and the amount of total organic carbon (TOC) found within the sediment. The study demonstrating the highest sensitivity of an organism to TBT-contaminated sediment used a 42-day growth (sublethal) test with the polychaete *Armandia brevis* (Meador and Rice, 2001). In this study, *A. brevis* exposed to TBT-spiked sediment demonstrated 21-day and 42-day Lowest Observable Effect Concentrations (LOEC) of 191 ug/kg and 101 ug/kg, respectively, whereas 21-day and 42-day No Observable Effect Concentrations (NOEC) were 101 ug/kg and 43 ug/kg, respectively. In contrast, in acute toxicity tests in which several species were exposed to TBT-spiked sediment for 10 days, approximated LOECs for *A. brevis, R. abronius, and E. washingtonianus* were 2000 ug/kg, 7000 ug/kg, and 4000 ug/kg, respectively, whereas approximated NOEC values were 1500 ug/kg, 3000 ug/kg, and 2500 ug/kg, respectively (Meador *et al.*, 1997). A number of additional studies over the last ten years have shown that sediment contaminated with TBT was associated with detrimental biological effects or changes in benthic community structure at TBT concentrations in sediment ranging from 100 to 7000 ug/kg (McGee *et al.*, 1995, Austen and McEvoy, 1997, Stronkhorst *et al.*, 1999, Hallers-Tjabbes *et al.*, 2003). In addition to the above studies, an effort to identify sediment quality guidelines for TBT was shown by a study in which sediment concentrations less than 120 ug/kg (in sediment

with 2% organic carbon; based on a tissue residue approach) were determined to be protective of salmonid species in Puget Sound (Meador, 2000).

Total DDTs in Surface Sediment

Surface sediment concentrations of total DDTs (4,4'-DDT and its derivatives 4,4'–DDE and 4,4'–DDD), were found at concentrations greater than ER-M values in two samples collected from under dry docks within Parcel 4 (SWM7, 8), four sampling locations adjacent to a dry dock within Parcel 4 (SWM5, 6, 9, 12), a sampling location adjacent Parcel 4 (SWM1), and one location at a wharf face (SWM17). Total DDT concentrations ranged from below the detection limit at SWM18, a wharf face sampling location, to 182 ug/kg at SWM12, a location adjacent to a dry dock in Parcel 4.

Total PCBs in Surface Sediment

Total PCB concentrations in surface sediment were found to be higher than ER-M values at many sampling locations within and around Parcel 4 including SWM3, SWM9, SWM12, SWM18, and SWM20. Total PCB concentrations ranged from below the detection limit (0.5 to 3.0 ug/kg) at the reference location, SWM24, and several other sampling locations, to as high as 2867 ug/kg at SWM12, a location adjacent to the dry docks in Parcel 4.

Total Aroclors in Surface Sediment

Several aroclors, or mixtures of PCBs, including aroclor 1248, 1254, and 1260, were found in surface sediment samples from within and outside of Parcel 4. Total aroclor concentrations in surface sediment were detected at higher than ER-M values for PCBs (180 ug/kg), from three sampling locations under a dry dock in Parcel 4 (SWM3, 7, 8), three sampling locations adjacent to a dry dock in Parcel 4 (SWM6, 9, 12), three wharf face locations (SWM18, 19, 20), and two locations in the slip channel (SWM20, 21). Total aroclor concentrations ranged from below detection limits at the reference location, SWM24, and several other locations to 11,800 ug/kg at SWM18, a wharf face sampling location.

Total PAHs in Surface Sediment

Total PAH concentrations in surface sediment were not detected at concentrations greater than ER-M values. Total low molecular weight PAH concentrations ranged from below detection limits at the reference station, SWM24, and several other sampling locations, to 1910 ug/kg at SWM8. Total high molecular weight PAH concentrations ranged from below detection limits at SWM22 and SWM24 to 6520 ug/kg at SWM3.

3.5.Geotechnical Results for Subsurface Sediment (2-13 ft)

Subsurface Sediment Composition

Subsurface sediment samples (2-13 ft.) were analyzed for grain size, total solids, specific gravity, and total organic carbon (TOC). The greatest percentage of coarse grain material (gravel and sand) was found at those sampling stations near the wharf face (Berths 240X-Z) (SWM17, 18, and 19) and those areas adjacent to the dry docks near Parcel 4 (SWM4, 5,6, 9,11, 12),with an average between 87.82% and 88.31% coarse grain material, respectively. The greatest amount of fine grain material was found at those sampling locations under the dry docks near Parcel 4 (SWM8, 10, 13, 3, 3B, and 7) with an average of 51.95% of the sampled material being comprised of silt and clay.

Total Solids, Specific Gravity, Total Organic Carbon (TOC)

Total solids for subsurface samples (2-13ft) were found to be highest in the sampling areas located adjacent to dry docks near Parcel 4 (SWM4, 5, 6, 9, 11, 12), in the channel near berths 240X-Z (SWM20-23), and near the wharf face (Berths 240X-Z) (SWM17, 18, 19), with average values ranging from 76.21% to 77.52%. The average specific gravity ranged from 1.62 under the dry docks in Parcel 4 (SWM3, 3B, 7, 8, 10, and 13), to 1.81 at those sampling areas adjacent to dry docks in Parcel 4 (SWM4, 5, 6, 9, 11, and 12). Total organic carbon (TOC) was found to be greatest in those areas sampled under the dry docks in Parcel 4 (SWM8, 10, 13, 3, 3B, and 7) with an average of 1.88% TOC. The other sampling locations had little variability with average TOC values ranging from 1.07% to .46%.

3.6.Chemistry of Subsurface Sediment Samples (Below 2 ft)

Metals in Subsurface Sediment

Metals were detected at elevated concentrations within subsurface sediment samples from Parcel 4 of SWM and in areas outside of Parcels 4, 5, and 6. Mercury, copper, lead, and zinc were detected at concentrations greater than ER-M values.

Mercury concentrations in subsurface sediment were found above ER-M values at three sampling locations that were adjacent to a dry dock in Parcel 4 (SWM5, 9, 12), two sampling locations under a dry dock in Parcel 4 (SWM3, 3B), two wharf face sampling locations (SWM17-18), two locations in the slip channel (SWM20, 22), and two sampling locations adjacent to Parcel 4 (SWM1, 14). Mercury concentrations in subsurface sediment samples ranged from below detection limits in two samples (SWM7, 11) to 54.8 mg/kg in SWM9 (4-6 ft), located adjacent to a dry dock in Parcel 4. Mercury concentrations in subsurface sediment samples from SWM9, 12, and 22 were above the TTLC of 20 mg/kg and therefore are classified as hazardous waste.

Copper concentrations in subsurface sediment samples from three sampling locations under a dry dock in Parcel 4 (SWM3, 3B, 13), two locations adjacent to a dry dock in Parcel 4 (SWM5, 12), two sampling locations in the slip channel (SWM20, 22), one wharf face sampling location (SWM18), and one location adjacent to Parcel 4 (SWM14) demonstrated copper concentrations above ER-M values. Copper concentrations in subsurface sediment ranged from 6.61 mg/kg at SWM18 (4-9 ft), a wharf face sampling location, to 2610 mg/kg at SWM3 (6-8 ft), a location under a dry dock in Parcel 4.

Lead concentrations in subsurface sediment were above ER-M values at many sampling locations that were found both in and near the SWM leasehold area (SWM1, 3, 3B, 5, 12, 17, 18, 20, 22). Lead concentrations in subsurface sediment ranged from 1.9 mg/kg at SWM11 (4-9 ft), adjacent to the dry dock in Parcel 4, to 1820 mg/kg at SWM20 (4-6 ft), located in the slip channel. Lead concentrations in the subsurface sediment at SWM12 (4-6 ft) and SWM20 (4-6 ft) were above the TTLC of 1000 mg/kg and therefore are classified as hazardous waste.

Zinc concentrations were above ER-M values in subsurface sediment samples from three sampling locations under a dry dock in Parcel 4 (SWM3, 3B, 13), two locations adjacent to a dry dock in Parcel 4 (SWM5, 12), two sampling locations in the slip channel (SWM20, 22), two

wharf face sampling locations (SWM17, 18), and three locations adjacent to Parcel 4 (SWM1, 14, 15). Zinc concentrations in subsurface sediment ranged from 15.7 mg/kg at SWM18 (2-4 ft)[3] to 3850 mg/kg in at SWM17 (5-8 ft).

Tributyltin in Subsurface Sediment

Concentrations of tributyltin (TBT) in subsurface sediment samples ranged from below detection limits at many sampling locations to 4400 ug/kg at SWM13 (4-6 ft), located under a dry dock in Parcel 4. TBT concentrations in subsurface sediment were higher than 100 ug/kg at sampling locations located both in and near the SWM leasehold including SWM3, 3B, 5, 14, 15, 18, and 20. While there are no ER-L or ER-M values to use as guidelines for assessing the potential biological significance of TBT concentrations in sediment, a number of studies have demonstrated that TBT-contaminated sediment causes toxicity to test organisms or changes in benthic communities at concentrations ranging from 100 to 7000 ug/kg (see section above for further discussion).

Total DDTs in Subsurface Sediment

Subsurface sediment concentrations of total DDTs (4,4'-DDT and its derivatives 4,4'–DDE and 4,4'–DDD), were found at concentrations greater than ER-M values in two sampling locations under a dry dock within Parcel 4 (SWM3, 3B), three sampling locations adjacent Parcel 4 (SWM1, 2, 14), two wharf face sampling locations (SWM17, 18), and one sampling location adjacent to a dry dock in Parcel 4 (SWM5). Total DDT concentrations ranged from below the detection limit at several sampling locations to 310 ug/kg at SWM5 (4-6 ft), adjacent to a dry dock in Parcel 4.

Total PCBs in Subsurface Sediment

Total PCB concentrations in subsurface sediment were higher than ER-M values at two sampling locations adjacent to a dry dock in Parcel 4 (SWM9, 12). Total PCB concentrations ranged from below detection limits at many locations to 694 µg/kg at SWM12 (4-6 ft), a location adjacent to a dry dock in Parcel 4.

Total Aroclors in Subsurface Sediment

Several aroclors, or mixtures of PCBs, including Aroclor 1248, 1254, and 1260, were detected in subsurface sediment samples from within and outside of Parcel 4. Total Aroclor concentrations in subsurface sediment were detected at higher than ER-M values for PCBs (180 ug/kg) including one sampling location under a dry dock in Parcel 4 (SWM13), three sampling locations adjacent to a dry dock in Parcel 4 (SWM5, 9, 12), one wharf face location (SWM18), and one location in the slip channel (SWM22). Total Aroclor concentrations ranged from below detection limits at many locations to 5900 ug/kg at SWM18 (2-5 ft), a location in the slip channel.

Total PAHs in Subsurface Sediment

Total low molecular weight PAH concentrations in subsurface sediment were detected at concentrations greater than ER-M values at three sampling locations (SWM12, 14, 22). Total low molecular weight PAH concentrations in subsurface sediment ranged from below detection limits at many sampling locations to 5770 ug/kg in the 2-5 ft sample from SWM22. Total high

[3] Zinc concentrations from the 2-4 ft sample from SWM18 were above ER-M values and were 434 mg/kg.

molecular weight PAH concentrations in subsurface sediment were detected at concentrations greater than ER-M values at four sampling locations (SWM3B, 12, 14, 20). Total high molecular weight PAH concentrations ranged from below detection limits at many sampling locations to 23,200 ug/kg at SWM3B (4-6 ft), located under a dry dock in Parcel 4.

3.7.Comparison of Surface vs. Subsurface Sediment Samples

Metals

There were more surface sediment samples demonstrating above ER-M concentrations of mercury (N=17)[4] and copper (N=17) than subsurface sediment samples demonstrating above ER-M concentrations of mercury (N=16) and copper (N=10), respectively (Table 2A and 2B). There were more subsurface sediment samples demonstrating above ER-M concentrations of lead (N=9) and zinc (N=13) than surface sediment samples demonstrating above ER-M concentrations of lead (N=7) and zinc (N=1). The highest concentrations of mercury, copper, lead, and zinc, separately, detected in this investigation were in subsurface sediment samples. There were more surface sediment samples from within Parcel 4 that had above ER-M mercury concentrations (N=9) than those collected from outside of Parcel 4 (N=8). Similarly, more subsurface sediment samples from within Parcel 4 had above ER-M mercury concentrations (N=9) than those collected from outside of Parcel 4 (N=7). There were also more surface sediment samples from within Parcel 4 that had above ER-M copper concentrations (N=9) than those collected from outside of Parcel 4 (N=8). Similarly, more subsurface sediment samples from within Parcel 4 had above ER-M copper concentrations (N=6) than those collected from outside of Parcel 4 (N=4). In contrast to copper and mercury, more surface sediment samples from outside of Parcel 4 had above ER-M lead concentrations (N=4) than those collected from within Parcel 4 (N=3). Similarly more subsurface sediment samples from outside of Parcel 4 had above ER-M lead concentrations (N=5) than those collected from within Parcel 4 (N=4). The highest concentration of chromium detected (559 ug/kg, above the ER-M value for chromium) in this investigation was from a surface sediment sample outside of Parcel 4.

Tributyltin

There were more surface sediment samples demonstrating TBT concentrations above 100 ug/kg (N=15) than subsurface sediment samples demonstrating TBT concentrations above 100 ug/kg (N=8; Table 2A and 2B), a concentration above which has been shown to cause toxicity to test organisms (McGee *et al.*, 1995, Austen and McEvoy, 1997, Meador *et al.*, 1997, Stronkhorst *et al.*, 1999, Meador and Rice, 2001, Hallers-Tjabbes *et al.*, 2003). In addition, the highest concentrations of TBT were detected in a surface sediment sample (SWM8). There were more surface sediment samples from within Parcel 4 that had TBT concentrations above 100 ug/kg (N=11) than those collected from outside of Parcel 4 (N=4). In contrast, there were more subsurface sediment samples from outside of Parcel 4 that had TBT concentrations above 100 ug/kg (N=6) than those collected from within Parcel 4 (N=2).

Total DDTs

There were more subsurface sediment samples demonstrating above ER-M concentrations of total DDTs (N=10) than surface sediment samples demonstrating above ER-M concentrations of total DDTs (N=8) (Table 2A and 2B). In addition, the highest concentrations of total DDTs were

[4] N = number of samples

detected in subsurface sediment samples (SWM5, SWM22). There were more surface sediment samples from within Parcel 4 that had above ER-M concentrations of total DDTs (N=6) than those collected from outside of Parcel 4 (N=2). In contrast, there were more subsurface sediment samples from outside of Parcel 4 that had above ER-M concentrations of total DDTs (N=7) than those collected from within Parcel 4 (N=3).

Total PCBs

There were more surface sediment samples demonstrating above ER-M concentrations of total PCBs (N=5) than subsurface sediment samples demonstrating above ER-M concentrations of total PCBs (N=2) (Table 2A and 2B). In addition, the highest concentrations of total PCBs were detected in a surface sediment sample (SWM12). There were more surface sediment samples from within Parcel 4 that had above ER-M concentrations of total PCBs (N=3) than those collected from outside of Parcel 4 (N=2). Similarly, there were more subsurface sediment samples from within Parcel 4 that had above ER-M concentrations of total PCBs (N=2) than those collected from outside of Parcel 4 (N=0).

Total Aroclors[5]

There were more surface sediment samples demonstrating above ER-M concentrations of total Aroclors (N=11) than subsurface sediment samples demonstrating above ER-M concentrations of total Aroclors (N=6) (Table 2A and 2B). In addition, the highest concentrations of total Aroclors were detected in a surface sediment sample (SWM18). There were more surface sediment samples from within Parcel 4 that had above ER-M concentrations of total Aroclors (N=6) than those collected from outside of Parcel 4 (N=5). Similarly, there were more subsurface sediment samples from within Parcel 4 that had above ER-M concentrations of total Aroclors (N=4) than those collected from outside of Parcel 4 (N=2).

