

**Site Management & Monitoring Plan
for Three Southern California
Ocean Dredged Material Disposal Sites:
LA-2, LA-3, and LA-5**

**Prepared by US EPA Region IX
and
US Army Corps of Engineers, Los Angeles District**

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1.0 Introduction

The disposal of dredged material in ocean waters, including the territorial sea is regulated under the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), 33 U.S.C. § 1401, ff. The transportation of dredged material for disposal into ocean waters is permitted by the U.S. Army Corps of Engineers (USACE) (or, in the case of federal projects, authorized for disposal under MPRSA §103(e)) only after environmental criteria established by U.S. Environmental Protection Agency (EPA) are applied. The Water Resources Development Act of 1992 (WRDA 92; Public Law 102-580) made a number of changes to the MPRSA. As amended by Section 506 of WRDA 92, Section 102 (c) of the MPRSA provides that, in the case of ocean dredged material disposal sites (ODMDS), no site shall receive a final designation unless a management plan has been developed. EPA and the USACE issued a joint guidance document in February 1996 for the development of ocean dredged material disposal site management plans (EPA/USACE, 1996).

MPRSA Section 102(c)(3), as amended by WRDA 92, sets forth a number of requirements regarding the content and development of site management plans, including:

- (A) a baseline assessment of conditions at the site;
- (B) a program for monitoring the site;
- (C) special management conditions or practices to be implemented at each site that are necessary for protection of the environment;
- (D) consideration of the quantity of the material to be disposed of at the site, and the presence, nature, and bioavailability of the contaminants in the material;
- (E) consideration of the anticipated use of the site over the long term, including the anticipated closure date for the site, if applicable, and any need for management of the site after the closure of the site; and
- (F) a schedule for review and revision of the plan (which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter).

Similar ocean dredged material disposal sites receiving similar material may be combined into a single management plan provided that all MPRSA Section 102 (c)(3) requirements are met for each site (EPA/USACE, 1996).

EPA manages three ocean disposal sites off southern California that qualify under this criterion: LA-2 off the ports of Los Angeles and Long Beach, LA-3 off Newport Beach, and LA-5 off San Diego Bay ([Figure 1](#)). Disposal at these sites is coordinated jointly by the same offices of EPA (Region IX) and USACE (Los Angeles District); therefore, this SMMP will fulfill the requirements for all three disposal sites.

The requirements of this Site Management and Monitoring Plan (SMMP) (and the compliance and enforcement provisions of the MPRSA regulations themselves) apply to all projects using the LA-2, LA-3 or LA-5 sites, including projects which have received an "ocean dumping permit" issued by the USACE under Section 103 of the MPRSA, as well as federal projects conducted by or for the USACE. Throughout this SMMP, the terms "permit" and "permittee" are used generically to apply to all these projects, even though the USACE does not issue a "permit" for its own dredging projects.

2.0 Disposal Site Characteristics

A comprehensive description of physical, chemical, and biological characteristics of the sediments and water column at LA-2 and LA-3 can be found in the LA-2/LA-3 FEIS (EPA 2005), and for LA-5 in the LA-5 FEIS ([EPA 1992?](#)). A brief description of each site is presented below, and in Table 2.

The LA-2 disposal site is located on the outer continental shelf margin, at the upper southern wall of San Pedro Sea Valley, at depths from 380-1060 ft (110 to 320 m), about 6.8 miles (11 km) south-southwest of the Queens Gate entrance to the Los Angeles/Long Beach Harbor ([Figure 2](#)). The site is centered at 33°37'6" N and 118°17'24" W with an overall radius of 3000 ft (915 meters). However, disposal vessels must be fully within the smaller 1,000 ft (305 m) radius Surface Disposal Zone (SDZ), centered at the same coordinates, when discharging dredged material.

The LA-3 disposal site is located on the continental slope near the Newport Submarine Canyon at a depth of about 1,475 ft (450 m), approximately 5.4 miles (8.5 km) southwest of the entrance of Newport Harbor ([Figure 3](#)). The site is centered at 33°31'00" N and 117°53'30" W, with a 3000 ft (915 m) radius. However, disposal vessels must be fully within the smaller 1,000 ft (305 m) radius Surface Disposal Zone (SDZ), centered at the same coordinates, when discharging dredged material.

The LA-5 disposal site is located on the continental shelf approximately 7 miles (11.3 km) southwest of Point Loma, at a depth of 460-660 ft (145-200 m) ([Figure 4](#)). The site is centered at [\[NAD 27!\]](#) 32°36.83' N and 117°20.67' W [\[NAD 27!\]](#) with an overall radius of 3000 ft (915 meters). However, disposal vessels must be fully within the smaller 1,000 ft (305 m) radius Surface Disposal Zone (SDZ), centered at the same coordinates, when discharging dredged material.

Table 1. Dimensions and Center Coordinates for the Three Southern California Ocean Disposal Sites, and Their Surface Disposal Zones (SDZ)

Disposal Site	Dimensions		Center Coordinates	
	Radius of SDZ	Radius of Overall Site	Latitude (NAD 83)	Longitude (NAD 83)
LA-2 (Los Angeles)	1000 ft	3000 ft	33°37'6" N	118°17'24" W
LA-3 (Newport)	1000 ft	3000 ft	33°31'00"N	117°53'30"W
LA-5 (San Diego)	1000 ft	3000 ft	32°36.83'N; <u>NAD 27</u>	117°20.67' W <u>NAD 27</u>

3.0 Site Management Plan

This management plan has been developed jointly by the U.S. EPA Region IX and the USACE Los Angeles District. The LA-2, LA-3, and LA-5 sites have been in use since the mid-1970s: the LA-2 site was used as an interim disposal site until officially designated as a permanent disposal site in 1991; the LA-3 site was in interim status until 2005, when EPA designated it as a permanent site (and adjusted its location slightly); and LA-5 was an interim site until designated as a permanent site in 1992. While a site management plan for the LA-2 site was established previously, the 2005 site designation EIS for LA-3 provided the opportunity to re-examine both sites in light of historical data on the effects of three decades of dredged material disposal and to design a coordinated management/monitoring plan that would allow effective natural resource coordination by the EPA and USACE for both sites. Now, EPA and USACE are combining all three southern California ODMDS under a single SMMP. We are taking this step in order to minimize confusion for dredgers and permit writers, and because the site use conditions are virtually identical among the three sites.

3.1 Background

This SMMP for the three southern California ODMDS was developed with the advantage of having more than 25 years of agency experience managing ocean disposal sites. A wealth of management and monitoring data exists (see EPA 1992?, EPA 2005, Germano & Assoc. 2008, EPA 2010), and the streamlined nature of this plan reflects many of the lessons learned from past disposal projects and monitoring surveys at these and other ocean disposal sites. The main purpose of the management plan is to provide a structured framework to ensure that dredged

material disposal activities will not unreasonably degrade or endanger human health, welfare, the marine environment, or economic potentialities (MPRSA 103 § [a]). It is the next step in the continuum of effective resource management that starts with the site designation process.

Another key aspect of the SMMP is the inherent flexibility to accommodate unforeseen needs and the associated ability to revise the plan, if necessary, as changes arise or needs are identified in the future. While the basic management and monitoring plan has been structured based on experience to date with these and other disposal sites, there is always the possibility that an unanticipated event or problem will arise that will require accommodations to this current framework. To this end, the SMMP will be reviewed periodically by EPA Region IX and the USACE Los Angeles District to discuss potential problems or address concerns of other state and federal regulatory agencies or of the public regarding disposal activities.

3.2 Objectives

The main objectives for management of all the southern California ocean disposal sites (LA-2, LA-3, and LA-5) are the same as for any other open-water disposal site:

- Protection of the marine environment,
- Beneficial use of dredged material whenever practical, and
- Documentation of disposal activities at the ODMDS.

EPA and USACE Los Angeles District personnel will achieve these objectives by jointly administering the following activities:

- Regulation and administration of ocean disposal permits,
- Ensuring suitability of dredged material for ocean discharge, through pre-dredge sediment evaluation,
- Project-specific compliance tracking of disposal operations,
- Evaluation of permit compliance and monitoring results,
- Implementation of a site monitoring program, and
- Periodic review of this SMMP.

3.3 Site Management Roles & Responsibilities

While EPA and the USACE work in coordination on all ODMDS in U.S. waters, they also have separate authorities over these sites. The roles and responsibilities for managing the three southern California ODMDS are outlined in Table 2 below:

Table 2. Management Responsibilities

Site Management Task	Responsible Agency
ODMDS Site Designation	EPA Region IX
Disposal Project Evaluation & Permit Issuance	USACE Los Angeles District ¹ with EPA Region IX concurrence
Project-specific Compliance Tracking of Dredging and Disposal Operations	USACE Los Angeles District and EPA Region IX
Enforcement Actions for Violations Regarding Dredging Operations	USACE Los Angeles District (lead agency)
Enforcement Actions for Violations Regarding Disposal Operations	EPA Region IX
Disposal Site Monitoring	USACE Los Angeles District with periodic assistance from EPA Region IX
Pre-disposal sediment evaluation	USACE Los Angeles District and EPA Region IX

3.4 Funding

Funds for past disposal site monitoring have been provided by the USACE Los Angeles District and EPA. Funding for future site monitoring will be provided by the USACE and other users; EPA will provide periodic funding and/or EPA research vessel for site monitoring.

3.5 Quantity of Material and Type of Material Allowed

The LA-2, LA-3, and LA-5 sites are restricted to the disposal of suitable (clean) dredged material only. LA-2 is limited to an annual maximum disposal volume of 1,000,000 yd³, and LA-3 is limited to an annual maximum disposal volume of 2,500,000 yd³. The rulemaking that designated the LA-5 site did not establish an annual maximum disposal volume limit. However, the LA-5 site designation EIS evaluated the disposal of 700,000 yd³ per year and predicted no significant adverse environmental impacts at that level of disposal. Therefore under this SMMP, EPA is generally limiting disposal at LA-5 to an annual maximum disposal volume of 700,000 yd³. EPA and USACE may occasionally authorize greater volumes, but projects using the site under these circumstances may be subject to additional conditions including special operational or monitoring requirements.

Management decisions about the suitability of dredged material for ocean disposal are guided by criteria in the MPRSA and EPA's Ocean Dumping Regulations; guidance on specific aspects of these regulations is provided in *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters* (the "Ocean Testing Manual" or OTM; EPA/USACE 1991), or

¹ Issued by either the Planning/Operations or Regulatory Branch of the USACE Los Angeles District, as appropriate

subsequent national updates. EPA Region IX in coordination with USACE Los Angeles District may also develop additional regional guidance in the future for sediment testing which should be used in conjunction with the OTM.

Regulatory decisions about dredged material proposed for ocean disposal will be based on the following:

- Compliance with applicable criteria defined in the EPA's Ocean Dumping Regulations at 40 CFR Part 227.
- Requirements imposed on the permittee under the USACE Permitting Regulations at 33 CFR Parts 320-330 and 335-338.
- The potential for significant adverse environmental impacts at either LA-2 or LA-3 from disposal of the proposed dredged material.

Potential environmental impacts from dredged material disposal are considered significant when such impacts pose an unacceptable risk to the marine environment or human health. Determinations will be based on appropriate methods to evaluate differences between the proposed dredged material and reference site sediments for chemicals of concern, acute toxicity of the proposed dredged material, the magnitude of bioaccumulation, and potential ecological impacts. The main concerns are that disposal of sediments may cause: 1) significant mortality or bioaccumulation of contaminants within the disposal site or adjacent to the site boundaries and 2) adverse ecological changes to either the ODMDS or the surrounding ocean floor. Changes in the benthic community are expected, because different sediment-grain size and periodic disturbance will promote colonization of the site by different benthic species that may be on the surrounding bottom outside the site.

Management actions, involving the permit process or the disposal sites themselves are designed to reduce or mitigate any adverse environmental impact (see Section 5, Site Monitoring Plan). Management options for the permitting process include, but are not limited to: 1) full or partial approval of the dredged material proposed for ocean disposal, 2) prohibition of sediments proposed for ocean disposal, or 3) special management restrictions for ocean disposal of the suitable material (e.g., limits on disposal quantities, specification of frequency, timing, equipment, or disposal at designated areas within either ODMDS). Management actions for the disposal site following unfavorable monitoring results may include, but are not limited to: additional confirmatory monitoring to delineate the extent of the problem, capping to isolate the sediments from potential biological receptors, or closure of the site.