Total PAHs

There were more subsurface sediment samples demonstrating above ER-M concentrations of total low molecular weight PAHs (N=3) than surface sediment samples demonstrating above ER-M concentrations of total low molecular weight PAHs (N=0) (Table 2A and 2B). In addition, the highest concentrations of total PAHs were detected in a subsurface sediment sample (SWM22).

There were more subsurface sediment samples demonstrating above ER-M concentrations of total high molecular weight PAHs (N=4) than surface sediment samples demonstrating above ER-M concentrations of total high molecular weight PAHs (N=0) (Table 2A and 2B). In addition, the highest concentrations of total PAHs were detected in a subsurface sediment sample (SWM3B).

[5] Total Aroclor concentrations were compared to ER-M values for total PCBs because Aroclors are PCB mixtures

Analytical Results from

Weston (2007a) Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine Leasehold Areas for Use in Remediation Efforts, Port of Los Angeles, San Pedro, California.

Final Report

Chemical Characterization of Sediments within the Southwest Marine Leasehold Areas for Use in Remediation Efforts

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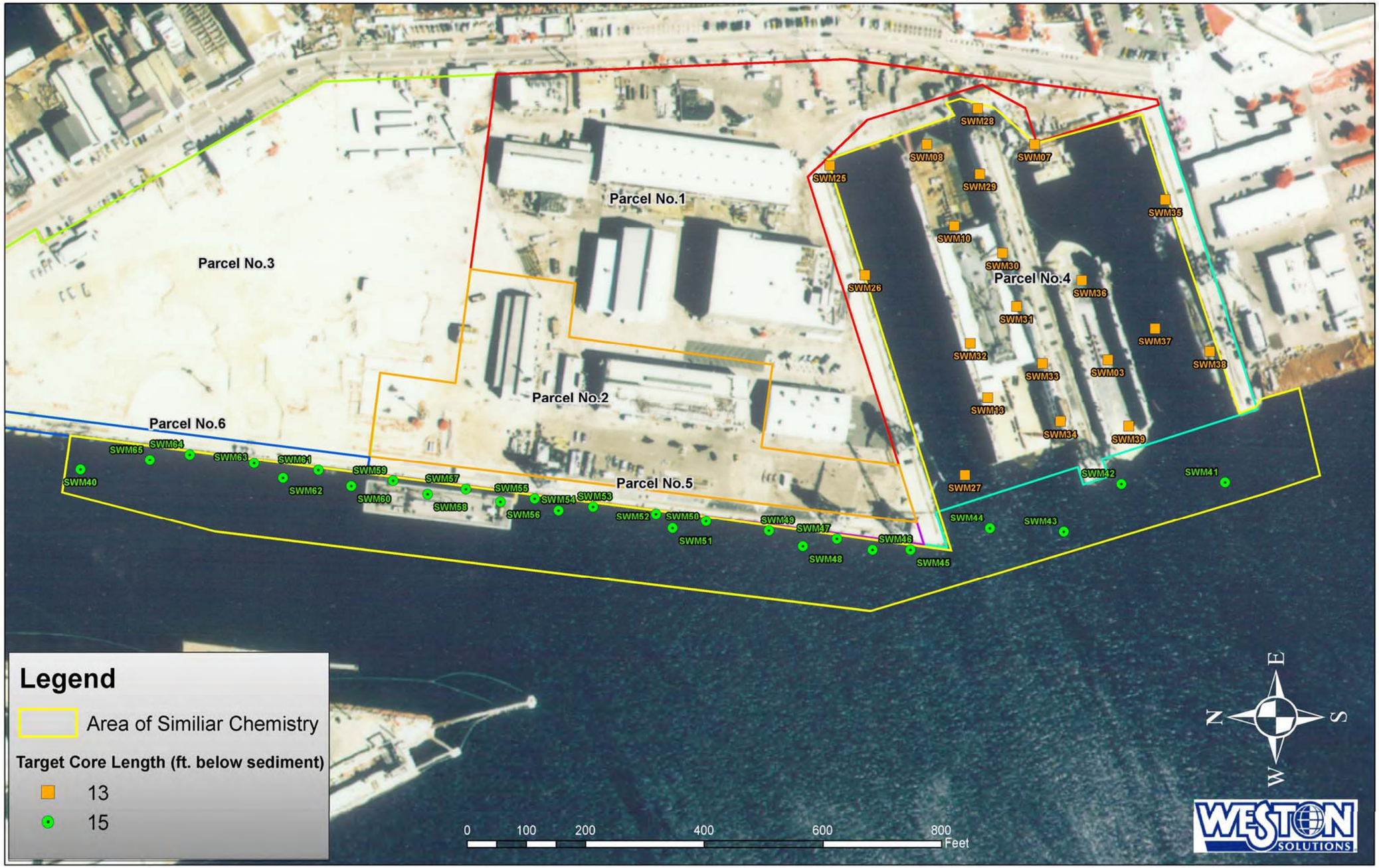

Figure 1. Sampling Locations for Additional Sediment Cores Collected at Southwest Marine in January 2007

Table 1. Core Locations, Target Lengths, Station ID and Approximate Depths

Station ID	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (ft.) (approximations for some locations)	Target Core Length (ft.)
SWM03	33° 43.768	-118° 16.210	-36.80	13
SWM07	33° 43.789	-118° 16.138	-25.20*	13
SWM08	33° 43.819	-118° 16.138	-43.30*	13
SWM10	33° 43.811	-118° 16.165	-47.40*	13
SWM13	33° 43.801	-118° 16.222	-36.41	13
SWM25	33° 43.845	-118° 16.145	-26.00*	13
SWM26	33° 43.836	-118° 16.182	-26.38	13
SWM27	33° 43.808	-118° 16.248	-34.52	13
SWM28	33° 43.804	-118° 16.126	-43.30*	13
SWM29	33° 43.804	-118° 16.148	-45.90*	13
SWM30	33° 43.797	-118° 16.174	-47.70*	13
SWM31	33° 43.793	-118° 16.192	-38.00*	13
SWM32	33° 43.806	-118° 16.204	-36.32	13
SWM33	33° 43.786	-118° 16.211	-46.40*	13
SWM34	33° 43.781	-118° 16.230	-46.30*	13
SWM35	33° 43.752	-118° 16.156	-24.50*	13
SWM36	33° 43.775	-118° 16.183	-36.13	13
SWM37	33° 43.755	-118° 16.199	-35.90	13
SWM38	33° 43.740	-118° 16.207	-24.11	13
SWM39	33° 43.762	-118° 16.232	-37.74	13
SWM40	33° 44.054	-118° 16.247	-36.08	15
SWM41	33° 43.735	-118° 16.250	-34.55	15
SWM42	33° 43.764	-118° 16.251	-39.74	15
SWM43	33° 43.780	-118° 16.267	-37.39	15
SWM44	33° 43.801	-118° 16.266	-30.40	15
SWM45	33° 43.823	-118° 16.273	-34.30	15
SWM46	33° 43.833	-118° 16.273	-35.44	15
SWM47	33° 43.843	-118° 16.269	-10.02	15
SWM48	33° 43.853	-118° 16.272	-35.41	15
SWM49	33° 43.862	-118° 16.267	-28.67	15
SWM50	33° 43.880	-118° 16.264	-26.50*	15
SWM51	33° 43.889	-118° 16.266	-33.11	15
SWM52	33° 43.894	-118° 16.261	-22.82	15
SWM53	33° 43.911	-118° 16.259	-27.80*	15
SWM54	33° 43.921	-118° 16.260	-32.45	15
SWM55	33° 43.927	-118° 16.256	-32.38	15
SWM56	33° 43.937	-118° 16.257	-32.42	15
SWM57	33° 43.946	-118° 16.253	-30.60*	15
SWM58	33° 43.957	-118° 16.255	-32.60	15
SWM59	33° 43.967	-118° 16.250	-32.88	15
SWM60	33° 43.978	-118° 16.252	-32.95	15
SWM61	33° 43.987	-118° 16.247	-33.61	15
SWM62	33° 43.997	-118° 16.250	-34.17	15
SWM63	33° 44.005	-118° 16.245	-30.46	15
SWM64	33° 44.023	-118° 16.242	-25.28	15
SWM65	33° 44.034	-118° 16.244	-34.58	15

* Water depth was not available prior to sampling for specific stations, therefore, actual water depths obtained in the field are reported here.

2.1.7 Documentation and Chain-of-Custody

Samples were considered to be in custody if they were: (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a secured container. The principal documents used to identify samples and to document possession were COC records, field log books, and field tracking forms. COC procedures were used for all samples throughout the collection, transport, and analytical process, and for all data and data documentation, whether in hard copy or electronic format.

COC procedures were initiated during sample collection. A COC record was provided with each sample or sample group. An example of a COC form is provided in Appendix A. Each person who has custody of the samples signed the form and ensure that the samples were not left unattended unless properly secured. Minimum documentation of sample handling and custody included the following:

- Sample identification
- Sample collection date and time
- Any special notations on sample characteristics
- Initials of the person collecting the sample
- Date the sample was sent to the laboratory
- Shipping company and waybill information

The completed COC form was placed in a sealable plastic envelope within the ice chest containing the listed samples. The COC form was signed by the person transferring custody of the samples. The condition of the samples was recorded by the receiver.

2.2 Physical and Chemical Analyses

2.2.1 Phased Analytical Approach

Physical and chemical analyses were performed according to the phased approach depicted in Table 3. The first phase consisted of analyzing the 0-2 ft (surface) and 4-6 ft core segments with the exception of sample locations previously analyzed. For those locations (SWM3/3B, SWM7, SWM8, SWM10 and SWM13), a slightly modified Phase I approach was used. The second phase consisted of two separate scenarios. In the first scenario (Phase IIa), core segment 2-4 ft was analyzed if sediment contaminant concentrations exceeded the Effects Range-Median[1] (ER-M) values (developed by Long et al., 1995) or exceeded 100 µg/kg TBT in the 0-2 ft core segment, but not in the 4-6 ft core segment. In the second scenario (Phase IIb), core segment 6-8 ft was analyzed if sediment chemistry exceeded ER-M values or TBT concentrations in the 4-6 ft core segment, with the exception of SWM3/3B and SWM13. For area SWM3/3B, the 12-13 ft core segment was analyzed if the 8-10 ft core segment demonstrated elevated sediment chemistry values. For area SWM13, the 12-13 ft core segment was analyzed if the 6-8 ft core segment demonstrated elevated sediment chemistry values. No additional core segments were analyzed if both the 0-2 ft and 4-6 ft core segments were below ER-M values or below 100 µg/kg TBT. Results from the 2005 sediment characterization study were also referenced and used in the decision process when proceeding from Phase I to Phase II. A third phase was implemented if results from Phase IIb still exceeded sediment quality objectives. In Phase III, the 8-10 ft and core segment was analyzed and depending on the target length of the core, either the 12-13 ft core segment (for 13 ft cores) or the 14-15 ft core segment (for 15 ft cores) was analyzed. In Phase III, SWM3/3B could not have any additional analyses and SWM13 could only be analyzed for the 8-10 ft core segment.

[1] See discussion in Section 2.2.5

Table 3. Phased Approach to Physical and Chemical Analyses for Individual Core Segments

Core Segment (feet)	SWM3/3B	SWM7	SWM8	SWM10	SWM13	All Other SWM Samples
0 - 2						
2 – 4						
4 – 6						
6 – 8						
8 – 10						
10 – 12						
12 – 13						
For 15 ft cores						
12 – 14	NA	NA	NA	NA	NA	
14 – 15	NA	NA	NA	NA	NA	

		Previously analyzed (2005)
	Phase I	Initial analyses
	Phase IIa	If exceedances of ER-M or TBT values in 0-2 ft segment and not in 4-6 ft segment
	Phase IIb	If exceedances of ER-M or TBT values in 4-6 ft segment (or 8-10 ft for SWM3/3B and 6-8 ft for SWM13)
	Phase III	If necessary, after consultation
		Archived
	NA	Not Applicable

Utilizing this approach, 35 samples within Parcel 4 and 52 samples offshore of Parcel 4 and along Parcel 5 and 6 wharf faces were analyzed as part of Phase I. An additional 37 samples were analyzed in Phase II and an additional 15 samples were analyzed in Phase III.

Physical and chemical analytes measured in this testing program were selected to provide data on potential chemicals of concern in POLA sediments. All analytical methods used to obtain contaminant concentrations follow the United States Environmental Protection Agency (USEPA), American Society for Testing and Materials (ASTM), or Standard Methods (SM). In addition, chemical and physical measures selected for this evaluation are consistent with those recommended for assessing dredged material in Los Angeles (USEPA/USACE, 1991; USEPA Region IX/USACE-LA, 1993). The specific analytes and target detection limits were listed in Weston's sampling and analysis plan (SAP; Weston, 2007).

2.2.2 Physical Analyses

Grain size was analyzed to determine the general size classes that make up the sediment (e.g., gravel, sand, silt, and clay). The frequency distribution of the size ranges (reported in millimeters [mm]) of the sediment will be reported in the final data report. Grain size analysis was conducted using the gravimetric procedure described in Plumb (1981).

2.2.3 General Chemistry

TOC, made up of volatile and nonvolatile organic compounds, was performed as recommended in the Ocean Testing Manual (OTM; USEPA/USACE, 1991) using USEPA method 9060A. This procedure (the Lloyd Kahn Method) involved dissolving inorganic carbon (carbonates and bicarbonates) with hydrochloric acid or sulfuric acid prior to TOC analysis (USEPA Region II, 1988).

2.2.4 Sediment Chemistry

Sediment samples were analyzed for priority pollutants and included metals, organochlorine pesticides and organotins. All analytical methods used to obtain contaminant concentrations follow USEPA or SM procedures. The analysis for priority pollutant metals (with the exception of mercury) was conducted using an inductively coupled plasma emissions spectrometry – mass spectrometry (ICP-MS), in accordance with USEPA Method 6020m. Mercury was analyzed using USEPA Method 7471A using graphite furnace atomic absorption spectrophotometry (GFAAS). Organochlorine pesticides were analyzed using gas chromatography with electron capture detection (GC/ECD) using USEPA Method 8081A. The analytical method used to determine tributyltin (TBT) involves methylene chloride extraction, followed by Grignard derivatization and analyzed by gas chromatography with mass spectrometry (GC/MS; Krone et al., 1989). Target detection limits were listed in the SAP (Weston, 2007a).

2.2.5 Comparison of Results to ER-L and ER-M Values and Other Benchmarks

Sediment chemical concentrations in this study were compared to effects range-low (ER-L) and effects range-median (ER-M) values (Long et al., 1995), and regulatory levels, or TTLCs. The effects range values are helpful in assessing the potential significance of elevated sediment-associated contaminants of concern, in conjunction with biological analyses. Briefly, these values were developed from a large data set where results of both benthic organism effects (e.g., toxicity tests, benthic assessments) and chemical concentrations were available for individual samples. To derive these guidelines, the chemical values for paired data demonstrating benthic impairment were sorted according to ascending chemical concentration. The 10th percentile of this rank order distribution was identified as the ER-L and the 50th percentile as the ER-M. While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. The ER-L and ER-M sediment quality values are used in conjunction with bioassay testing and are included for comparative purposes only. TTLCs indicate the level above which material must be managed as hazardous waste upon removal, in accordance with the Title 40 Code of Federal Regulations (CFR) part 261 and Title 22 of the California Code of Regulations.