3.6 Anticipated Site Use Duration

The LA-2, LA-3, and LA-5 sites are designated as permanent ocean disposal sites. They are each in deep water (ranging from 110 – 450 meters, or 360 – 1,475 feet) where accumulation of dredged material is never anticipated to become a navigation hazard. Therefore, no specific closure date is planned for any of these sites at this time.

3.7 Site Management Plan Review and Revision

Because this SMMP has been developed after almost three decades of dredged material disposal at these three sites with no unreasonable or significant impacts to the marine environment, EPA and USACE feel confident that the important site management and monitoring requirements are known and addressed in this document. However, there is always the possibility for unanticipated problems or events, in which case modifications to the management or monitoring plan will be decided jointly with EPA Region IX and USACE Los Angeles District personnel.

Independent of any unforeseen or unanticipated problems with the management or monitoring of dredged material disposal at any of these sites, this plan will be reviewed (and revised if necessary) at 10-year intervals.

4.0 Disposal Site Use Conditions and Practices

All three southern California ODMDS have the same base, or generic, mandatory site use conditions. All users of any of the three disposal sites must comply with these conditions unless alternative conditions have been specifically approved in writing by EPA and USACE. In addition, EPA and USACE may apply additional, project-specific requirements for any project. It is the permittee's responsibility to ensure that all personnel involved in approved dredging and disposal operations, including contractors and subcontractors, are aware of and comply with all required site use conditions and practices.

A) *Mandatory conditions.* All permits or federal project authorizations for use of the LA-2, LA-3, or LA-5 ODMDS shall at a minimum include the following conditions, unless approval for an alternative permit condition is sought and granted pursuant to paragraph (C) of this section:

- 1) Dredged material shall not be leaked or spilled from disposal vessels during transit to the LA-2, LA-3, or LA-5 ODMDS. Transportation of dredged material to the approved ODMDS shall only be conducted when weather and sea state conditions will not interfere with safe transportation and will not create risk of spillage, leak, or other loss of dredged material during transit. No disposal vessel trips shall be initiated when the National Weather Service has issued a gale warning for local waters during the time period necessary to complete transportation and disposal operations.
- 2) Surface Disposal Zone (SDZ): When dredged material is discharged within the LA-2, LA-3, or LA-5 site, no portion of the vessel from which the materials are to be released (*e.g.*, hopper dredge or towed barge) shall be further than 1000 ft (305 m) from the center of the site designated in the permit. The center of the ODMDS (Table 2) is also the center of the SDZ for disposal.

- 3) No more than one disposal vessel may be present within SDZ of any disposal site at any time.
- 4) The primary disposal tracking system for recording ocean disposal operations data shall be disposal vessel- (e.g., scow-) based. An appropriate Global Positioning System (GPS) shall be used to indicate the position of the disposal vessel with a minimum accuracy of 10 feet during all transportation and disposal operations. This primary disposal tracking system must indicate and automatically record both the position, **and the fore and aft** draft of the disposal vessel at a maximum 1-minute interval while outside the disposal site boundary and at a maximum 15-second interval while inside the disposal site boundary. This system must also indicate and record the time and location of each disposal event (e.g., the discharge phase). Finally, the primary system must include a real-time display, located in the wheelhouse or elsewhere for the helmsman, of the position of the disposal vessel relative to the boundaries of the disposal site and its SDZ, superimposed on the appropriate National Ocean Survey (NOS) chart so that the operator can confirm proper position within the SDZ before discharging the dredged material.
- 5) Data recorded from the primary disposal tracking system must be posted by a third-party contractor on a real time basis to a World Wide Web (Internet) site accessible at a minimum by EPA Region IX, the Los Angeles District USACE, **the California Coastal Commission**, the permittee, the prime dredging contractor, and any independent inspector. The Web site must be searchable by date and by unique disposal trip number, and at a minimum for each disposal trip it must provide:
 - a visual display of the disposal vessel transit route to the disposal site;
 - a visual display of the disposal phase (including beginning and ending locations) for each disposal event;
 - the disposal vessel draft **and speed** throughout transit and for at least 15 minutes following completion of the disposal phase;
 - the estimated volume of material transported (bin volume, including sediment plus water); and
 - the name of the disposal vessel and tug as applicable.

The requirement for posting this information on the Web is independent from the hard-copy reporting requirements listed in Special Condition 9, below. The third-party system must also generate and distribute “e-mail alerts” regarding any degree of apparent disposal outside the SDZ of the disposal site, and regarding any apparent substantial leakage/spillage or other loss of material en route to the disposal site. Substantial leakage/spillage or other loss shall be defined as an apparent net loss of draft of one foot or more between the time that the disposal vessel begins the trip to the disposal site and the time of the beginning of actual disposal. E-mail alerts for any disposal trip must be sent within 24 hours of the end of that trip, at a minimum to EPA Region IX, the Los Angeles District USACE, **the California Coastal Commission** the permittee, and the prime-dredging contractor.

- 6) If the primary disposal tracking system fails during transit, the navigation system on the towing vessel (tug, if any), meeting the minimum accuracy requirement listed above, may be used to complete the disposal trip by maneuvering the towing vessel so that, given the compass heading and tow cable length to the scow (“lay back”), the estimated scow position would be within the SDZ (i.e., within 1,000 feet of the center of the disposal site). In such cases the towing vessel’s position, and the tow cable length and compass heading to the disposal vessel must be recorded and reported. Further disposal operations using a disposal vessel whose navigation tracking system fails must cease, until the primary disposal-tracking capabilities are restored.
- 7) The permittee shall complete an EPA- and USACE-approved Scow Certification Checklist that documents:
 - the amount of dredged material loaded into each barge or hopper for disposal;
 - the location from which the material in each barge was dredged;
 - the weather report and sea-state conditions anticipated during the transit period;
 - the time that each disposal vessel departs for, arrives at, and returns from the disposal site;
 - the exact coordinates and time of each disposal event; and
 - the volume of material disposed during each disposal trip.The permittee’s proposed Scow Certification Checklist must be approved prior to the commencement of any ocean disposal operations.
- 8) The permittee shall report any anticipated, potential, or actual variances from compliance with these Mandatory Conditions, and any additional project-specific Special Conditions, to EPA Region IX and the Los Angeles District USACE within 24 hours of discovering such a situation. An operational “e-mail alert” system, as described in Special Condition 5 above, will be considered as fulfilling this 24-hour notification requirement. In addition, the permittee shall prepare and submit a detailed report of any such compliance problems with the monthly hard-copy reports described in Special Condition 9 below.
- 9) The permittee shall compile, for each ocean disposal trip, hard copy reproductions of the Scow Certification Checklist and printouts of the automatically-recorded electronic data from the primary disposal tracking system described in Condition 5.. These daily records shall be provided in reports to both EPA Region IX and the Los Angeles District USACE at a minimum for each month during which ocean disposal operations occur. These reports shall also include the automatically recorded electronic navigation tracking and disposal vessel draft data on CD-ROM (or other media approved by EPA and USACE). The reports shall also include a cover letter describing any problems complying with these Ocean Disposal Special Conditions, the cause(s) of the problems, any steps taken to rectify the problems, and whether the problems occurred on subsequent disposal trips.

10) Following the completion of ocean disposal operations, the permittee shall submit to EPA Region IX and the Los Angeles District USACE a completion letter summarizing the total number of disposal trips and the overall (*in-situ*) volume of material disposed of at LA-2, LA-3, or LA-5 for the project, and whether any of this dredged material was excavated from outside the areas authorized for ocean disposal or was dredged deeper than authorized by the permit.

B) *Project-specific conditions.* Permits or federal project authorizations authorizing use of the LA-2, LA-3, or LA-5 disposal sites may include additional conditions, if EPA or the USACE determines these conditions are necessary to facilitate safe use of the site(s), the prevention of potential harm to the environment, or accurate monitoring of site use. These can include any conditions that EPA or USACE determine to be necessary or appropriate to facilitate compliance with the requirements of the MPRSA, such as timing of operations or methods of transportation and disposal.

C) *Alternative permit/project conditions.* Alternatives to the permit conditions specified in this section and/or in a permit or federal project authorization may be proposed by the permittee. Such conditions may be authorized if the permittee demonstrates to the District Engineer and the Regional Administrator that the alternative conditions are sufficient to accomplish the specific intended purpose of the permit condition(s) in issue and further demonstrates that the waiver will not increase the risk of harm to the environment, the health or safety of persons, nor will impede monitoring of compliance with the MPRSA, regulations promulgated under the MPRSA, or any permit or authorization issued under the MPRSA.

5.0 Site Monitoring Plan

Site monitoring is a requirement for use of both the LA-2 and LA-3 disposal sites; disposal operations will be prohibited if resources for implementing the SMMP are not available. **Routine monitoring surveys (described below) at either site will occur at least every 5 years or more frequently as determined by EPA.** The primary purpose of the environmental monitoring plan is to verify the predictions in the FEIS of site conditions following disposal. Simply stated, these predictions are that: a) only acceptable dredged material is disposed at the site, b) no substantial amounts of dredged material will go outside the site, c) no substantial amount of bioaccumulation is occurring inside the site, and d) no adverse effects are occurring to biological resources outside the site. A summary of how these predictions are addressed in the tiered site monitoring plan (described in detail in the sections to follow) is presented in Table 3. Dredged material that is suitable for ocean disposal under the 1991 Green Book guidelines is expected to cause acceptable impacts within the disposal site. These include burial of any onsite benthic communities and potentially some chronic, sub-lethal biological effects to any onsite fauna from associated chemicals of concern in the disposed sediments. Partial recolonization will occur within the site, but full recovery of the benthic community the designated boundary of LA-2 or

LA-3 is not expected during active use of either site, because continued disposal operations will tend to bury any recolonizing fauna. Full recolonization of the site with no long-term associated environmental impact would be expected if either site is ever closed in the future and disposal is discontinued.

Table 3
A Summary of the Tiered Disposal Site Monitoring Design

Tier Level	Predictions Tested Within Tier				Trigger Level to Initiate Next Tier or Management Action
	a. Only Acceptable Material Inside	b. No Material Outside	c. No Bioaccumulation Inside	d. No Outside Adverse Effects	
1	✓	✓	(by default)	(by default)	Sediment chemistry elevated above disposal or historical values, or material outside site
2			✓	✓	Material fails bioeffects testing, or anomalous recolonization pattern outside site
3				✓	Management action to be determined by regulatory agencies

Two types of monitoring will be carried out at the LA2/LA3 disposal sites: routine compliance monitoring as part of ongoing disposal projects, and periodic tiered disposal site monitoring (Figure 1). The routine project compliance monitoring that provides the necessary feedback for on-going disposal site management are those tasks outlined in Section 2.3 above that are carried out by the permittee. Compliance monitoring results consist of completed post-cruise scow log sheets, inspection reports, records of transport and disposal activities, etc., as specified in each issued permit. If any of these reports show serious discrepancies (e.g., known permit violations for disposal scow conditions, awareness of misplaced dredged material as a result of permittee disposal reports), the resulting management actions can include fines or additional monitoring activities carried out by the permittee at the disposal site as specified by either USACE Los Angeles District or EPA Region IX.

The periodic disposal site tiered disposal site monitoring consists of a hierarchical series of sampling tasks that will provide a comprehensive assessment of current conditions at each site to be compared against baseline conditions. Baseline conditions at both sites are documented in EPA Region IX's FEIS for the LA-3 site designation action, and this document summarizes all the data from the multiple previous surveys performed at these two sites. These documents will be used, along with reference data, to evaluate future changes to each site. In addition, all sediment testing results for dredged material characterization projects will be entered into the regional sediment quality database being assembled by the Los Angeles Contaminated Sediment

Task Force (CSTF; see <http://www.coastal.ca.gov/web/sediment/sdindex.html> and www.sccwrp.org) for comparison with results from sediment grabs at the disposal site as part of compliance monitoring.

As part of the tiered site monitoring program described in this section, EPA Region IX and USACE Los Angeles District will determine if there are any detectable significant impacts to the following areas, based on monitoring physical, chemical, and biological parameters:

Inside the ODMDS boundary

Over an area adjacent to the ODMDS boundary if monitoring shows that significant accumulations of dredged material (> 15 cm [5.9 inches]) are outside the site boundary or that adverse bioeffects are occurring inside the site. [NOTE: This is an extremely conservative trigger level that will have little or no adverse effects on the benthic infauna; details to follow in Section 3.1.1 below].