Copper concentrations were also compared to a target cleanup level of 254 mg/kg. This value is based on recommendations by the Contaminated Sediments Task Force (CSTF) Advisory Committee for channel deepening projects near Berths 48-52 in the POLA. The CSTF decided this target cleanup level was more appropriate than the ER-M value (270 mg/kg) based on the following: (1) ER-M values are derived from a nationwide database and may not be relevant to specific sites, (2) local studies suggest bioaccumulation of copper occur at concentrations below 270 mg/kg, and (3) a site-specific study conducted by the Navy at the Long Beach Naval Station (LBNS) determined a cleanup level of 254 mg/kg was more appropriate (i.e., if using an apparent effects thresholds sediment toxicity approach).

Currently there are no sediment quality objectives, guidelines, or target cleanup levels for tributyltin. However, an extensive literature review conducted by Weston (2007b), concentrations of 100 μg/kg TBT or greater in sediment have the potential to cause toxicity to aquatic organisms. Based on these studies, 100 μg/kg was used as a guideline in our phased analytical approach (section 2.2.1), and in describing the analytical results below.

2.3 Quality Assurance Procedures

Weston's quality assurance/quality control (QA/QC) staff performs periodic audits to ensure that test conditions, data collection, and test procedures are conducted in accordance with Weston Solutions' standard operating procedures (SOPs). Weston's SOPs have been audited and approved by an independent USEPA-approved laboratory and placed in the QA file as well as laboratory files.

2.3.1 Field Collection and Sample Handling

All relevant project and sample information and field measurements were recorded on customized water-proof core log data forms. A daily field log was maintained, and formal chain-of-custody procedures were followed and documented. The DGPS system was verified daily by comparing accuracy with known landmarks. All sampling equipment was cleaned between sample stations. Samples were double-bagged, and both inner and outer bags labeled. Samples were held on ice until transport to Weston in Carlsbad, California. COC forms were prepared in the field during sediment collection by Weston personnel. Once sediments were composited, a new COC was prepared for the transfer of sediments for physical, chemical and biological analyses.

2.3.2 Chemical and Physical Analyses

Chemical analyses were performed using QC criteria specified in Methods for Chemical Analysis of Water and Wastes (USEPA, 1983) and Test Methods for Evaluating Solid Waste (SW-846) (USEPA, 2004a), in a California state-certified laboratory (California ELAP Certification #2261). TOC analyses were performed in accordance with QA procedures outlined by EPA (USEPA, 2004b), ASTM (2005), the 2006 Department of Defense Quality Systems Manual for Environmental Laboratories (Version 3; DoD, 2006) and the 2003 National Environmental Laboratory Accreditation Conference Standard (NELAC, 2004) in a Texas state-certified and nationally-accredited laboratory (NELAP Certificate #E87956). Grain size analyses, performed by Weston, were consistent with internal QC criteria. Performance objectives were evaluated via the use of standard reference materials, or laboratory control samples, method blanks, surrogates, spiked samples, duplicate samples, and internal QC samples. Precision and accuracy objectives were established for method reporting limits (MRLs), spike recoveries, and duplicate analyses.

3.0 RESULTS

3.1 Sediment Sample Collection and Handling

Vibracore sampling was conducted January 8 – 13, 2007. The weather was overcast, with light winds and calm seas in the mornings, and partial clouds with moderate to strong winds and mildly choppy seas in the afternoon.

Field coordinates, depth of penetration relative to the mudline (i.e., the sediment surface), depth of recovery relative to the mudline, and core length retained for each station location are summarized in Table 4.

The actual length of the cores differs from the target lengths because of differences in the actual bathymetry and the historical bathymetry used to calculate target core lengths. Field core logs, core photos, and other associated documentation for the sampling effort are provided in Appendix B.

Table 4. Field Coordinates and Sampling Depths of Sediment Core Samples

Station ID	Attempt	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (MLLW [ft])	Target Core Length (ft)	Penetration (ft)	Final Core Length (ft)	Final Core Length Kept for Analysis (ft)	Comments
SWM03	1	33˚43.772'	118˚16.215'	-40.3	13.0	13.0	7.0	7.0	Recovery insufficient.
SWM03	2	33˚43.772'	118˚16.214'	-40.3	13.0	13.0	13.0	13.0	
SWM07	1	33˚43.790'	118˚16.146'	-27.7	13.0	14.0	13.0	13.0	
SWM08	1	33˚43.814'	118˚16.138'	-45.2	13.0	14.0	14.0	13.0	
SWM10	1	33˚43.823'	118˚16.165'	-49.4	13.0	12.0	10.0	10.0	Recovery insufficient.
SWM10	2	33˚43.823'	118˚16.166'	-49.8	13.0	14.0	12.0	12.0	
SWM13	1	33˚43.792'	118˚16.217'	-47.4	13.0	13.0	13.0	13.0	
SWM25	1	33˚43.837'	118˚16.146'	-27.3	13.0	14.0	12.0	12.0	
SWM26	1	33˚43.835'	118˚16.183'	-25.6	13.0	14.0	13.0	13.0	
SWM27	1	33˚43.813'	118˚16.250'	-31.5	13.0	5.0	5.0	5.0	Refusal at 5 feet, debris
SWM27	2	33˚43.814'	118˚16.252'	-31.2	13.0	14.0	14.0	13.0	
SWM28	1	33˚43.809'	118˚16.138'	-45.5	13.0	14.0	12.0	12.0	Refusal at 12 feet.
SWM29	1	33˚43.808'	118˚16.148'	-47.6	13.0	14.0	13.0	13.0	
SWM30	1	33˚43.799'	118˚16.176'	-49.2	13.0	14.0	11.0	11.0	Refusal at 12 feet.
SWM31	1	33˚43.794'	118˚16.192'	-39.3	13.0	14.0	11.5	11.5	Refusal at 12 feet.
SWM32	1	33˚43.798'	118˚16.203'	-49.0	13.0	14.0	13.0	13.0	
SWM33	1	33˚43.788'	118˚16.218'	-48.6	13.0	14.0	13.0	13.0	
SWM34	1	33˚43.783'	118˚16.230'	-49.0	13.0	14.0	13.0	13.0	
SWM35	1	33˚43.752'	118˚16.158'	-27.0	13.0	13.0	13.0	13.0	
SWM36	1	33˚43.780'	118˚16.189'	-39.0	13.0	13.0	10.5	10.5	No analysis beyond 10.5
SWM37	1	33˚43.752'	118˚16.203'	-34.8	13.0	5.0	1.5	1.5	Refusal at 5 feet, debris
SWM37	2	33˚43.752'	118˚16.203'	-35.6	13.0	10.5	7.0	7.0	Refusal at 10.5 feet, debris
SWM38	1	33˚43.739'	118˚16.210'	-26.0	13.0	13.5	13.0	13.0	
SWM39	1	33˚43.769'	118˚16.231'	-39.0	13.0	8.0	8.0	8.0	Refusal at 6 feet.
SWM39	2	33˚43.769'	118˚16.231'	-39.9	13.0	13.5	13.0	13.0	
SWM40	1	33˚44.056'	118˚16.250'	-37.7	15.0	16.0	15.0	15.0	

Station ID	Attempt	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (MLLW [ft])	Target Core Length (ft)	Penetration (ft)	Final Core Length (ft)	Final Core Length Kept for Analysis (ft)	Comments
SWM41	1	33˚43.740'	118˚16.254'	-44.6	15.0	16.0	16.0	15.0	
SWM42	1	33˚43.768'	118˚16.258'	-41.8	15.0	15.0	13.0	13.0	Refusal at 13 feet.
SWM43	1	33˚43.776'	118˚16.263'	-46.0	15.0	15.0	15.0	15.0	
SWM44	1	33˚43.803'	118˚16.255'	-39.9	15.0	15.5	15.5	15.0	Vibracore tube broke, boat shifted.
SWM45	1	33˚43.819'	118˚16.280	-38.2	15.0	15.5	15.0	15.0	
SWM46	1	33˚43.825'	118˚16.277'	-41.0	15.0	15.5	15.0	15.0	
SWM47	1	33˚43.846'	118˚16.275'	-31.5	15.0	15.0	14.0	14.0	
SWM48	1	33˚43.854'	118˚16.278	-33.4	15.0	15.5	15.5	15.0	
SWM49	1	33˚43.860'	118˚16.242'	-29.9	15.0	16.0	15.5	15.0	
SWM50	1	33˚43.876'	118˚16.269'	-29.3	15.0	15.0	15.0	15.0	
SWM51	1	33˚43.881'	118˚16.271	-31.5	15.0	15.0	14.0	14.0	
SWM52	1	33˚43.892'	118˚16.266'	-29.9	15.0	15.0	15.0	15.0	
SWM53	1	33˚43.910'	118˚16.265'	-29.8	15.0	13.0	13.0	13.0	Shell hash at 13 feet.
SWM54	1	33˚43.923'	118˚16.261'	-29.2	15.0	-	-	-	Refusal at 4 feet rocks.
SWM54	2	33˚43.922'	118˚16.265'	-32.2	15.0	15.5	15.5	15.0	
SWM55	1	33˚43.930'	118˚16.261'	-29.9	15.0	2.0	-	-	Refusal at 1 foot rocks.
SWM55	2	33˚43.930'	118˚16.261'	-32.8	15.0	-	-	-	Refusal at 1 foot rocks.
SWM55	3	33˚43.932'	118˚16.268'	-37.6	15.0	15.0	15.0	15.0	
SWM56	1	33˚43.941'	118˚16.262'	-34.6	15.0	15.5	15.5	15.0	
SWM57	1	33˚43.949'	118˚16.258'	-32.8	15.0	15.5	15.5	15.0	
SWM58	1	33˚43.960'	118˚16.263'	-36.7	15.0	15.0	15.0	15.0	
SWM59	1	33˚43.968'	118˚16.258'	-36.0	15.0	16.0	16.0	15.0	
SWM60	1	33˚43.981'	118˚16.258'	-36.8	15.0	15.0	15.0	15.0	
SWM61	1	33˚43.982'	118˚16.255'	-33.0	15.0	15.0	15.0	15.0	
SWM62	1	33˚43.997'	118˚16.255'	-32.5	15.0	15.0	15.0	15.0	
SWM63	1	33˚44.006'	118˚16.250'	-33.6	15.0	15.0	15.0	15.0	
SWM64	1	33˚44.029'	118˚16.254'	-38.0	15.0	11.0	11.0	11.0	Refusal at 11 feet.
SWM64	2	33˚44.027'	118˚16.255'	-37.0	15.0	14.0	12.5	12.5	Refusal at 14 feet. Clumps of red, paint like material found throughout core.
SWM65	1	33˚44.039'	118˚16.253'	-38.3	15.0	16.0	16.0	15.0	

3.2 Results of Physical and Chemical Analyses

3.2.1 Physical and Chemical Characteristics

Results of physical and chemical analyses for project sediment composites are presented in Table 5 through Table 8. All results are expressed in dry weight unless otherwise indicated. Target detection limits were provided in the SAP (Weston, 2007). The actual detection limits and raw data for the analyses are provided in Appendix C.

3.2.1.1 Within Parcel 4

Twenty stations (SWM03, SWM07, SWM08, SWM10, SWM13, and SWM25 – SWM39) were located within Parcel 4. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 20 stations. At four stations (SWM07, SWM25, SWM27 and SWM32), Phase II and Phase III analyses were not required. At five stations (SWM08, SWM26, SWM28, SWM29 and SWM38), Phase IIa analysis (2-4 ft depth interval) was conducted. At eleven stations (SWM03, SWM10, SWM13, SWM30, SWM31, SWM33 - SWM37 and SWM39), Phase IIb analysis (6-8 ft depth interval except at SWM03 and SWM13, which had the 12-13 ft analyzed) was conducted. At four stations (SWM33, SWM34, SWM 36 and SWM39), Phase III analysis was required for one or more groups of analytes. The 6-8 ft depth interval at SWM28 was also analyzed in Phase III to further delineate elevated levels of TBT.

Grain Size and TOC

The majority of the samples collected within Parcel 4 (75%) consisted of predominantly coarse-grained material ranging from 52.1% to 98.2% gravelly sand. The remaining 25% of samples consisted primarily of fine-grained material ranging from 52.6% to 89.1% silts and clays. TOC ranged in concentration from 0.03% at multiple stations to 4.2% at SWM31/0-2 ft.

Metals

At eight stations (SWM07, SWM08, SWM26, SWM27, SWM29, SWM34, SWM35 and SWM37), metals concentrations were generally low with at most one metal exceeding an ER-M value at a specific depth interval at a station. At SWM26, zinc was the only metal to exceed its ER-M value (410 mg/kg) with a concentration of 700 mg/kg in the duplicate sample. At SWM29, mercury exceeded its ER-M (0.71 mg/kg) in the 0-2 ft and 2-4 ft depth intervals with concentrations of 0.84 mg/kg and 1.94 mg/kg, respectively. Mercury also exceeded its ER-M value at SWM37 with a concentration of 0.98 mg/kg in the 4-6 ft depth interval. Copper was the only metal to exceed its ER-M value (270 mg/kg) at SWM34/4-6 ft with a concentration of 641 mg/kg.

In contrast, three stations (SWM03, SWM10 and SWM38) had multiple metals exceeding in a single depth layer and nine stations (SWM13, SWM25, SWM28, SWM30 – SWM33, SWM36 and SWM39) had multiple metals exceeding ER-M values (or in the case of SWM13 exceeding the TTLCs) at several depth layers. At SWM13, copper and zinc both exceeded their TTLCs (2,500 mg/kg and 5,000 mg/kg, respectively) with concentrations of maximum observed concentrations of 3,490 mg/kg and 5,150 mg/kg, respectively. The maximum concentrations of lead and mercury both occurred at SWM36, with values of 720 mg/kg and 12.7 mg/kg in the 6-8 ft and 4-6 ft depth intervals, respectively. With the exception of SWM13/12-13 ft, metals concentrations in the deepest sediment layer analyzed at each station within Parcel 4 were below ER-M values. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 9.