The monitoring plan includes the on-going compliance monitoring as well as two interdependent lines of monitoring: a Physical/Biological monitoring module and a Chemical/Bioeffects monitoring module (Figure 1). Each type of monitoring is “tiered” to insure that information is collected in a cost-effective manner and limited resources are not wasted. This program facilitates monitoring of both short-term (dredged material is largely confined within site boundaries as modeling studies predict; see Chapter 4 of FEIS) and long-term (recolonization and bioeffects testing) conditions, enabling both EPA Region IX and the USACE Los Angeles

Figure1B&W

District to make management decisions in a timely manner should potential unacceptable impacts be discovered. The physical, biological, and chemical monitoring also will help these agencies verify whether disposal operations are being carried out in compliance with permit requirements and environmental regulations.

A wide variety of past studies at both sites have shown that water column effects are transient and impacts to most components of the biological environment (plankton, epifauna, fish, birds, mammals, threatened or endangered species) and socioeconomic environment (commercial/recreational fisheries, shipping, military usage, oil and natural gas development) are rated as a Class III impact (adverse but insignificant or no anticipated impacts; no mitigation measures are necessary; see Chapter 4 of FEIS). Long-term dredged material monitoring programs on the east-coast (Disposal Area Monitoring System, or DAMOS, run by the USACE New England District since 1979) and west coast (Puget Sound Dredged Disposal Analysis, PSDDA, run by the USACE Seattle District since 1986; SF-DODS monitoring, run by the USACE San Francisco District since 1996 and periodic monitoring conducted by EPA Region IX) have demonstrated that monitoring resources are better allocated toward measuring impacts that are not transient, i.e. persist on time scales that are greater than those occurring in the range of hours to days. As such, the planned sampling efforts for both the LA-2 and LA-3 sites are focused on the seafloor and fulfill the needs for both compliance sampling (Tier 1) and impact assessment (Tiers 2 and 3).

Readers will note that all 3 tiers of the Physical/Biological Module will be carried out during the same initial monitoring cruise on which the sediments for the Tier 1 on-site chemistry are collected for the Chemical/Bioeffects Module. Sufficient sediment for potential Tier 2 activities under the Chemical/Bioeffects Module should be collected during the initial cruise in the event that bulk chemistry analyses reveals the need for acute or chronic bioeffects testing. Only Tier 3 activities under the Chemical/Bioeffects Module would potentially require an additional monitoring cruise to the disposal site unless sufficient sediment for Tier 2 activities is not collected during the initial cruise or if sediment holding times are violated by the time that the Tier 2 bioassay/bioaccumulation tests are scheduled to begin.

3.1 Physical/Biological Module

The monitoring for physical/biological processes is focused on the potential transport of dredged material out of the site boundaries following disposal and the recolonization of dredged material by benthic infauna. A site-specific numerical model was run for predictions of transport and fate of dredged material disposed at both LA-2 and LA-3 (CE, 2004; see Chapter 4, FEIS for summary of results), and no substantial accumulations are expected outside the site boundary; the physical portion of the module focuses on mapping and tracking the dredged material deposit on the seafloor to verify the predictions of the numerical model. If material is found outside the

site in accumulations thicker than expected, biological monitoring will be performed to document that infaunal recolonization is proceeding as expected.

3.1.1 Tier 1 Physical Monitoring

Tier 1 Physical Monitoring shall primarily consist of a sediment vertical profiling system (SVPS) survey of transects radiating out from the disposal site boundary to map any dredged material outside the site boundary. Also, periodic high-resolution multibeam surveys will be performed when the equipment is available to map the topography and distribution of dredged material deposits within the disposal site boundaries. Such a survey will be performed using a multibeam system with similar frequency and beam width as the baseline surveys (Gardner 2000) so that data can be overlain and "depth difference" maps produced to show the spatial extent and thickness of the disposed dredged material within the site.

Physical monitoring activities, including field measurement and data analysis, focus on the question: Is a substantial (> 15 cm [5.9 inches]) accumulation of dredged material occurring outside of the disposal site boundaries?

A series of radial transects starting at the edge of the site and continuing out 500 meters beyond the edge of the detectable dredged material layer will be sampled with SVPS technology. SVPS stations will be placed at 200–500 m (655–1640 ft) intervals along the transects or at appropriate spacing so that any area outside the site boundary with dredged material has at least 3–5 stations located on the dredged material. The SVPS system must be equipped with a digital camera to allow on-board evaluation of results (necessary for assessing the adequacy of station locations for mapping the dredged material and for Tier 2 activities; see below).

The SMMP is designed to ensure that significant deposits of dredged material do not consistently occur or extend beyond the site boundaries. A substantial deposit is defined as 15 cm (5.9 inches) or more since the last monitoring event (thicker deposits are expected to occur and are acceptable within the site boundaries). Physical mapping of the dredged material footprint on the seafloor will be conducted at periodic intervals in order to confirm that management guidelines for disposal operations are operating within expected criteria and the predictions from the numerical models are correct.

Although the 30 cm (12 inches) depositional interval is used as a conservative impact threshold for computer modeling purposes (see Chapter 4 of the FEIS, Figures 4.2-1, 4.2-2, 4.3-1, 4.4-1, and 4.4-2), the 15-cm (5.9-inch) depositional interval of dredged material outside the site boundary has been selected as a trigger level to proceed to Tier 2 for a number of reasons:

The maximum depositional interval that can be detected by the SVPS equipment is 20 cm (7.9 inches), but the camera settings are usually adjusted so that actual prism penetration is somewhat

less than that (12–19 cm; 4.7–7.5 inches) in order to capture details at the sediment-water interface.

Impacts to infauna from deposition of dredged material can range from negligible to total mortality, depending on the type of material and rate of deposition (a 50-cm [19.7-inch] layer deposited at the rate of 1 cm (0.4 inch) per week over the course of a year would have little detectable impact as compared with a 50-cm [19.7-inch] layer that occurred at a location in one depositional event). Estimates of depositional intervals through which native infauna can re-establish themselves range from 5 cm (2 inches) to 85 cm (33.5 inches) (Kranz, 1974; Nichols et al., 1978; Maurer et al., 1980, 1986).

Repeated monitoring at the LA-2 and LA-3 sites (see FEIS) as well as at other open-water dredged material sites off all coasts of the USA (e.g., Rhoads and Germano, 1986; Germano et al., 1994; Hall, 1994; Newell et al., 1998) have shown that even in dredged material deposits exceeding a meter or more (where one can safely assume that all resident infauna were smothered and killed), benthic recolonization and community succession will occur with full ecosystem recovery over time, so any impact to the benthic community from deposition of dredged material that has passed testing criteria as acceptable for open-water disposal will be temporary. Using 15 cm (5.9 inches) as trigger level is an extremely conservative value; while this will most likely have little, if any, adverse effects on the benthic infauna, it will be a good verification check for the disposal model's predicted footprint of dredged material on the seafloor.

During the years when the optional physical monitoring (multibeam survey) is performed, it should be done as the first phase of Tier 1 sampling before any further Tier 1 monitoring (SVPS and sediment grabs/box cores). This phased approach will not cause any increase in costs; while some post-cruise time to process the multibeam data and perform the depth-difference analysis would be needed regardless, these two types of surveys would typically be done on two different cruises (or vessels) either to maximize efficiency in ship equipment configuration or personnel utilization. The depth difference results from the multibeam survey would provide useful ancillary information to show areas a) where dredged material has gone outside the boundary to help direct the transects for SVPS sampling and b) where the dredged material accumulations are within the site boundary in order to confirm the location of sediment sampling stations. Note that the depth resolution of the currently-available multibeam equipment is 30 cm (11.8 inches), so any detected depositional layers less than this thickness are most likely sampling artifacts.

3.1.2 Tier 2 Physical/Biological Monitoring

Tier 2 Physical monitoring will consist of an on-board evaluation by trained personnel in SVPS image interpretation to determine if benthic recolonization is occurring as predicted to verify that the sediment outside the site is not causing an adverse impact; a

subsequent detailed image analysis will be performed back in the laboratory, but the on-board evaluation will determine if Tier 3 sediment sampling is required.

Having some dredged material beyond the site boundary is not considered an adverse impact unless the sediment quality is compromised to the point where it is impairing biological recovery; as such, the assessment of infaunal successional status serves as a surrogate for an *in-situ* bioassay of sorts. Using infaunal successional status as determined from sediment profile image interpretation as an indication of dredged material disposal impact has been a successful monitoring strategy for dredged material disposal under the DAMOS program for over two decades; this streamlined approach has been cited by the National Research Council as one that “has successfully addressed most important questions related to dredged material disposal” (NRC, 1990). Experienced scientists can readily assess benthic recolonization from determining the successional stage of the infaunal community based on the information in sediment profile images (Rhoads and Germano, 1982, 1986). The images will be downloaded from the camera after the stations have been sampled and the infaunal successional status of each location determined.

Numerous studies have shown that organism-sediment interactions in fine-grained sediments follow a predictable sequence after a major seafloor perturbation. This theory states that primary succession results in “the predictable appearance of macrobenthic invertebrates belonging to specific functional types following a benthic disturbance. These invertebrates interact with sediment in specific ways. Because functional types are the biological units of interest..., our definition does not demand a sequential appearance of particular invertebrate species or genera” (Rhoads and Boyer 1982). This theory is presented in Pearson and Rosenberg (1978) and further developed in Rhoads and Germano (1982) and Rhoads and Boyer (1982).

This continuum of change in animal communities after a disturbance (primary succession) has been divided subjectively into three stages: Stage I is the initial community of tiny, densely populated polychaete assemblages; Stage II is the start of the transition to head-down deposit feeders; and Stage III is the mature, equilibrium community of deep-dwelling, head-down deposit feeders (Figure 2).

After an area of bottom is disturbed by natural or anthropogenic events, the first invertebrate assemblage (Stage I) appears within days after the disturbance. Stage I consists of assemblages of tiny tube-dwelling marine polychaetes that reach population densities of 10^4 to 10^6 individuals per m^2 . These animals feed at or near the sediment-water interface and physically stabilize or bind the sediment surface by producing a mucous “glue” that they use to build their tubes.

If there are no repeated disturbances to the newly colonized area, these initial tube-dwelling suspension or surface-deposit feeding taxa are followed by burrowing, head-down deposit-feeders that rework the sediment deeper and deeper over time and mix oxygen from the overlying water into the sediment. Stage II is the beginning of the transition to burrowing, head-

down deposit feeders that rework the sediment deeper with time and mix oxygen from the overlying

Figure 2B&W

water into the sediment. Stage II animals may include tubicolous amphipods, polychaetes, and mollusks. These animals are larger and have lower population densities than Stage I animals.

Stage III is the mature and stable community of deep-dwelling, head-down deposit feeders. In contrast to Stage I organisms, these animals rework the sediments to depths of 3 to 20 cm or more, loosening the sedimentary fabric and increasing the water content of the sediment. They also actively recycle nutrients because of the high exchange rate with the overlying water resulting from their burrowing and feeding activities. The presence of Stage III taxa can be a good indication that the sediment surrounding these organisms has not been severely disturbed recently. Because Stage III species tend to have relatively low rates of recruitment and ontogenetic growth, they may not reappear for several years once they are excluded from an area. These inferences are based on past work, primarily in temperate latitudes, showing that Stage III species are relatively intolerant to physical disturbance, organic enrichment, and chemical contamination of sediments. Population densities are low (10 to 10^2 individuals per m^2) compared to Stage I.

We would predict that by the time monitoring takes place, the benthic community should be in at least a transitional Stage I going to Stage II community or later. The surface oxidized layer of sediment would be at least 1–1.5 cm thick, and the subsurface sediments would not show signs of organic enrichment. If the sediment profile images reveal locations with low reflectance subsurface sediments or oxidized surface layers less than 0.3 cm (0.1 inches) thick with little to no evidence of infaunal activity, then Tier 3 sampling will be initiated.

3.1.3 Tier 3 Physical/Biological Monitoring

Tier 3 Monitoring will be a chemical evaluation of the offsite dredged material layer and will consist of taking a minimum of 5 sediment samples in those areas determined from the SVPS image analysis to have impaired benthic recolonization. Samples will be appropriately stored and returned to an on-shore laboratory for chemical analysis and will follow the same evaluation hierarchy as detailed for onsite sediments starting in Tier 1 of the Chemical/Bioeffects Module (see Figure 1).