Table 5. Summary of Physical Measurements and Chemistry Analytical Results for the area within Parcel 4, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Within Parcel 4								Within Parcel 4					Within Parcel 4			
					Phase I	Phase II	Phase I	Phase II	Phase II	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase I
					SWM03	SWM03	SWM07	SWM08	SWM08	SWM08	SWM10	SWM10	SWM13	SWM13	SWM25	SWM25	SWM25	SWM26	SWM26	SWM26	SWM26
					8-10 ft	12-13 ft	4-6 ft	2-4 ft	2-4 ft DUP	4-6 ft	4-6 ft	6-8 ft	6-8 ft	12-13 ft	0-2 ft	4-6 ft	6-8 ft	0-2 ft	0-2 ft DUP	2-4 ft	4-6 ft
Grain Size (%)																					
Gravel	-		-	-	0.53	1.88	5.03	8.52		10.41	1.08	5.29	1.78	1.45	1.87	1.28	0.40	0.74		0.91	1.51
Sand	-		-	-	37.72	94.78	41.09	78.10		87.37	76.70	80.60	79.10	90.10	91.90	50.81	97.54	96.52		91.14	95.75
Silt	-		-	-	32.10	1.93	31.75	9.71		0.65	12.66	9.96	8.32	4.76	3.51	32.63	0.77	1.04		3.45	1.18
Clay	-		-	-	29.65	1.41	22.13	3.67		1.56	9.56	4.15	10.81	3.69	2.72	15.28	1.28	1.69		4.50	1.56
General Chemistry																					
TOC (%)	-		-	-	2.12	0.04	1.08	0.06		0.03	0.80	0.07	0.54	1.24	0.28	0.34	0.22	0.12		0.23	0.04
Metals (mg/kg)																					
Arsenic	**8.2**		**70**	**500**	**27.3**	2.22	**11.4**	3.73	3.95	2.49	**11.8**	5.49	**170**	**25.5**	**10.6**	4.52	2.04	3.95	4.41	**13.9**	3.98
Cadmium	**1.2**		**9.6**	**100**	**1.45**	<0.123	0.34	<0.127	<0.125	<0.122	0.73	<0.123	**6.91**	**1.37**	0.54	0.13	<0.120	<0.128	0.23	<0.476	<0.125
Chromium	**81**		**370**	**2500**	**176B**	7.25	37.0B	76.9	**92.6**	32.7B	66.4B	18	**88.1B**	**476**	**91.9B**	18.1B	5.26	15.9B	10.4	37.3	9.35B
Copper	**34**	**254**	**270**	**2500**	**1970**	10.8	**61.8**	**50.1**	**42.9**	**35.7**	**388**	17.9	**3490**	**1480**	**354**	**41.1**	3.6	**40.7**	**47.2**	**91.6**	**40**
Lead	**46.7**		**218**	**1000**	**383**	3.46	19	9.53	10	6.29	**170**	4.62	**693**	**420**	**342**	43.3B	1.7	**49.1**	28.9	42.3	10.6B
Mercury	**0.15**		**0.71**	**20**	**7.83**	0.0958	**0.22**	0.0705	0.092	0.03	**2.01**	0.0468	**0.24**	**0.191**	**2.86**	**1.19**	0.0378	**0.61**	**0.21**	**0.348**	0.1
Nickel	**20.9**		**51.6**	**2000**	**31.1**	4.62	**27.3**	5.85	5.98	4.09	17.3	12.8	12.3	18.7	12.2	9.95	3.68	6.83	6.46	**22.5**	6.61
Silver	**1**		**3.7**	**500**	0.62	<0.123	<0.159	<0.127	<0.125	<0.122	0.42	<0.123	0.6	0.277	0.14	<0.125	<0.120	<0.128	<0.128	<0.476	<0.125
Zinc	**150**		**410**	**5000**	**671**	21.2	99.4	75.2	67.1	49.7	**390**	42.7	**3990**	**5150**	**719**	**314**	15.9	125	**700**	**219**	61.5
Organochlorine Pesticides (µg/kg)																					
2,4'-DDD	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
2,4'-DDE	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
2,4'-DDT	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
4,4'-DDD	**2**		**20**	**1000**	<1.7	<1.2	<1.6	**3.5**	**2.9**	<1.2	<1.4	<1.2	<1.3	**35**	<1.2	<1.2	<1.2	<1.3	<1.3	**<4.8**	<1.2
4,4'-DDE	**2.2**		**27**	**1000**	**170**	**3.4**	<1.6	1.8	**3.8**	1.7	**72**	1.4	**42**	**44**	**27**	**6.4**	<1.2	**5.3**	**4.6**	**50**	2.2
4,4'-DDT	**1**		**7**	**1000**	**<1.7**	**<1.2**	**<1.6**	**<1.3**	**<1.2**	**<1.2**	**<1.4**	**<1.2**	**<1.3**	**<1.3**	**<1.2**	**<1.2**	**<1.2**	**<1.3**	**<1.3**	**<4.8**	**<1.2**
Total DDTs	**1.58**		**46.1**	**1000**	**170**	**3.4**	0	**5.3**	**6.7**	**1.7**	**72**	1.4	**42**	**79**	**27**	**6.4**	0	**5.3**	**4.6**	**50**	**2.2**
Aldrin	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Alpha-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Beta-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Chlordane	**0.5**		**6**	**2500**	**<17**	**<12**	**<16**	**<13**	**<12**	**<12**	**<14**	**<12**	**<13**	**<13**	**<12**	**<12**	**<12**	**<13**	**<13**	**<48**	**<12**
Delta-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Dieldrin	**0.02**		**8**	**8000**	**<1.7**	**<1.2**	**<1.6**	**<1.3**	**<1.2**	**<1.2**	**<1.4**	**<1.2**	**<1.3**	**31**	**<1.2**	**<1.2**	**<1.2**	**<1.3**	**<1.3**	**<4.8**	**<1.2**
Endosulfan I	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endosulfan II	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endosulfan Sulfate	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin Aldehyde	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin Ketone	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Gamma-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Heptachlor	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Heptachlor Epoxide	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Methoxychlor	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Toxaphene	-		-	-	<34	<25	<32	<25	<25	<24	<28	<25	<27	<25	<25	<25	<24	<26	<26	<95	<25
Organotins (µg/kg)																					
Dibutyltin	-		-	-	<5.2	<3.7	<4.8	7.1	6.2	75	440	4.6	1000	1200	77	18	<3.7	30	10	100	<3.8
Monobutyltin	-		-	-	<5.2	<3.7	<4.8	<3.8	<3.8	<3.7	26	<3.8	53	<77	<3.8	<3.8	<3.7	<3.8	<3.8	<14	<3.8
Tetrabutyltin	-		-	-	<5.2	<3.7	<4.8	<3.8	<3.8	<3.7	14	<3.8	22	<77	<3.8	<3.8	<3.7	<3.8	<3.8	<14	<3.8
Tributyltin	-		-	-	17	9	8.9	55	84	27	850	8.2	1800	3300	120	34	3.2	50	20	160	18

Table 5. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Within Parcel 4										Within Parcel 4					
					Phase I	Phase I	Phase I	Phase II	Phase I	Phase III	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II
					SWM27	SWM27	SWM28	SWM28	SWM28	SWM28	SWM29	SWM29	SWM29	SWM29	SWM30	SWM30	SWM30	SWM31	SWM31	SWM31
					0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	6-8 ft	0-2 ft	2-4 ft	4-6 ft	4-6 ft DUP	0-2 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	6-8 ft
Grain Size (%)																				
Gravel	-		-	-	3.36	6.41	1.69	0.32	3.44	2.36	0.00	0.15	4.67		8.45	5.80	1.04	11.20	1.22	0.36
Sand	-		-	-	92.43	91.17	27.43	83.61	93.23	95.86	95.05	80.10	91.19		17.40	41.63	65.51	12.28	35.11	97.39
Silt	-		-	-	2.17	0.51	30.61	7.53	1.03	0.51	2.41	11.45	2.14		36.86	29.02	18.81	38.04	29.99	0.53
Clay	-		-	-	2.03	1.91	40.27	8.54	2.30	1.27	2.54	8.30	2.01		37.30	23.55	14.64	38.48	33.68	1.72
General Chemistry																				
TOC (%)	-		-	-	0.12	0.04	2.93	0.24	0.12	1.02	0.08	1.12	0.05		3.06	2.62	0.08	4.15	2.49	0.04
Metals (mg/kg)																				
Arsenic	**8.2**		**70**	**500**	4.47	2.93	**58.5**	**10.4**	4.38	.	3.26	**10.1**	2.58	2.84	**32.2**	**35.7**	7.59	**25.4**	**22.3**	2.05
Cadmium	**1.2**		**9.6**	**100**	0.15	<0.123	**1.8**	0.369	<0.122	.	<0.127	0.411	<0.120	<0.119	**1.21**	**1.67**	0.287	0.96	**1.25**	<0.123
Chromium	**81**		**370**	**2500**	17.6B	6.51B	**127B**	24.8	7.68B	.	9.76B	36.2	8.15B	5.45	95.9B	**255B**	24.7	78.5B	**115B**	6.41
Copper	**34**	**254**	**270**	**2500**	**51.3**	8.36	**1720**	**320**	**45.5**	.	30.7	**231**	20.8	19.4	**1330**	**1320**	**61.2**	**680**	**704**	15.6
Lead	**46.7**		**218**	**1000**	31.8	5.08B	**314**	**76.1**	10.2B	.	8.41	**68.9**	5.57B	6.64	**125**	**358B**	12.3	**105**	210B	2.62
Mercury	**0.15**		**0.71**	**20**	**0.61**	0.14	**2.23**	**0.282**	0.09	.	**0.84**	**1.94**	0.07	0.05	**1.05**	**2.43**	**0.221**	**0.63**	**3.21**	0.0523
Nickel	**20.9**		**51.6**	**2000**	9.75	4.29	**46.3**	7.13	4.28	.	5.09	12.4	5.02	4.37	**39.5**	**31.9**	14.3	**42.2**	**33.7**	4.17
Silver	**1**		**3.7**	**500**	0.17	<0.123	0.94	<0.130	<0.122	.	<0.127	<0.147	<0.120	<0.119	0.75	0.82	<0.145	0.64	0.56	<0.123
Zinc	**150**		**410**	**5000**	89.6	29.4	**1780**	**292**	**152**	.	47.4	**176**	49.6	57.6	**650**	**1340**	95.7	**495**	**1710**	21.7
Organochlorine Pesticides (µg/kg)																				
2,4'-DDD	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
2,4'-DDE	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
2,4'-DDT	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
4,4'-DDD	**2**		**20**	**1000**	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	**<2.2**	<1.8	<1.5	**<2.6**	**35**	<1.2
4,4'-DDE	**2.2**		**27**	**1000**	**9.6**	<1.2	**51**	**16**	**7.1**	.	**4.9**	**30**	1.8	1.3	**26**	**97**	1.8	**37**	**86**	**2.4**
4,4'-DDT	**1**		**7**	**1000**	**<1.2**	**<1.2**	**<2.0**	**<1.3**	**<1.2**	.	**<1.3**	**<1.5**	**<1.2**	**<1.2**	**<2.2**	**<1.8**	**<1.5**	**<2.6**	**19**	**<1.2**
Total DDTs	**1.58**		**46.1**	**1000**	**9.6**	0	**51**	**16**	**7.1**	.	**4.9**	**30**	**1.8**	1.3	**26**	**97**	**1.8**	**37**	**140**	**2.4**
Aldrin	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Alpha-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Beta-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Chlordane	**0.5**		**6**	**2500**	**<12**	**<12**	**<20**	**<13**	**<12**	.	**<13**	**<15**	**<12**	**<12**	**<22**	**<18**	**<15**	**<26**	**<18**	**<12**
Delta-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Dieldrin	**0.02**		**8**	**8000**	**<1.2**	**<1.2**	**<2.0**	**<1.3**	**<1.2**	.	**<1.3**	**<1.5**	**<1.2**	**<1.2**	**<2.2**	**<1.8**	**<1.5**	**<2.6**	**<1.8**	**<1.2**
Endosulfan I	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endosulfan II	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endosulfan Sulfate	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin Aldehyde	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin Ketone	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Gamma-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Heptachlor	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Heptachlor Epoxide	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Methoxychlor	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2	.	<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Toxaphene	-		-	-	<24	<25	<40	<26	<24	.	<25	<29	<24	<24	<43	<37	<29	<51	<37	<25
Organotins (µg/kg)																				
Dibutyltin	-		-	-	18	<3.7	1100	220	77	<3.7	72	230	12	7.2	630	890	19	250	52	11
Monobutyltin	-		-	-	<3.7	<3.7	97	<20	<3.7	<3.7	<3.8	<22	<3.6	<3.6	110	18	<4.4	31	<5.6	<3.7
Tetrabutyltin	-		-	-	<3.7	<3.7	18	<20	<3.7	<3.7	<3.8	<22	<3.6	<3.6	19	28	<4.4	<7.7	12	<3.7
Tributyltin	-		-	-	38	<3.7	3300	480	250	4	120	490	31	19	2300	2600	94	950	610	30

Table 5. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Within Parcel 4												Within Parcel 4		
					Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II
					SWM32	SWM32	SWM32	SWM32	SWM33	SWM33	SWM33	SWM33	SWM34	SWM34	SWM34	SWM34	SWM35	SWM35	SWM35
					0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	6-8 ft	12-13 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	6-8 ft
Grain Size (%)																			
Gravel	-		-	-	2.22	0.33	0.36	0.47	11.53	3.32	3.33	0.00	3.86	0.18	0.02	0.01	0.60	1.91	1.41
Sand	-		-	-	13.19	75.29	95.98	96.37	16.54	7.62	29.62	96.72	8.27	64.80	80.64	94.32	85.25	94.03	95.90
Silt	-		-	-	43.29	13.29	1.70	1.52	34.90	41.35	33.82	1.84	41.42	15.52	9.05	2.71	7.76	1.63	1.03
Clay	-		-	-	41.30	11.09	1.96	1.64	37.03	47.72	33.22	1.44	46.45	19.51	10.29	2.96	6.39	2.43	1.67
General Chemistry																			
TOC (%)	-		-	-	2.94	0.32	0.06	0.05	3.12	3.51	2.86	0.03	3.61	1.30	0.45	0.11	0.25	0.40	0.04
Metals (mg/kg)																			
Arsenic	8.2		70	500	23.3	12	3.05	.	28.4	76.2	35.2	2.01	17.6	21.7	9.67	.	6.63	4.35	4.98
Cadmium	1.2		9.6	100	0.88	0.58	<0.123	.	1.13	2.99	1.72	2.97	1.12	0.77	0.389	.	0.25	<0.128	<0.123
Chromium	81		370	2500	87.9B	80.1B	14.8	.	83.6B	117B	124	6.73	73.7B	59.4B	27	.	30.1B	15.0B	11
Copper	34	254	270	2500	1160	625	54.9	.	1150	1350	997	11.4	244	641	163	.	122	49.9	21.1
Lead	46.7		218	1000	83.4	98.8B	20.9	.	102	272B	248	2.42	57.6	81.7B	37.8	.	77.1	15.4	7.31
Mercury	0.15		0.71	20	0.63	0.53	0.172	.	1.08	1.33	3.22	<0.0247	0.62	0.6	0.515	.	0.94	0.52	0.0606
Nickel	20.9		51.6	2000	43.6	13.8	4.95	.	43.6	40.8	37.1	5.71	42.7	27.2	13.2	.	8.06	7.87	7.17
Silver	1		3.7	500	0.73	0.3	<0.123	.	0.68	0.88	0.492	<0.123	0.57	0.52	<0.149	.	<0.130	<0.128	<0.123
Zinc	150		410	5000	506	676	79.6	.	567	1600	1100	33.4	281	366	198	.	154	771	22.5
Organochlorine Pesticides (µg/kg)																			
2,4'-DDD	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
2,4'-DDE	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
2,4'-DDT	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
4,4'-DDD	2		20	1000	<2.2	8.1	<1.2	.	<2.3	<2.4	23	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
4,4'-DDE	2.2		27	1000	33	36	13	.	32	36	78	1.3	17	22	31	10	54	6.1	1.4
4,4'-DDT	1		7	1000	<2.2	14	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Total DDTs	1.58		46.1	1000	33	58.1	13	.	32	36	101	1.3	17	22	31	10	54	6.1	1.4
Aldrin	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Alpha-BHC	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Beta-BHC	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Chlordane	0.5		6	2500	<22	<14	<12	.	<23	<24	<20	<12	<23	<18	<15	<13	<13	<13	<12
Delta-BHC	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Dieldrin	0.02		8	8000	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endosulfan I	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endosulfan II	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endosulfan Sulfate	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endrin	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endrin Aldehyde	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Endrin Ketone	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Gamma-BHC	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Heptachlor	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Heptachlor Epoxide	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Methoxychlor	-		-	-	<2.2	<1.4	<1.2	.	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2
Toxaphene	-		-	-	<44	<27	<25	.	<47	<49	<41	<25	<45	<35	<30	<26	<26	<26	<25
Organotins (µg/kg)																			
Dibutyltin	-		-	-	710	170	82	40	260	82	670	48	64	45	140	44	63	<3.8	<3.7
Monobutyltin	-		-	-	74	<4.1	<18	<3.7	<7.0	<7.3	<62	<3.7	<6.8	<5.3	48	<3.9	<3.9	<3.8	<3.7
Tetrabutyltin	-		-	-	32	<4.1	<18	<3.7	<7.0	<7.3	<62	<3.7	<6.8	<5.3	<4.5	<3.9	<3.9	<3.8	<3.7
Tributyltin	-		-	-	4200	490	600	97	650	670	2600	94	140	580	230	160	66	<3.8	<3.7

Table 5. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Within Parcel 4							Within Parcel 4						
					Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
					SWM36	SWM36	SWM36	SWM36	SWM37	SWM37	SWM37	SWM38	SWM38	SWM38	SWM39	SWM39	SWM39	SWM39
					0-2 ft	4-6 ft	6-8 ft	10-10.5 ft	0-2 ft	4-6 ft	6-7 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)																		
Gravel	-		-	-	8.07	0.37	2.69	5.36	0.05	2.81	25.02	14.02	4.45	5.33	9.76	2.63	0.11	0.45
Sand	-		-	-	56.47	92.10	69.60	90.03	91.92	90.65	70.64	72.78	92.61	89.73	5.46	16.20	76.11	94.23
Silt	-		-	-	18.28	4.20	15.72	2.00	3.46	2.67	1.71	5.36	1.66	2.14	52.87	49.27	13.75	3.06
Clay	-		-	-	17.18	3.33	11.99	2.62	4.56	3.87	2.63	7.83	1.27	2.80	31.91	31.90	10.02	2.26
General Chemistry																		
TOC (%)	-		-	-	2.28	0.49	1.75	0.07	0.18	0.16	0.12	0.80	0.05	0.07	3.13	3.37	0.38	0.08
Metals (mg/kg)																		
Arsenic	**8.2**		**70**	**500**	**33.9**	**13.7**	**23.1**	2.3	4.5	3.45	2.84	**10.2**	3.35	3.65	**24.1**	**31.7**	**11.3**	2.7
Cadmium	**1.2**		**9.6**	**100**	**1.36**	0.58	0.752	<0.120	0.13	0.15	<0.132	0.38	<0.120	<0.130	**1.5**	**2.38**	0.502	<0.125
Chromium	**81**		**370**	**2500**	**311B**	**176B**	**132**	13.5	17.5B	11.6B	10.9	37.5B	17.4	8.09B	**114B**	**221B**	60.7	8.69
Copper	**34**	**254**	**270**	**2500**	**2190**	**2100**	**2020**	**96.6**	**128**	**76.9**	**65.5**	**403**	14.1	6.51	**593**	**1180**	**394**	19
Lead	**46.7**		**218**	**1000**	**522**	**395B**	**720**	16.6	**59.5**	28.7B	**73.9**	**470**	3.63	5.09	**158**	**586B**	**117**	6.56
Mercury	**0.15**		**0.71**	**20**	**6.99**	**12.7**	**0.349**	**0.366**	**0.59**	**0.98**	**0.618**	**0.94**	0.0637	0.03	**1.18**	**9.34**	**1.47**	0.0412
Nickel	**20.9**		**51.6**	**2000**	**31.8**	9.24	13.6	5.25	6.45	5.32	14	16.1	5.16	6.32	**44.1**	**42.2**	13.7	5.15
Silver	**1**		**3.7**	**500**	0.59	<0.119	<0.118	<0.120	<0.130	<0.119	<0.132	<0.135	<0.120	<0.130	0.93	0.94	<0.137	<0.125
Zinc	**150**		**410**	**5000**	**1260**	**1100**	**655**	49.3	83.2	67.8	137	**250**	83.8	150	**619**	**724**	**211**	27.4
Organochlorine Pesticides (µg/kg)																		
2,4'-DDD	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
2,4'-DDE	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
2,4'-DDT	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
4,4'-DDD	**2**		**20**	**1000**	**57**	**62**	<1.2	.	<1.3	**5.3**	**4.3**	<1.4	<1.2	<1.3	**<2.1**	<1.9	<1.4	<1.2
4,4'-DDE	**2.2**		**27**	**1000**	**89**	**80**	<1.2	.	**7.3**	**11**	**13**	**100**	**10**	<1.3	**27**	**230**	**64**	**12**
4,4'-DDT	**1**		**7**	**1000**	**<1.6**	**<1.2**	**<1.2**	.	**<1.3**	**6.1**	**<1.3**	**<1.4**	**<1.2**	**<1.3**	**7.3**	**<1.9**	**<1.4**	**<1.2**
Total DDTs	**1.58**		**46.1**	**1000**	**146**	**142**	0	.	**7.3**	**22.4**	**17.3**	**100**	**10**	0	**34.3**	**230**	**64**	**12**
Aldrin	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Alpha-BHC	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Beta-BHC	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	7.3	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Chlordane	**0.5**		**6**	**2500**	**<16**	**<12**	**<12**	.	**<13**	**<12**	**<13**	**<14**	**<12**	**<13**	**<21**	**<19**	**<14**	**<12**
Delta-BHC	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Dieldrin	**0.02**		**8**	**8000**	**<1.6**	**<1.2**	**<1.2**	.	**<1.3**	**<1.2**	**<1.3**	**<1.4**	**<1.2**	**<1.3**	**<2.1**	**<1.9**	**<1.4**	**<1.2**
Endosulfan I	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endosulfan II	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endosulfan Sulfate	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin Aldehyde	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin Ketone	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Gamma-BHC	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Heptachlor	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Heptachlor Epoxide	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Methoxychlor	-		-	-	<1.6	<1.2	<1.2	.	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Toxaphene	-		-	-	<33	<24	<23	.	<26	<24	<26	<27	<24	<26	<43	<38	<28	<25
Organotins (µg/kg)																		
Dibutyltin	-		-	-	220	280	<3.5	.	51	31	17	260	<3.6	<3.9	270	39	25	.
Monobutyltin	-		-	-	<4.9	<3.6	<3.5	.	<3.9	<3.6	<4.0	23	<3.6	<3.9	25	<5.8	<4.1	.
Tetrabutyltin	-		-	-	13	24	<3.5	.	<3.9	<3.6	<4.0	25	<3.6	<3.9	<6.4	10	<4.1	.
Tributyltin	-		-	-	950	900	22	.	61	52	29	2100	3.9	<3.9	870	270	36	.

Table 6. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 4, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Offshore of Parcel 4					Offshore of Parcel 4					
					Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase I	Phase II	Phase III
					SWM41	SWM41	SWM42	SWM42	SWM42	SWM43	SWM43	SWM44	SWM44	SWM44	SWM44
					0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)															
Gravel	-		-	-	0.38	0.02	0.89	0.45	2.92	0.63	5.38	2.32	1.45	1.98	5.28
Sand	-		-	-	96.97	97.46	53.36	75.32	94.04	92.65	84.91	67.77	79.45	77.65	92.02
Silt	-		-	-	1.52	1.19	23.20	14.54	1.19	4.66	6.39	14.15	10.94	11.15	1.16
Clay	-		-	-	1.13	1.32	22.55	9.69	1.85	2.06	3.32	15.76	8.16	9.22	1.54
General Chemistry															
TOC (%)	-		-	-	0.03	0.03	1.10	0.67	0.03	0.05	0.07	0.85	0.70	0.96	0.03
Metals (mg/kg)															
Arsenic	**8.2**		**70**	**500**	2.75	2.45	**11**	8.17	2.11	2.38	2.95	**11.6**	**13.5**	**11.2**	2.86
Cadmium	**1.2**		**9.6**	**100**	<0.120	<0.122	0.65	0.465	<0.122	<0.125	<0.123	0.7	**2.76**	0.698	<0.120
Chromium	**81**		**370**	**2500**	5.31B	5.12B	54.2B	38.2	5.86B	8.43B	11.0B	**136**	**151**	**112**	4.63
Copper	**34**	**254**	**270**	**2500**	6.79	4.43	**261**	**158**	6.7	19.9	15.1	**343**	**422**	**377**	4.14
Lead	**46.7**		**218**	**1000**	2.31	1.68	**327**	**73.4**	2.55	4.94	5.52	**293**	**854**	**276**	3.31
Mercury	**0.15**		**0.71**	**20**	<0.0241	<0.0245	**0.98**	**1.69**	0.07	0.05	**0.41**	**1.29**	**16**	0.131	<0.0241
Nickel	**20.9**		**51.6**	**2000**	4.13	4.11	**22.4**	13.6	9.75	5.95	8.11	16.3	12.4	13.8	3.94
Silver	**1**		**3.7**	**500**	<0.120	<0.122	0.24	<0.135	<0.122	<0.125	<0.123	0.3	0.31	<0.130	<0.120
Zinc	**150**		**410**	**5000**	23.4	69.1	**227**	**156**	79.4	40.3	36.6	**391**	**6890**	**659**	14.6
Organochlorine Pesticides (µg/kg)															
2,4'-DDD	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
2,4'-DDE	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
2,4'-DDT	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
4,4'-DDD	**2**		**20**	**1000**	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
4,4'-DDE	**2.2**		**27**	**1000**	<1.2	<1.2	**96**	**27**	<1.2	**3.3**	<1.2	<1.4	<1.3	<1.3	.
4,4'-DDT	**1**		**7**	**1000**	**<1.2**	**<1.2**	**<1.6**	**<1.4**	**<1.2**	**<1.2**	**<1.2**	**<1.4**	**<1.3**	**<1.3**	.
Total DDTs	**1.58**		**46.1**	**1000**	0	0	**96**	**27**	0	**3.3**	0	0	0	0	.
Aldrin	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Alpha-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Beta-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Chlordane	**0.5**		**6**	**2500**	**<12**	**<12**	**<16**	**<14**	**<12**	**<12**	**<12**	**<14**	**<13**	**<13**	.
Delta-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Dieldrin	**0.02**		**8**	**8000**	**<1.2**	**<1.2**	**<1.6**	**<1.4**	**<1.2**	**<1.2**	**<1.2**	**<1.4**	**<1.3**	**<1.3**	.
Endosulfan I	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Endosulfan II	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Endosulfan Sulfate	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Endrin	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Endrin Aldehyde	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Endrin Ketone	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Gamma-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Heptachlor	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Heptachlor Epoxide	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Methoxychlor	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	.
Toxaphene	-		-	-	<24	<24	<32	<27	<24	<25	<25	<28	<26	<26	.
Organotins (µg/kg)															
Dibutyltin	-		-	-	<3.6	<3.7	110	31	<3.7	<3.8	<3.7	97	110	64	.
Monobutyltin	-		-	-	<3.6	<3.7	<4.8	<4.1	<3.7	<3.8	<3.7	29	24	11	.
Tetrabutyltin	-		-	-	<3.6	<3.7	<4.8	<4.1	<3.7	<3.8	<3.7	5.9	4.5	<3.9	.
Tributyltin	-		-	-	<3.6	<3.7	620	46	<3.7	12	<3.7	420	240	92	.

Table 7. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 5, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Parcel 5						Parcel 5					Parcel 5			
					Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
					SWM45	SWM45	SWM45	SWM46	SWM46	SWM46	SWM47	SWM47	SWM48	SWM48	SWM48	SWM49	SWM49	SWM49	SWM49
					0-2 ft	2-4 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	12-14 ft
Grain Size (%)																			
Gravel	-		-	-	2.15	1.76	0.25	1.37	0.18	0.50	0.03	1.32	3.38	10.70	0.36	0.38	1.36	1.21	2.81
Sand	-		-	-	94.37	40.17	93.16	63.45	96.25	92.19	96.69	95.20	72.71	68.22	94.23	92.16	87.57	90.39	95.42
Silt	-		-	-	1.34	30.17	3.16	21.48	1.85	3.79	1.51	1.42	13.61	11.56	3.82	4.32	6.21	5.04	0.76
Clay	-		-	-	2.13	27.90	3.43	13.70	1.71	3.52	1.77	2.06	10.30	9.52	1.60	3.14	4.85	3.36	1.01
General Chemistry																			
TOC (%)	-		-	-	1.55	2.39	0.18	3.15	0.04	0.04	1.39	0.06	0.42	0.87	0.08	0.12	0.35	0.28	0.03
Metals (mg/kg)																			
Arsenic	**8.2**		**70**	**500**	**12.8**	**11.6**	3.84	**10.6**	3.16	3.39	**8.42**	3.22	4.53	7.85	2.2	4.24	**17.4**	7.61	1.5
Cadmium	**1.2**		**9.6**	**100**	0.76	0.992	<0.133	0.87	<0.127	<0.127	0.33	<0.128	0.13	0.937	<0.123	0.22	**1.43**	0.492	<0.122
Chromium	**81**		**370**	**2500**	78.6	49	9.42	46.7	6.77	6.68	72.4	9.41	70.7	53.5	5.14	34.4	**129**	45.5	3.45
Copper	**34**	**254**	**270**	**2500**	**206**	**72.7**	14.5	**52.8**	4.24	5.14	**139**	16.3	**39.6**	**108**	9.63	**52.8**	**359**	**191**	15.2
Lead	**46.7**		**218**	**1000**	**148**	43	4.82	41.8	1.82	2.28	**128**	14.4	**71.5**	**175**	33.8	**86.4**	**962**	**408**	10.2
Mercury	**0.15**		**0.71**	**20**	**0.92**	**0.86**	**0.38**	**0.74**	0.03	0.03	**0.4**	**0.26**	**3.12**	**1.87**	**0.41**	**0.43**	**0.48**	**1.22**	<0.0245
Nickel	**20.9**		**51.6**	**2000**	**22.4**	**41**	7.01	**39.5**	4.89	5.04	**26.2**	5.22	7.22	16.9	3.48	15	**24.4**	9.73	3.36
Silver	**1**		**3.7**	**500**	0.33	0.183	<0.133	0.24	<0.127	<0.127	0.17	<0.128	<0.130	<0.130	<0.123	<0.127	0.35	<0.123	<0.122
Zinc	**150**		**410**	**5000**	**409**	130	34.7	122	19.6	75.1	**179**	44.3	123	**298**	33.1	**173**	**1480**	**1910**	44.5
Organochlorine Pesticides (µg/kg)																			
2,4'-DDD	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
2,4'-DDE	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
2,4'-DDT	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
4,4'-DDD	**2**		**20**	**1000**	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
4,4'-DDE	**2.2**		**27**	**1000**	**8.3**	<1.7	<1.3	<1.7	<1.3	<1.3	**7.1**	2.1	**6.8**	**21**	1.3	**6.8**	**21**	**26**	.
4,4'-DDT	**1**		**7**	**1000**	**<1.5**	**<1.7**	**<1.3**	**<1.7**	**<1.3**	**<1.3**	**<1.5**	**<1.3**	**<1.3**	**<1.3**	**<1.2**	**<1.3**	**<1.3**	**<1.2**	.
Total DDTs	**1.58**		**46.1**	**1000**	**8.3**	0	0	0	0	0	**7.1**	**2.1**	**6.8**	**21**	1.3	**6.8**	**21**	**26**	.
Aldrin	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Alpha-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Beta-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Chlordane	**0.5**		**6**	**2500**	**<15**	**<17**	**<13**	**<17**	**<13**	**<13**	**<15**	**<13**	**<13**	**<13**	**<12**	**<13**	**<13**	**<12**	.
Delta-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Dieldrin	**0.02**		**8**	**8000**	**<1.5**	**<1.7**	**<1.3**	**<1.7**	**<1.3**	**<1.3**	**<1.5**	**<1.3**	**<1.3**	**<1.3**	**<1.2**	**<1.3**	**<1.3**	**<1.2**	.
Endosulfan I	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Endosulfan II	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Endosulfan Sulfate	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Endrin	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Endrin Aldehyde	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Endrin Ketone	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Gamma-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Heptachlor	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Heptachlor Epoxide	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Methoxychlor	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	.
Toxaphene	-		-	-	<31	<34	<27	<34	<25	<25	<29	<26	<26	<26	<25	<25	<26	<25	.
Organotins (µg/kg)																			
Dibutyltin	-		-	-	<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	14	11	8	21	<3.7	11	<3.9	<3.7	.
Monobutyltin	-		-	-	<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	<4.4	<3.8	<3.9	<3.9	<3.7	<3.8	<3.9	<3.7	.
Tetrabutyltin	-		-	-	<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	<4.4	<3.8	<3.9	<3.9	<3.7	<3.8	<3.9	<3.7	.
Tributyltin	-		-	-	64	<5.2	5.4	9.5	<3.9	<3.8	78	45	46	26	4.6	20	8.1	<3.7	.