If the results from the Tier 2 analysis of the SVPS images show impaired recolonization and there is knowledge that the sediments from the area of concern have not been placed at the site very recently (within the past week), then there is a chance that these sediments may have chemical concentrations that are preventing successful recruitment and reestablishment of the benthic community. In order to determine whether or not the delay in benthic recolonization/recovery is due to chemical vs. physical (disposal, trawling, etc.) or biological (competition, predation) disturbance, at least five sediment grab samples will be taken in the area of concern for bulk sediment chemistry analysis. The evaluation pathway will be the same as the one followed for on-site sediments (see next section).

3.2 Chemical/Bioeffects Module

Chemical/bioeffects monitoring focuses on the effects of dredged material deposition on the chemical characteristics of sediments within (and potentially adjacent to) the LA-2 or LA-3 disposal sites and potential effects of biological uptake of contaminants associated with the sediments. Routine monitoring of selected chemical constituents will be performed as part of compliance monitoring (to insure that adequate sediment characterization has been accomplished through the permitting process) and also as a conservative measure to evaluate the long-term potential for acute and chronic bioeffects from sediment contaminants. Two key components of evaluating the results from this module will be the Ocean Disposal Database maintained by the USACE Los Angeles District as well as the CSTF Sediment Quality Database; there will be a wealth of historical information in the latter database, not only on historical data collected from the site, but also on the chemical concentrations of sediments approved for disposal from the dredged material permitting process. As such, it will be important for both the USACE Los Angeles District or EPA Region IX to maintain the database and keep the information current so that comparisons with bulk sediment chemistry results from disposal site sampling will be accurate and reflect the most current information.

Sediments with highly elevated or toxic concentrations of chemical contaminants should not be disposed of at either the LA-2 or LA-3 sites; extensive pre-disposal testing and evaluation is used to identify sediments that meet the stringent ocean disposal criteria (EPA/USACE 1991). This sediment testing required as part of the permit processing should identify and exclude from ocean disposal any sediments that are toxic or pose an unacceptable risk of bioaccumulation to the marine environment. However, the SMMP recognizes that occasionally some small volumes of unsuitable material may be missed in the pre-dredging characterization studies, or that unintentional disposal of some excluded material could potentially occur in rare occasions. Direct chemical monitoring of the deposited sediments within the disposal site will accurately reflect the concentrations of material available to biological receptors as a back-up verification/validation of the permit characterization process. This ensures that decisions about the need for Management Action as described in Section 4 are based on more accurate knowledge about actual site conditions.

3.2.1 Tier 1 Onsite Chemical Monitoring

Tier 1 chemical monitoring shall consist of collecting, processing, and storing grab samples of surface sediments from at least 10 stations randomly located on the dredged material deposit (as determined from disposal location records, multibeam, or SVPS results) that will be analyzed for chemicals of concern and evaluated against known historical sediment chemistry values from both past disposal site surveys and dredged material characterization studies.

Tier 1 chemical monitoring is designed to address the following question: Do concentrations of chemicals of concern in dredged material actually deposited at either LA-2 or LA-3 significantly exceed the range of concentrations in the dredged material either already at the site or pre-approved by the EPA and USACE for disposal at the site?

Sediment samples will be collected at a minimum of 10 stations and analyzed for grain-size properties, total organic carbon (TOC), and, at a minimum, the suite of trace metals, chlorinated pesticides, polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH), and other organic compounds/classes listed as part of the regional guidance for dredged material permit characterization. Compound- and metal-specific detection limits and other quality control requirements must be consistent with this regional guidance. Additional analytes may be added if information from bulk chemical characterizations of the material approved for disposal at LA-2 or LA-3 indicates a potential for cumulative effects in the disposal site sediments.

The top 10 cm (3.9 inches) of surface sediments will be removed from an acceptable grab or box core for chemical analysis. An acceptable grab or box core is one where:

- the sampler is not overfilled, which could be indicative of sample loss;
- overlying water is present indicating sample integrity;
- the sediment surface appears to be relatively undisturbed; and
- the desired sample depth has been achieved (ideally, at least 1 or 2 cm [0.4 – 0.8 inches] should remain at the bottom of the sampler after the upper layer has been subsampled).

If sample acceptability criteria are met, overlying water will be carefully siphoned off (if the water is turbid, it could be allowed to settle out for a short period). In order to remove sediments from the grab or box core for chemical analyses, a sample aliquot will be collected to the appropriate sediment depth (10 cm; 3.9 inches) and placed either in the appropriate sample jar or in a mixing container, such as a stainless steel bowl. It is recommended that sample aliquots be collected from the grab or box core with stainless steel utensils such as spoons, spatulas, or flat-bottomed hand trowels, although Teflon implements may be substituted. Sufficient sediment shall be collected for immediate post-cruise bulk chemical analyses as well as enough for potential bioassay/bioaccumulation tests, should they need to be performed later. This would also require collecting and archiving sediment from the site reference stations for later bioassay/bioaccumulation tests, should they need to be run.

Trigger levels that would initiate proceeding to Tier 2 evaluations (requiring testing of the remaining archived sediment from the initial cruise) would not be determined by comparing disposal site sediment chemistry results to reference site results (we would expect these to be different), but rather to existing site historical concentrations and concentrations of sediments permitted to go to the site. This would be done by multiple comparisons of site monitoring results to the recent (since the last monitoring event) pre-disposal testing concentration ranges (approved for ocean disposal) as well as a tolerance interval based on historical data. The

tolerance interval would be constructed on the historical data to contain at least 80 percent of the population of background (historical) data with 95-percent confidence. The exact distribution of the historical data is unknown, so the tolerance interval is a random interval; that is, the tolerance bounds are random variables computed from the sample statistics derived from the observed historical data. A beta-content upper tolerance bound with 80-percent coverage and 95-percent confidence indicates that we have 95-percent confidence that 80 percent of the population will be less than the tolerance bound. If any of the disposal site samples exceed both the pre-disposal concentration ranges and this tolerance bound, we conclude that they are different from the historical population and warrant further investigation, as described in Tier 2 or Tier 3 monitoring. If concentrations are not elevated compared to these ranges, then no further chemical/bioeffects monitoring or Management Action is required. Because trigger levels will be derived from measurements taken for specific projects that have disposed material at either ODMDS up to the time of the monitoring event, these values (trigger levels) are expected to change on a year-to-year basis. Consequently, a table of specific trigger levels is not provided in this SMMP; the site monitoring reports, published separately, will report the trigger levels used for comparison during the period being covered.