Table 7. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Parcel 5					Parcel 5						Parcel 5				
					Phase I	Phase I	Phase II	Phase II	Phase III	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase I	Phase III
					SWM50	SWM50	SWM50	SWM50	SWM50	SWM51	SWM51	SWM51	SWM52	SWM52	SWM52	SWM53	SWM53	SWM53	SWM53	SWM53
					0-2 ft	4-6 ft	6-8 ft	6-8 ft DUP	12-14 ft	0-2 ft	4-6 ft	6-8 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	4-6 ft DUP	6-8 ft	8-10 ft
Grain Size (%)																				
Gravel	-		-	-	0.43	3.85	4.30		3.06	1.11	5.20	2.15	4.51	0.69	1.46	0.27	4.13		5.10	2.64
Sand	-		-	-	97.07	78.85	79.89		93.62	95.07	66.23	90.79	70.73	87.08	95.07	97.20	80.44		82.00	88.67
Silt	-		-	-	1.25	9.60	8.59		1.15	1.71	17.38	4.04	14.04	6.65	1.93	1.34	9.48		7.51	4.95
Clay	-		-	-	1.25	7.70	7.22		2.17	2.10	11.19	3.02	10.73	5.58	1.54	1.20	5.95		5.39	3.73
General Chemistry																				
TOC (%)	-		-	-	0.24	0.81	0.03		0.08	0.15	1.17	0.22	0.79	0.57	0.08	0.05	0.45		0.35	0.18
Metals (mg/kg)																				
Arsenic	8.2		70	500	4.05	9.36	8.57	8.82	2.39	3.97	13.7	3.75	16.5	13.8	3.04	2.99	7.15	3.16	3.55	10.4
Cadmium	1.2		9.6	100	0.31	0.57	1.18	1.18	<0.120	<0.172	0.96	0.142	0.96	3.45	0.13	<0.128	0.5	<0.127	0.165	0.976
Chromium	81		370	2500	44.3	365	90.3	95	6.11	49.0B	830B	27.6	319B	178	9.48B	30.3B	92.7B	22.5	29.2	70.1
Copper	34	254	270	2500	126	322	722	849	30	28.8	175	73.4	427	197	16.9	42.4	148	62.1	39.1	171
Lead	46.7		218	1000	269	693	837	763	27.8	28.6	387	77.5	517	3080	52.5	23.5	535	62.6	31.9	229
Mercury	0.15		0.71	20	1.63	4.06	0.527	0.297	0.205	0.75	2.29	0.705	6.44	0.402	0.52	0.32	0.51	0.38	1.47	0.564
Nickel	20.9		51.6	2000	10.8	16.9	15.7	15.4	7.11	8.85	28.5	6.32	28.1	14.2	9.82	8.7	24.7	8.21	8.67	18.3
Silver	1		3.7	500	<0.135	0.25	0.289	0.303	<0.120	0.81	0.4	<0.123	0.25	0.383	<0.123	<0.128	0.17	<0.127	<0.125	0.277
Zinc	150		410	5000	398	486	640	696	72.7	133	664	172	813	6060	101	59.8	292	64	82.3	863
Organochlorine Pesticides (µg/kg)																				
2,4'-DDD	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
2,4'-DDE	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
2,4'-DDT	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
4,4'-DDD	2		20	1000	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
4,4'-DDE	2.2		27	1000	21	78	34	210	3.2	12	73	12	250	33	2.2	3.6	24	2.7	40	38
4,4'-DDT	1		7	1000	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Total DDTs	1.58		46.1	1000	21	78	34	210	3.2	12	73	12	250	33	2.2	3.6	24	2.7	40	38
Aldrin	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Alpha-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Beta-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Chlordane	0.5		6	2500	<14	<12	<12	<13	<12	<17	<15	<12	<14	<13	<12	<13	<13	<13	<12	<12
Delta-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Dieldrin	0.02		8	8000	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan I	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan II	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan Sulfate	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin Aldehyde	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin Ketone	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Gamma-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Heptachlor	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Heptachlor Epoxide	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Methoxychlor	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Toxaphene	-		-	-	<27	<25	<25	<26	<24	<34	<30	<25	<27	<26	<25	<26	<26	<25	<25	<25
Organotins (µg/kg)																				
Dibutyltin	-		-	-	<4.1	28	<3.7	<3.9	.	<5.2	11	<3.7	230	<3.8	<3.7	<3.8	31	<3.8	<3.8	.
Monobutyltin	-		-	-	<4.1	<3.7	<3.7	<3.9	.	<5.2	<4.5	<3.7	<4.1	<3.8	<3.7	<3.8	<3.9	<3.8	<3.8	.
Tetrabutyltin	-		-	-	<4.1	<3.7	<3.7	<3.9	.	<5.2	<4.5	<3.7	17	<3.8	<3.7	<3.8	<3.9	<3.8	<3.8	.
Tributyltin	-		-	-	89	210	<3.7	<3.9	.	19	20	<3.7	1600	4.6	<3.7	33	180	26	8.4	.

Table 7. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Parcel 5					Parcel 5							Parcel 5			
					Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase III	Phase I	Phase I	Phase I	Phase I
					SWM54	SWM54	SWM54	SWM55	SWM55	SWM56	SWM56	SWM56	SWM57	SWM57	SWM57	SWM57	SWM58	SWM58	SWM59	SWM59
					0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	0-2 ft	4-6 ft
Grain Size (%)																				
Gravel	-		-	-	1.89	1.14	0.99	0.95	5.08	2.58	3.67	4.68	0.27	3.07	1.97	3.71	0.95	1.45	1.43	4.21
Sand	-		-	-	67.41	95.76	97.19	95.16	90.96	67.00	78.04	93.43	54.11	87.44	94.61	93.80	19.17	94.03	87.56	93.92
Silt	-		-	-	18.01	1.42	0.92	1.56	2.04	14.03	9.48	0.76	24.18	5.27	1.45	0.92	48.71	2.46	6.10	0.50
Clay	-		-	-	12.69	1.68	0.91	2.33	1.91	16.39	8.81	1.13	21.43	4.21	1.97	1.57	31.17	2.06	4.90	1.37
General Chemistry																				
TOC (%)	-		-	-	1.41	0.04	0.02	0.08	0.12	1.59	1.84	0.04	0.96	0.30	0.08	0.18	0.18	0.06	0.16	0.03
Metals (mg/kg)																				
Arsenic	**8.2**		**70**	**500**	**12.6**	1.6	1.39	3.4	5.63	**10.2**	**9.13**	2	7.38	3.18	2.29	.	3.41	1.73	3.89	1.35
Cadmium	**1.2**		**9.6**	**100**	1.08	<0.123	<0.127	0.13	0.19	0.59	0.628	<0.125	0.38	0.129	<0.123	.	<0.128	<0.128	<0.123	<0.127
Chromium	**81**		**370**	**2500**	**103B**	5.38	4.16B	44.8B	48.8B	**89.4B**	69.3	7.73B	**113**	49.7	20.1	.	34.6	9.38	12.1	3.69
Copper	**34**	**254**	**270**	**2500**	**221**	4.29	3	**64.9**	**132**	**215**	**147**	10.2	**154**	**35.5**	33.9	.	**42.6**	12	**84.4**	10.9
Lead	**46.7**		**218**	**1000**	**255**	4.42	1.26	38.5	**207**	**143**	**191**	4.91	**293**	24	11.8	.	32.9	8.45	10.4	1.72
Mercury	**0.15**		**0.71**	**20**	**1.78**	0.126	<0.0253	**0.17**	**0.32**	**23.6**	**0.169**	0.08	**15.2**	**0.637**	0.1	.	**0.37**	0.1	0.1	0.03
Nickel	**20.9**		**51.6**	**2000**	**43.7**	4.03	3.37	11.4	13.4	**25**	**40.9**	4.55	**25**	8.17	4.47	.	10.3	4.13	7.79	4.08
Silver	**1**		**3.7**	**500**	0.36	<0.123	<0.127	<0.125	**1.27**	0.32	0.165	<0.125	0.18	<0.125	<0.123	.	<0.128	<0.128	<0.123	<0.127
Zinc	**150**		**410**	**5000**	**459**	23.8	17.8	130	**171**	**328**	**311**	30.5	**247**	67.3	35.8	.	77	28.6	56.5	26.9
Organochlorine Pesticides (µg/kg)																				
2,4'-DDD	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
2,4'-DDE	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
2,4'-DDT	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
4,4'-DDD	**2**		**20**	**1000**	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
4,4'-DDE	**2.2**		**27**	**1000**	**300**	**5**	<1.3	**5.4**	**5.9**	**73**	**27**	1.5	**24**	**9.4**	**2.7**	.	**10**	**2.7**	**8**	1.3
4,4'-DDT	**1**		**7**	**1000**	**<1.6**	**<1.2**	**<1.3**	**<1.2**	**<1.4**	**<1.6**	**<1.4**	**<1.2**	**<1.4**	**<1.2**	**<1.2**	.	**<1.3**	**<1.3**	**<1.2**	**1.4**
Total DDTs	**1.58**		**46.1**	**1000**	**300**	**5**	0	**5.4**	**5.9**	**73**	**27**	1.5	**24**	**9.4**	**2.7**	.	**10**	**2.7**	**8**	**2.7**
Aldrin	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Alpha-BHC	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Beta-BHC	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Chlordane	**0.5**		**6**	**2500**	**<16**	**<12**	**<13**	**<12**	**<14**	**<16**	**<14**	**<12**	**<14**	**<12**	**<12**	.	**<13**	**<13**	**<12**	**<13**
Delta-BHC	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Dieldrin	**0.02**		**8**	**8000**	**<1.6**	**<1.2**	**<1.3**	**<1.2**	**<1.4**	**<1.6**	**<1.4**	**<1.2**	**<1.4**	**<1.2**	**<1.2**	.	**<1.3**	**<1.3**	**<1.2**	**<1.3**
Endosulfan I	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Endosulfan II	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Endosulfan Sulfate	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Endrin	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Endrin Aldehyde	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Endrin Ketone	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Gamma-BHC	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Heptachlor	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Heptachlor Epoxide	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Methoxychlor	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	.	<1.3	<1.3	<1.2	<1.3
Toxaphene	-		-	-	<31	<25	<25	<25	<29	<32	<28	<25	<29	<25	<25	.	<26	<26	<25	<25
Organotins (µg/kg)																				
Dibutyltin	-		-	-	39	<3.7	<3.8	8.7	9.3	54	15	<3.8	120	29	19	10	21	5.9	20	<3.8
Monobutyltin	-		-	-	<4.7	<3.7	<3.8	<3.8	<4.4	<4.8	<2.4	<3.8	24	<3.7	<3.8	<3.7	<3.8	<3.8	10	<3.8
Tetrabutyltin	-		-	-	<4.7	<3.7	<3.8	<3.8	<4.4	<4.8	<2.4	<3.8	<4.3	<3.7	<3.8	<3.7	<3.8	<3.8	<3.8	<3.8
Tributyltin	-		-	-	52	<3.7	<3.8	27	35	93	31	7.4	530	81	140	83	210	15	160	16

Table 8. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 6, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Parcel 6				Parcel 6					Parcel 6			
					Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
					SWM40	SWM40	SWM40	SWM40	SWM60	SWM60	SWM61	SWM61	SWM61	SWM62	SWM62	SWM62	SWM62
					0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)																	
Gravel	-		-	-	1.52	1.63	2.33	2.20	1.20	2.13	8.95	2.87	1.39	2.59	3.98	14.82	3.92
Sand	-		-	-	94.81	72.15	52.66	57.76	85.20	95.31	81.24	85.98	96.54	65.32	78.38	77.44	94.34
Silt	-		-	-	1.97	14.51	21.95	20.02	6.15	0.90	3.93	5.45	0.85	16.50	9.95	4.39	0.63
Clay	-		-	-	1.70	11.72	23.07	20.02	7.45	1.67	5.88	5.71	1.21	15.60	7.69	3.35	1.12
General Chemistry																	
TOC (%)	-		-	-	2.80	1.37	2.24	1.97	0.60	0.04	0.29	0.09	0.04	1.21	0.83	0.08	0.03
Metals (mg/kg)																	
Arsenic	8.2		70	500	21.9	18.9	19.6	15.5	5.58	2.33	5.8	2.03	1.61	10.4	7.42	9.52	1.67
Cadmium	1.2		9.6	100	1.37	0.91	1.07	0.891	0.3	<0.125	0.5	<0.119	<0.123	0.57	0.67	0.506	<0.120
Chromium	81		370	2500	159	96.9	51.5	47.7	32.2	16.1	68.1	9.66	5.39	76.3	133	22	4.93
Copper	34	254	270	2500	520	1470	457	478	72.5	48.8	100	23	8.72	195	121	131	5.67
Lead	46.7		218	1000	235	367	219	200	60.2	18.6	251	11.3	2.5	261	224	244	52.1
Mercury	0.15		0.71	20	7.01	22.5	0.375	12.8	0.33	0.07	0.31	0.115	0.08	2.48	2.21	0.214	0.117
Nickel	20.9		51.6	2000	49.4	17.5	38.7	28.2	12.8	4.76	14.1	4.59	4.51	23.3	76.7	19.2	7.83
Silver	1		3.7	500	0.83	0.54	0.383	0.437	<0.133	<0.125	<0.130	<0.119	<0.123	0.3	0.18	<0.123	<0.120
Zinc	150		410	5000	548	578	377	367	161	57.3	261	48.4	26.1	286	303	184	21.3
Organochlorine Pesticides (µg/kg)																	
2,4'-DDD	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
2,4'-DDE	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
2,4'-DDT	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
4,4'-DDD	2		20	1000	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
4,4'-DDE	2.2		27	1000	33	29	12	.	8.1	1.8	10	18	<1.2	46	100	34	3.2
4,4'-DDT	1		7	1000	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Total DDTs	1.58		46.1	1000	33	29	12	.	8.1	1.8	10	18	0	46	100	34	3.2
Aldrin	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Alpha-BHC	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Beta-BHC	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Chlordane	0.5		6	2500	<20	<14	<15	.	<13	<12	<13	<12	<12	<15	<14	<12	<12
Delta-BHC	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Dieldrin	0.02		8	8000	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan I	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan II	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan Sulfate	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin Aldehyde	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin Ketone	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Gamma-BHC	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Heptachlor	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Heptachlor Epoxide	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Methoxychlor	-		-	-	<2.0	<1.4	<1.5	.	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Toxaphene	-		-	-	<40	<29	<31	.	<27	<25	<26	<24	<25	<29	<28	<25	<24
Organotins (µg/kg)																	
Dibutyltin	-		-	-	12	<4.3	<4.5	.	<4.0	6.5	8.5	<3.6	<3.7	10	11	<3.7	.
Monobutyltin	-		-	-	<6.0	<4.3	<4.5	.	<4.0	<3.8	<3.9	<3.6	<3.7	<4.4	<4.2	<3.7	.
Tetrabutyltin	-		-	-	<6.0	<4.3	<4.5	.	<4.0	<3.8	<3.9	<3.6	<3.7	<4.4	<4.2	<3.7	.
Tributyltin	-		-	-	110	14	<4.5	.	42	17	12	11	6.6	96	200	16	.