3.2.2 Tier 2 Onsite Chemical/Bioeffects Monitoring

Tier 2 Chemical/Bioeffects monitoring shall consist of first evaluating the elevated chemical concentrations to see if they represent bioaccumulative compounds of concern (BCOCs). If BCOCs exceed pre-disposal testing concentration ranges, then sediments from both the dredged material layer as well as the ODMDS reference station(s) will be evaluated with bioaccumulation tests; if they do not, then sediments from both the dredged material layer as well as the ODMDS reference station(s) will be evaluated with acute toxicity testing.

Tier 2 chemical/bioeffects monitoring addresses the following question: Do the elevated chemical concentrations represent bioavailable contaminants that will adversely affect the marine environment?

Sediments collected during the Tier 1 activities should be stored at 4° C for up to 6 weeks in the event that acute or chronic bioeffects testing needs to be performed. If sufficient sediment for bioassay/bioaccumulation testing is not collected during the initial survey cruise or if there is a chance that holding times will be violated because of delays in laboratory scheduling for the Tier 1 analyses, then it will be necessary for EPA Region IX as part of their management strategy to shift the target of any ongoing disposal operations to another location within the site boundary so that that sediments characterized during Tier 1 are still available for Tier 2 evaluation and not covered by new material being placed at the site. Sufficient sediments would then have to be collected at areas of concern and the reference station(s) for either bioassay or bioaccumulation testing according to regional guidance and Green Book protocols.

If BCOCs are not present at elevated concentrations and the sediments pass the bioassay tests, while no Management Actions are required, a review of the management implications, *e.g.*, dredged material characterization permitting procedures or tolerance intervals of the historical database for Tier 1 evaluations, will be warranted given the desire to reduce the number of false positive triggers in future monitoring events. If the sediments fail the bioassay tests, then EPA Region IX and USACE Los Angeles District personnel will either require Tier 3 additional offsite investigations or need to implement the appropriate Management Actions (Section 4).

If BCOCs are present at elevated concentrations, either the remaining archived sediment from the initial Tier1 survey or newly collected sediments will be subjected to bioaccumulation testing according to regional guidance and Green Book protocols. If the sediments fail the bioaccumulation tests, then EPA Region IX and USACE Los Angeles District personnel will either require Tier 3 additional offsite investigations or need to implement the appropriate Management Actions (Section 4).

3.2.3 Tier 3 Offsite Monitoring

Tier 3 offsite monitoring and/or management activities shall be determined by EPA Region IX and USACE Los Angeles District personnel based on which results caused initiation of this level of activity.

Tier 3 offsite monitoring addresses the following question: Do the adverse effects discovered within the disposal site affect any resources of concern outside the site?

Depending on the nature and extent of the adverse effects detected within the site, additional sampling outside the disposal site may or may not be required. For example, if sediments from just one or a few of the 10 locations sampled during Tier 1 activities showed adverse biological effects, regulatory personnel may determine that a management action such as directing future disposal activities to the area of concern would alleviate the problem by covering the affected sediment with a new layer of dredged material and effectively removing the source of exposure for any biological receptors. However, the concern for adverse impacts to biological resources may extend outside the site to either benthic invertebrates or higher trophic levels, and additional sampling activities may be required, such as:

collection of benthic invertebrates outside the site to determine, if they have elevated tissue concentrations of contaminants of concern compared to organisms found at reference areas;
collection of demersal fish species in the vicinity of the disposal site to determine, if they have elevated tissue concentrations of contaminants of concern;
grabs or box cores for detailed benthic community analyses to determine, if there are population-level impacts from elevated chemical concentrations (Gray, 1979; Ferraro and Cole, 1997; Oug et al., 1998; Stark, 1998; Trannuma et al., 2004); and

additional SVPS sampling to determine the nature and extent of gradients in sediment oxygen demand, organic loading, sediment type, or benthic population structure.

The precise design of the sampling program, including the location of organism collection sites, would be determined by the area of potential impact as defined in the monitoring tasks which led to this tier as well as the distribution of the dredged material footprint as determined by the Physical Monitoring module.

4.0 Management Actions

As shown in Figure 1, the results of any monitoring task that drop down to Tier 2 or 3 cause either a review of management implications or a management action. The review of management implications (triggered by either disposed material outside the site boundary in excess of 15 cm [5.9 inches] or bulk sediment chemistry values greater than pre-disposal test concentration ranges or the tolerance interval calculated from the historical data base) could mean one or more of the following problems exist:

Control of disposal operations is not occurring as planned;

Numerical modeling predictions are inaccurate (site boundary may be too small);

Inadequate characterization of dredged material during the permitting process (material is either more heterogeneous than anticipated or sampling density for characterizing a specified volume is too low);

The tolerance envelope calculated from the historical data is too narrow and needs to be expanded; or

The tolerance envelope needs to be recalculated with different weighting factors applied to historical sampling data from the disposal site vs. permit characterization data (the two sources of data are not equivalent with respect to characterizing the mean and variability of contaminant concentrations on the disposal mound).

Depending on which path leads to the “Review Management Implications” box in Figure 1, further investigations would identify which of the above problems is most likely the cause of the false positive trigger and allow correction once EPA Region IX and USACE Los Angeles District personnel concur on the proper remedy and adjustment to the management plan. However, each agency is free to operate solely under its own authority as outlined in Table 1.

If, however, it is determined that the potential for risk to human health or the marine environment exists because of bioavailable contaminants being placed at the site, the potential management actions include any or all of the following actions:

Review and revise the sediment characterization process as part of permit activity;

Suspend or modify any further use of the site while the cause of the problem is being identified;

Cap the affected area with a sufficient volume of clean sediments to ensure the bioavailable contaminants are permanently isolated from any biological receptors;

Identify additional monitoring tasks that must be performed to better identify or delineate the source of the problem; and

Permanently terminate use of the site, if this is the only means for eliminating the adverse environmental impacts

In general, any management action would be initiated only after consensus has been reached between EPA Region IX and USACE Los Angeles District. EPA and the USACE still retain their respective authority over the disposal site and dredging site, and may exercise their independent authority (i.e., enforcement) if appropriate and necessary for environmental protection in either area. Any changes to the SMMP will be published by EPA.

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