Table 8. Continued

Analyte	ERL	LBNS (Copper only)	ERM	TTLC	Parcel 6							Parcel 6			
					Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III
					SWM63	SWM63	SWM63	SWM64	SWM64	SWM64	SWM64	SWM65	SWM65	SWM65	SWM65
					0-2 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	6-8 ft	10-12 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)															
Gravel	-		-	-	1.75	2.01	0.48	3.90	3.25	3.50	13.56	4.62	1.81	3.45	3.83
Sand	-		-	-	91.47	81.73	90.83	45.33	40.29	26.24	27.07	24.25	60.45	76.37	65.13
Silt	-		-	-	2.39	8.94	3.94	26.96	26.53	32.93	27.25	36.51	21.54	10.38	17.00
Clay	-		-	-	4.38	7.33	4.75	23.80	29.93	37.33	32.11	34.62	16.19	9.80	14.03
General Chemistry															
TOC (%)	-		-	-	0.19	0.66	0.05	1.86	3.83	4.09	3.43	2.88	1.34	0.98	1.44
Metals (mg/kg)															
Arsenic	**8.2**		**70**	**500**	4.13	**11.8**	2.4	**16.9**	**83.8**	**33.9**	**46.7**	**26.7**	**18**	**16**	**27**
Cadmium	**1.2**		**9.6**	**100**	0.16	0.53	<0.120	1.02	**2.26**	**2.09**	**4.64**	1.11	**1.4**	0.859	1.19
Chromium	**81**		**370**	**2500**	19.1	43.5	7.07	**83.8**	**92.8**	79.4	**194**	**101**	**103**	70.8	**82.1**
Copper	**34**	**254**	**270**	**2500**	**62.2**	**253**	12.7	**437**	**1670**	**829**	**1650**	**515**	**676**	**599**	**1170**
Lead	**46.7**		**218**	**1000**	**87.4**	**205**	9.2	**212**	**1040**	**507**	**935**	**231**	**256**	**237**	**266**
Mercury	**0.15**		**0.71**	**20**	**0.47**	**2.99**	0.101	**14.2**	**99.9**	**0.803**	**384**	**7.63**	**15.2**	**0.793**	**5.43**
Nickel	**20.9**		**51.6**	**2000**	13.8	14.6	4.12	**31.5**	**49.6**	**50.6**	**51.3**	**38.1**	**27.7**	**22**	**23.1**
Silver	**1**		**3.7**	**500**	<0.127	0.24	<0.120	0.46	0.54	0.71	0.879	0.62	0.51	0.195	0.533
Zinc	**150**		**410**	**5000**	107	**711**	50.6	**432**	**1320**	**823**	**2200**	**607**	**968**	**432**	**566**
Organochlorine Pesticides (µg/kg)															
2,4'-DDD	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
2,4'-DDE	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
2,4'-DDT	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
4,4'-DDD	**2**		**20**	**1000**	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	**<2.1**	<1.5	**3**	<1.5
4,4'-DDE	**2.2**		**27**	**1000**	**8**	**19**	1.9	**31**	**41**	**13**	.	**21**	**120**	**30**	**140**
4,4'-DDT	**1**		**7**	**1000**	**<1.3**	**<1.3**	**<1.2**	**<1.7**	**<1.7**	**<1.8**	.	**<2.1**	**<1.5**	**<1.4**	**<1.5**
Total DDTs	**1.58**		**46.1**	**1000**	**8**	**19**	**1.9**	**31**	**41**	**13**	.	**21**	**120**	**33**	**140**
Aldrin	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Alpha-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Beta-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Chlordane	**0.5**		**6**	**2500**	**<13**	**<13**	**<12**	**<17**	**<17**	**<18**	.	**<21**	**<15**	**<14**	**<15**
Delta-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Dieldrin	**0.02**		**8**	**8000**	**<1.3**	**<1.3**	**<1.2**	**<1.7**	**<1.7**	**<1.8**	.	**<2.1**	**<1.5**	**<1.4**	**<1.5**
Endosulfan I	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Endosulfan II	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Endosulfan Sulfate	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Endrin	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Endrin Aldehyde	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	8	<1.5	<1.4	<1.5
Endrin Ketone	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Gamma-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Heptachlor	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Heptachlor Epoxide	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Methoxychlor	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8	.	<2.1	<1.5	<1.4	<1.5
Toxaphene	-		-	-	<25	<26	<24	<33	<34	<37	.	<43	<29	<28	<30
Organotins (µg/kg)															
Dibutyltin	-		-	-	10	80	<3.5	24	<5.1	<5.5	.	30	19	<4.2	.
Monobutyltin	-		-	-	<3.8	<3.9	<3.5	<5.0	<5.1	<5.5	.	<6.4	<4.4	<4.2	.
Tetrabutyltin	-		-	-	<3.8	<3.9	<3.5	<5.0	<5.1	<5.5	.	<6.4	<4.4	<4.2	.
Tributyltin	-		-	-	55	300	11	190	<5.1	<5.5	.	340	140	33	.

All values in dry weight except where noted

BOLD The measured concentration exceeds the analyte's respective ER-L value.

BOLD, Underlined, and Yellow The measured concentration exceeds the analyte's respective ER-M value.

BOLD and Underlined and Green The measured concentration exceedes the analyte's respective TTLC.

< = Below the method detection limit indicated.

E = Analyte detected at a concentration below the reporting limit and above the method detection limit. Value is estimated.

B = Analyte detected in procedural blank

Table 9. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected within Parcel 4 in January 2007

Within Parcel 4					
56 Depth Intervals Analyzed across 20 Stations					
Metals	**Range (mg/kg)**	# < ER-L	**ER-L < # < ER-M**	**ER-M< # < TTLC**	**TTLC < #**
Arsenic	2.01 – 170	27	27	2	0
Cadmium	ND – 6.91	43	13	0	0
Chromium	5.26 – 476	38	17	1	0
Copper	3.60 – 3,490	12	20	23	1
Lead	1.70 – 720	29	14	13	0
Mercury	ND – 9.34	15	20	21	0
Nickel	3.60 – 46.3	39	17	0	0
Silver	ND – 0.94	56	0	0	0
Zinc	15.9 – 5,150	24	12	19	1

Organochlorine Pesticides

4,4'-DDD, 4,4'-DDE and 4,4'-DDT were the only DDT derivatives and organochlorine pesticides measured in sediments at stations within Parcel 4. 4,4'-DDD was detected at seven stations and exceeded its ER-M value (20 µg/kg) at four of these stations with a maximum concentration of 62 µg/kg at SWM36/4-6 ft. 4,4'-DDE was detected at all but one station (SWM07) and exceeded its ER-M value (27 µg/kg) at 15 stations with a maximum concentration of 230 µg/kg at SWM39/4-6 ft. 4,4'-DDT was only detected at three stations and exceeded its ER-M value (7 µg/kg) at two stations with a maximum concentration of 19 µg/kg at SWM31/4-6 ft. Total DDTs also exceeded its ER-M value (46.1 µg/kg) at 13 locations.

Organotins

TBT was detected at every station and nearly every depth interval with concentrations ranging from non-detect to 4,200 µg/kg. TBT exceeded concentrations of 100 µg/kg value at 13 stations of the 20 stations within Parcel 4. Dibutyltin (DBT) was detected at multiple depth intervals at all stations within Parcel 4, except two (SWM03 and SWM07) which did not have any detections of DBT. DBT ranged in concentration from non-detect to 1,200 µg/kg. Monobutyltin (MBT) was detected at nine stations, typically at only one depth interval. MBT ranged in concentration from non-detect to 110 µg/kg. Tetrabutyltin (TTBT) was detected at nine stations. TTBT ranged in concentration from non-detect to 32 µg/kg.

3.2.1.2 Offshore of Parcel 4

Four stations (SWM41 – SWM44) were located offshore of Parcel 4. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 4 stations. In addition, one of the stations was analyzed as part of Phase IIa (depth layer 2-4 ft) and one of the stations was analyzed as part of Phase IIb (depth layer 6-8 ft) and Phase III (depth layer 8-10 ft).

Grain Size and TOC

At each station offshore of Parcel 4, the sediment in each depth interval primarily consisted of coarse-grained material, ranging from 54.3% to 97.4 % gravelly sands. TOC ranged in concentration from 0.03% at multiple stations to 1.10% at SWM42/0-2 ft.

Metals

At SWM42 and SWM44, copper, lead and mercury were detected at levels greater than ER-M values in surface and intermediate layer sediments and zinc was detected above its TTLC at SWM44/4-6 ft. However, these metals were below the ER-L values in the 4-6 ft depth interval at SWM42 and in the 8-10 ft depth interval at SWM44. The greatest concentrations of these metals occurred in the 4-6 ft depth interval at SWM44; copper had a maximum concentration of 422 mg/kg, lead was 854 mg/kg, mercury was 16 mg/kg and zinc was measured at 6,890 mg/kg. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 10.

Table 10. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Offshore of Parcel 4 in January 2007

Offshore of Parcel 4					
11 Depth Intervals Analyzed across 4 Stations					
Metals	**Range (mg/kg)**	# < ER-L	**ER-L < # < ER-M**	**ER-M< # < TTLC**	**TTLC < #**
Arsenic	2.11 – 13.5	7	4	0	0
Cadmium	ND – 2.76	10	1	0	0
Chromium	4.63 – 151	8	3	0	0
Copper	4.14 – 422	6	1	4[1]	0
Lead	1.68 – 854	6	1	4	0
Mercury	ND – 16	6	1	4	0
Nickel	3.94 – 22.4	10	1	0	0
Silver	ND – 0.31	11	0	0	0
Zinc	14.6 – 6,890	6	3	1	1

[1] Includes 1 sample with a concentration greater than the LBNS copper threshold value of 254 mg/kg but less than the ER-M value of 270 mg/kg

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments at two stations (SWM42 and SWM43) offshore of Parcel 4 was 4,4'-DDE. 4,4'-DDE exceeded its ER-M value (27 µg/kg) in the surface sediments at one station (SWM42) with a maximum concentration of 96 µg/kg in the 0-2 ft depth interval. Total DDTs also exceeded its ER-M value (46.1 µg/kg) at this location, and was directly attributable to the 4,4'-DDE concentration at that interval.

Organotins

TBT was measured above a concentration of 100 µg/kg at both SWM42 and SWM44. At SWM42, the maximum concentration of 620 µg/kg only occurred in the surface layer. At SWM44, elevated TBT concentrations ranged from 420 µg/kg in the surface layer to 240 µg/kg in the 4-6 ft depth interval. DBT was detected at stations SWM42 and SWM44; concentrations ranged form non-detect at SWM42/4-6 ft to 110 µg/kg at SWM42/0-2 ft and SWM44/4-6 ft. MBT was detected only at station SWM44, with concentrations ranging from 11 µg/kg at 6-8 ft to 29 µg/kg at 0-2 ft. TTBT was not detected at any stations.

3.2.1.3 Adjacent to Parcel 5

Fifteen stations (SWM45 – SWM59) were located adjacent to Parcel 5. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 15 stations. At four stations (SWM47, SWM55, SWM58 and SWM59), Phase II and Phase III analyses were not required. At seven stations (SWM45, SWM46, SWM48, SWM52, SWM54, SWM56 and SWM57), Phase IIa (depth layer 2-4 ft) analyses were conducted and at four stations (SWM49, SWM50, SWM51 and SWM53), Phase IIb (depth layer 6-8 ft)

analyses were conducted. The 6-8 ft depth interval at SWM57 was also analyzed in Phase III to further delineate elevated levels of TBT.

Grain Size and TOC

All depth intervals at all stations adjacent to Parcel 5, except SWM45/2-4 ft and SWM58/0-2 ft, consisted of predominantly coarse-grained material (ranging from 54.4% to 98.2% gravelly sand). Fine-grained material was predominant at SWM45/2-4 ft (58.1% silts and clays) and at SWM58/0-2 ft (79.9% silts and clays). TOC ranged from 0.02% at SWM54/4-6 ft to 3.15% at SWM46/0-2 ft.

Metals

At five stations (SWM45, SWM46, SWM48, SWM54, and SWM57) metals concentrations were generally low throughout the sediment column with only an occasional ER-M exceedance of one metal at multiple depth intervals or a few metals at one depth interval. At SWM45, SWM46 and SWM48, mercury was the only metal to exceed ER-M values in the surface and, at two sites (SWM46 and SWM48), in the 2-4 ft depth interval. Lead and mercury concentrations were greater than ER-M values in the surface sediments at SWM54 and SWM57, with the highest concentrations of lead (293 mg/kg) and mercury (15.2 mg/kg) at SWM57/0-2 ft.. Zinc was also greater than its ER-M value in the surface sediments at SWM54, with a concentration of 459 mg/kg.

At five stations (SWM49 – SWM53), several metals, including copper, lead, mercury and zinc, exceeded ER-M values at multiple depth intervals at each station. At SWM56, mercury exceeded its TTLC. The maximum level of copper occurred in the SWM50/6-8 ft depth interval with a concentration of 722 mg/kg and a corresponding concentration of 849 mg/kg in the duplicate sample taken at that station. Both lead and zinc exceeded their TTLCs (1,000 mg/kg and 5,000 mg/kg, respectively) in the SWM52/2-4 ft sample with concentrations of 3,080 mg/kg and 6,060 mg/kg, respectively. Mercury was the only metal to exceed ER-M or TTLC guidelines at SWM56, with a concentration of 23.6 mg/kg in the surface sediments, greater than its TTLC of 20 mg/kg. In one sample, SWM51/4-6 ft, chromium also exceeded its ER-M value (370 mg/kg) with a concentration of 830 mg/kg; however, chromium was also detected in the associated procedural blank for this sample. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 11.

Table 11. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Adjacent to Parcel 5 in January 2007

Adjacent to Parcel 5					
44 Depth Intervals Analyzed across 15 Stations					
Metals	**Range (mg/kg)**	# < ER-L	**ER-L < # < ER-M**	**ER-M< # < TTLC**	**TTLC < #**
Arsenic	1.35 – 17.4	30	14	0	0
Cadmium	ND – 3.45	42	2	0	0
Chromium	3.45 - 830	34	9	1	0
Copper	3 - 722	15	25	4	0
Lead	1.26 – 3,080	22	10	11	1
Mercury	ND – 23.6	10	19	14	1
Nickel	3.36 – 43.7	32	12	0	0
Silver	ND – 1.27	43	1	0	0
Zinc	17.8 – 6,060	24	11	8	1

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments from nearly all depth intervals and at all stations adjacent to Parcel 5 was 4,4'-DDE. 4,4'-DDE exceeded its ER-M value (27

µg/kg) at six stations (SWM50 – SWM54 and SWM56) with a maximum concentration of 300 µg/kg in the 0-2 ft depth interval at SWM54. Total DDTs also exceeded its ER-M value (46.1 µg/kg) at each of these stations, except SWM53, and was directly attributable to the 4,4'-DDE concentration at those intervals.

Organotins

TBT was greater than a concentration of 100 µg/kg at six stations adjacent to Parcel 5 (SWM50, SWM52, SWM53, and SWM57 – SWM59). At three of these stations (SWM52, SWM58 and SWM59), TBT only exceeded 100 µg/kg in the surface sediments, with a maximum concentration of 1600 µg/kg at SWM52/0-2 ft. At SWM50 and SWM53, TBT only exceeded 100 µg/kg in the 4-6 ft depth interval. At SWM57, TBT was detected above 100 µg/kg in the surface sediments and in the 4-6 ft depth interval. DBT was detected in at least one depth interval at 13 of the 15 stations; concentrations were below 100 µg/kg in all samples except SWM52/0-2 ft (230 µg/kg) and SWM57/0-2 ft (120 µg/kg). MBT and TBT were only detected in a few samples and demonstrated concentrations below 24 µg/kg.

3.2.1.4 Adjacent to Parcel 6

Seven stations (SWM40, SWM60 – SWM65) were located adjacent to Parcel 6. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all seven stations. At SWM60, Phase II and Phase III analyses were not required. One of the stations (SWM61) was analyzed as part of Phase IIa (depth layer 2-4 ft), and stations SWM40 and SWM62-65 were analyzed as part of Phase IIb (depth layer 6-8 ft). Stations SWM40, SWM62, SWM64, and SWM65 were analyzed as part of Phase III (depth layer 8-10 ft).

Grain Size and TOC

All depth intervals at all stations adjacent to Parcel 6, except SWM64 (all depths) and SWM65 (0-2 ft), consisted of predominantly coarse-grained material (ranging from 55.0% to 97.9% gravelly sand). Each depth interval at SWM64 and the surface sediment at SWM65 consisted of predominantly fine-grained material (ranging from 50.8% to 71.13% silts and clays). TOC ranged from 0.03% at SWM62/8-10 ft to 4.09% at SWM64/6-8 ft, corresponding with areas of coarse-grained and fine-grained material, respectively.

Metals

At three stations (SWM60, SWM61, and SWM63) metals concentrations were generally low throughout the sediment column with only an occasional ER-M exceedance of one or two metals in one depth interval. In contrast, at four stations (SWM40, SWM62, SWM64 and SWM65), several metals exceeded ER-Ms or TTLCs at multiple depth intervals. Specifically, at SWM60, none of the metals exceeded ER-M values. At SWM61 lead exceeded its ER-M value in the surface sediment with a concentration of 251 mg/kg. At SWM63, mercury and zinc exceeded their ER-M values only in the 4-6 ft depth interval with concentrations of 2.99 mg/kg and 711 mg/kg, respectively.

At SWM40, SWM62, SWM64 and SWM65, the concentration of most metals, with the notable exception of silver, exceeded ER-L values, with several metals (copper, lead, mercury and zinc) consistently exceeding ER-M values from the surface to the deepest depth interval analyzed. However, copper, mercury, and zinc, were below ER-L values in the deepest depth interval (8-10 ft) at SWM62. Of these four stations, SWM64 had the highest overall contaminant levels. Arsenic was greater than its ER-M (70 mg/kg) in the 4-6 ft depth interval with a concentration of 83.8 mg/kg; arsenic exceeded the ER-L at all other depth intervals. Copper exceeded the CSTF target cleanup level (261 mg/kg) and the ER-M value (270 mg/kg) at all depth intervals with a maximum concentration of 1,670 mg/kg in the 4-6 ft depth interval. The maximum concentration of lead occurred in the 4-6 ft depth interval with a value of 1,040 mg/kg, greater than its TTLC of 1,000 mg/kg. Mercury exceeded its TTLC (20 mg/kg) at two depth intervals, with a concentration of 99.9 mg/kg in the 4-6 ft depth interval and a maximum concentration of 384 mg/kg in the 10-12 ft depth interval. Zinc had a maximum concentration in the 10-12 ft depth interval with a value of 2,200 mg/kg. It should be noted that mercury also exceeded its TTLC in the 4-6 ft depth

interval at SWM40. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 12.

Table 12. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Adjacent to Parcel 6 in January 2007

Adjacent to Parcel 6					
24 Depth Intervals Analyzed across 7 Stations					
Metals	**Range (mg/kg)**	# < ER-L	**ER-L < # < ER-M**	**ER-M< # < TTLC**	**TTLC < #**
Arsenic	1.61 – 83.8	9	14	1	0
Cadmium	ND – 4.64	19	5	0	0
Chromium	4.93 – 194	9	15	0	0
Copper	5.67 – 1,670	4	8	12	0
Lead	2.5 – 1,040	4	6	13	1
Mercury	0.07 – 384	5	5	11	3
Nickel	4.12 – 76.7	11	12	1	0
Silver	ND – 0.879	24	0	0	0
Zinc	21.3 – 2,200	6	7	11	0

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments from nearly all depth intervals and at all stations adjacent to Parcel 6 was 4,4'-DDE; however, 4,4'-DDD was detected at one depth interval at one station (SWM65/6-8 ft), but was below its ER-M value of 20 µg/kg. 4,4'-DDE exceeded its ER-M value (27 µg/kg) at four stations (SWM40, SWM62, SWM64 and SWM65) with a maximum concentration of 140 µg/kg in the 8-10 ft depth interval at SWM65. Total DDTs also exceeded its ER-M value (46.1 µg/kg) at SWM62/4-6 ft, SWM65/4-6 ft and SWM65/8-10 ft, directly attributable to the 4,4'-DDE concentration a those intervals.

Organotins

TBT was greater than 100 µg/kg at five of the seven stations adjacent to Parcel 6 (SWM40, SWM62, SWM63, SWM64 and SWM65). At three of these stations (SWM40, SWM64 and SWM65), TBT exceeded 100 µg/kg in surface sediments, with a maximum concentration of 340 µg/kg at SWM65/0-2 ft. At SWM62 and SWM63, TBT did not exceed 100 µg/kg in the surface sediments but exceeded this concentration in the 4-6 ft depth interval, with concentrations of 200 µg/kg, and 300 µg/kg, respectively. DBT was detected at least one depth interval at all stations adjacent to Parcel 6; however, concentrations were low and ranged from non-detect in many depth intervals to 80 µg/kg in SWM63/4-6 ft. MBT and TTBT were not detected at any stations.

Appendix D

Sample Containers, Holding Time, Preservation, and Storage for Analytical Chemistry

Sample Containers, Holding Times, Preservation and Storage

Parameter	Container Type/Size	Holding Time[a]	Preservation/Storage
Metals[b,c]	125-mL glass jar	Mercury – 28 days All others – 6 months	Hold at 4° ± 2°C up to 1 month or freeze at -20° ± 10°C
Butyltins	500-mL glass with Teflon® lid	14 days to extraction[c]; 40 days to analysis after extraction	Freeze for extended storage (-20° ± 10°C); otherwise store at 4° ± 2°C
PCBs[d], pesticides[e], PAHs[f]	500-mL glass with Teflon® lid	14 days to extraction[c]; 40 days to analysis after extraction	Freeze for extended storage (-20° ± 10°C); otherwise store at 4° ± 2°C
SVOCs TPH-Diesel TPH-Gasoline Phenol Pentachlorophenol MCPA MCPP Dichlorprop Dioxins	500-mL glass with Teflon® lid	14 days to extraction[c]; 30 days to extraction[c] for Dioxins[c]; 40 days to analysis after extraction	Freeze for extended storage (-20° ± 10°C); otherwise store at 4° ± 2°C
Grain size	125-mL plastic	6 months	4° ± 2°C
Total solids, TOC, ammonia	250-mL glass with Teflon® lid	Total solids, TOC – 1 month; ammonia – 7 days	4° ± 2°C
Toxicity tests	4-L glass with Teflon® lid (1 container per acute test)	6 weeks	4° ± 2°C/dark/airtight
Archive	500-mL and 1-L glass jars with Teflon® lid (for composite samples)	1 year	Freezer storage (-20° ± 10°C)

NOTE: PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
TOC – total organic carbon

[a] Holding times begin the day the sediment sample is collected in the field.
[b] Arsenic, cadmium, chromium, copper, lead , mercury, nickel, selenium, silver, and zinc.
[c] Sample may be held for up to one year if stored at -20°C±10°C (USEPA/USACE 1998).
[d] PCBs as congeners, Aroclors 1242, 1248, 1254, 1260, and total PCBs (USEPA/USACE 1998).
[e] Chlorinated pesticides on USEPA Method 608 list (USACE 1993; USEPA/USACE 1998).
[f] PAH compounds on USEPA Method 610 list (USACE 1993; USEPA/USACE 1998).

Appendix E

Standard Operating Procedures

STANDARD OPERATING PROCEDURE

SEDIMENT CORE/SAMPLE COLLECTION – VIBRACORER

Sediment core samples may be collected with an electrically powered vibracorer, which is lowered through the water column under winch control, and which penetrates the sediment by means of its weight and intense vibration. The following steps outline the procedure for collection of sediment samples using a vibracorer.

1. Maneuver the sampling vessel to the proposed sampling location using the navigation system and deploy a marker buoy at the location.

2. Check to ensure that the metal core barrel is securely fastened to the powerhead of the vibracorer and insert a decontaminated core liner inside the metal core barrel.

3. Insert a core catcher in to the core nose so that the catcher fingers will extend into the core liner, and then screw the core nose onto the bottom of the core barrel.

4. Continue screwing the core nose until the shoulder on the inside of the core nose firmly contacts the end of the core barrel. Tighten the core nose with a spanner or strap wrench.

5. Start the electrical generator, but **DO NOT** energize the corer.

6. Signal the winch operator to hoist the corer and swing it over the stern or side of the vessel at the marked sampling location. Reposition the vessel if necessary. Record the measured water depth, and enter the tidal elevation on the core collection log sheet. Calculate the mudline elevation, and then determine the number of feet of penetration required to reach project depth.

7. Signal the winch operator to lower the corer through the water column. Determine the depth of the corer in the water column and track its subsequent penetration into the sediment either by marking the winch line in 1-ft increments or by attaching a flexible tape measure to the powerhead. In either case, the reference will be 0 ft at the tip of the core nose.

8. When the core nose is within approximately 10 ft of the bottom, energize the corer by actuating the circuit breaker on the generator control panel.

9. Slow the descent speed of the corer in order to determine when the core nose is entering the sediment. Maintain tension on the winch line throughout the coring process to keep the corer from topping over. The worker monitoring the penetration of the corer into the sediment will signal the winch operator when to pay out more line.

10. If refusal is encountered or if the measured distance to the tip of the core nose indicates that project depth has been reached, stop paying out line and de-energize the corer. Do not power down the generator. Refusal is indicated by less than 6 inches of penetration in a given 30-second interval.

11. Signal the winch operator to bring the winch line taut. Maneuver the boom or the boat until the winch pulley is directly above the corer in the sediment, as indicated by the winch line being as close to true vertical as possible.

12. Record the position of the actual coring location. The navigation antenna may be mounted on the winch boom near the pulley to place it directly over the corer.

13. Signal the winch operator to retrieve the corer. If the corer is stuck in the bottom, energize the power head while maintaining tension on the winch line. To reduce the risk of losing sediment from the core barrel, de-energize the corer over the deck and lower it to a holding rack. Note and record the length of smearing on the outside of the core barrel, which gives and indication of the amount of penetration.

14. Use a spanner or strap wrench to unscrew the core nose and remove it. The catcher may stay inside the core nose or remain attached to sediment inside the core liner. Retain any sediment in the core nose and catcher for examination and possible use.

15. Pull the corer liner approximately 6 inches out of the core barrel, remove the catcher (if necessary), and immediately cap the bottom end of the core liner with a plastic cap. Secure the bottom cap with duct tape and proceed to step 16.

    Alternatively, remove the core completely out of the core barrel and evaluate the appearance and length of the core sample by examination through the clear plastic core liner. Note any stratigraphic intervals or other salient features on the core collection log sheet. Extrude the sediment from the core liner and place into food-grade polyethylene bags on board the sampling vessel and proceed to step 25.

16. Extract the core liner entirely from the core barrel, and immediately cap the top of the core liner.

17. If the core is to be cut into length-wise sections, draw a mark on the outside of the core liner where the cut will be made to cut off the bottommost section. Apply duct tape and use a permanent marker to mark the sections on both sides of the location of the future cut. Mark arrows pointing toward the top end of the core, write the core ID, write date and time, and indicate the depth interval spanned by the sections in terms of feet below mudline.

18. Three individuals are needed to complete the cutting process: One person will make the cut with a saw loaded with a decontaminated blade, and two persons will tend the cut ends of the sections.

19. Make the cut and immediately cap both the exposed ends. Immediately secure both caps with duct tape.

20. Repeat the cutting procedure if more length-wise sections need to be cut.

21. Remove the cap from the top end of the top-most section and drain the water. Draining may be accomplished by drilling the hole through the core liner just above the top of the sediment or by gently tipping the section to empty the water out the top. The latter approach may be risky if the sediments are watery or loose.

22. Cut off the excess plastic tube and immediately cap the end and secure the cap with duct tape.

23. If the core will consist of only one section, do steps 15 and 16, mark the core liner as described in step 17, and then do steps 21 and 22.

24. Evaluate the appearance and length of the core sample by examination through the clear plastic core liner. Note any stratigraphic intervals or other salient features on the core collection log sheet.

25. Fill out a chain-of-custody form for the core section(s) to initiate the tracking process.

26. Store the core sections at 4°C (± 2°C) in a refrigerator or iced cooler.

27. Complete any additional entries on the core collection log sheet.

<u>Acceptance criteria for a sediment core sample are as follows:</u>

- The core penetrated to and retained material to project depth or refusal and shows evidence of Merritt Sand.

- Cored material did not extend out the top of the core tube or contact any part of the sampling apparatus at the top of the core tube.

- There are no obstructions in the cored material that might have blocked the subsequent entry of sediment into the core and resulted in incomplete core collection.

If sample acceptance criteria are not achieved, the sample will be rejected. If repeated deployment within 25-50 ft of the proposed location does not result in a sample that meets the appropriate acceptance criteria, the Project Manager will make a decision regarding relocating the proposed sample location.

STANDARD OPERATING PROCEDURE

LABORATORY SEDIMENT CORE/SAMPLE PROCESSING

The following steps outline the general procedure to be followed. The number and subdivisions of berths and composites may vary, depending upon a particular sampling episode.

1. All equipment coming into contact with sediment will be decontaminated before use with each sample to avoid cross contamination.

2. Extrude the sediment from the core liner into a stainless-steel bowl or a 5-gallon high-density polyethylene (HDPE) bucket, depending on the volume.

3. Examine the sediment and record descriptive notes on the core collection log sheet. Parameters may include:
   a. Qualitative sediment description
   b. Odor
   c. Debris
   d. Biological activity (e.g., detritus, shells tubes, bioturbation, live or dead organisms)
   e. Presence of oil sheen
   f. Any other distinguishing characteristics

4. After the sediment description is complete, homogenize the sediment by hand using a stainless-steel mixing spoon or by using an electric drill with a stainless-steel stirring paddle.

5. Once the sediment has been homogenized, immediately collect a sample for sulfide analysis prior to any other processing. Use a stainless-steel spoon to place sediment into a 4-oz jar. Fill the jar two-thirds full and preserve with one vial of zinc acetate supplied by the analytical laboratory. Immediately screw on the lid, label the jar, and place it in a cooler supplied with ice or frozen blue ice packets.

6. Collect a sample of the homogenized sediment from the individual core for archiving. Fill one 16-oz sample container three-fourths full, screw on the lid, label the jar, and place it in freezer storage for archival purposes.

7. Use aluminum foil or a filtered lid to close the container of homogenized sediment until the remaining cores of the group to be composited for that site have been similarly processed.

8. In a 10-gallon HDPE bucket, combine equal portions of sediment from each individual core of the group to be composited and mix thoroughly (e.g., with an electric drill and stainless-steel paddle) until uniformly homogenized.

9. Collect a sample of the homogenized composite for archiving by filling a 32-oz sample jar three-fourths full, screwing the lid on tightly, labeling the jar, and placing it in freezer storage.

10. Distribute the composited homogenized site sediment to the appropriate sample jars, label the jars, complete the core processing log form and sample tracking form, and place the jars in refrigerated storage for subsequent packing and shipping to analytical laboratories.

11. If it is necessary to archive sediment for possible use in bioassays, ensure that all sample jars for analysis have been filled, then collect two 64-oz glass containers per bioassay.

12. Throughout the sample processing phase, maintain secure storage of sediment and samples; that is, observe proper custody procedures, and continue those procedures until the sample shipping containers are released to the shopping carriers.

13. Any sediment remaining from individual cores that was not used in preparing the homogenized composite should be archived at 4°C for potential subsequent analysis of the individual cores.