SITE MANAGEMENT AND MONITORING PLAN (SMMP) FOR HUMBOLDT BAY (HOODS) OCEAN DREDGED MATERIAL DISPOSAL SITE

I. INTRODUCTION

The Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972 (33 USC Section 1401 et seq.) is the primary legislative authority regulating the disposal of dredged material into ocean waters. The MPRSA prohibits disposal activities that would unreasonably degrade or endanger human health or the marine environment. Under the act, the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) have joint authority for regulating ocean disposal of dredged material and for managing ocean disposal sites. Management of an ocean disposal site consists of: (a) regulating the quantities, types of material, times, rates, and methods of disposing dredged material at an ocean disposal site; (b) development and maintenance of an effective monitoring program for the site; (c) recommending changes to site use, disposal amounts, or designation for a limited time based on periodic evaluation of site monitoring results; and (d) enforcement of permit conditions.

Section 506 of the Water Resources Development Act (WRDA) amends Section 102(c) of the MPRSA. These amendments require, in part, that a site management plan be developed for each designated ocean disposal site. This site management plan is required to include:

- a baseline assessment of conditions at the site;
- a program for monitoring the site;
- special management practices necessary for protection of the site;
- consideration of the quantity and contaminant levels of material to be disposed at the site;
- consideration of the active life of the site and management requirements after site closure; and
- a schedule for review and revision of the site management plan.

Section 506 of the WRDA further requires that, after January 1, 1995, a site management plan must be developed and approved before final designation is issued. After January 1, 1997, no permit for dumping may be issued under Section 103 of the MPRSA for a site unless the site has received final designation.

In the case of this proposed action, the final designation is scheduled for fall 1995. Thus, a site management plan is required to be developed and approved, pursuant to the WRDA, before the final designation may be issued.

Two key parts of an effective management plan are the flexibility to accommodate unforeseen needs, and the ability to revise the plan as changes are identified. The primary goal of site management is to ensure adequate environmental protection and regulatory compliance. To this end, the SMMP (see Exhibit A) for the ocean dredged material disposal site (ODMDS) off Humboldt Bay (HOODS) will be reviewed periodically by EPA Region IX and the Corps' San Francisco District. Agency representatives will meet to review site operations, to discuss potential problems with the condition at the HOODS or monitoring activities, and to address public concerns about disposal at the HOODS. Any changes must meet the approval of both agencies. Resolution of management and monitoring issues and public concerns will be worked out cooperatively.

A. Purpose of the SMMP

The SMMP for the HOODS has been developed jointly by EPA Region IX and the Corps' San Francisco District. It is designed to identify possible unacceptable adverse environmental impacts that may occur beyond the site boundary, and to ensure that disposal operations comply with established permit conditions. This document provides guidance to EPA Region IX and the Corps' San Francisco District staff on available management options and the proper times when management decisions may be required.

The HOODS is located in water depths between 49 and 55 meters (160 and 180 feet) and is positioned within the coordinates 40° 48 25N, 124° 16 22W; 40°49'3"N, 124°17'22"W; 40°47'38"N, 124°17'22"W; 40°48'17" N, 124°18'12"W (Figure 1). The site is one square nautical mile (nm^2; 850 acres) in area and is divided into 4 quadrants (1-4), each containing 9 cells (Figure 2). Management decisions must reflect local characteristics of the disposal site such as: (1) geographic location; (b) oceanographic conditions; (c) physical, chemical, and biological characteristics and composition of the proposed dredged material; and (d) adjacent amenities and resources that might be adversely affected by disposal operations.

As an integral part of the SMMP, a site monitoring program has been designed for the HOODS to provide necessary data for site management. These data will address potential and actual impacts to the marine environment and biological resources at the HOODS or in areas adjacent to the site boundaries. The program design facilitates monitoring of both short-term and long-term impacts, enabling EPA Region IX and the Corps' San Francisco District to make management decisions in a timely manner should potential or actual unacceptable adverse impacts be detected. Specific portions of the SMMP will also help EPA Region IX and Corps' San Francisco District staff to verify whether disposal operations are carried out in compliance with permitting requirements and other environmental laws.

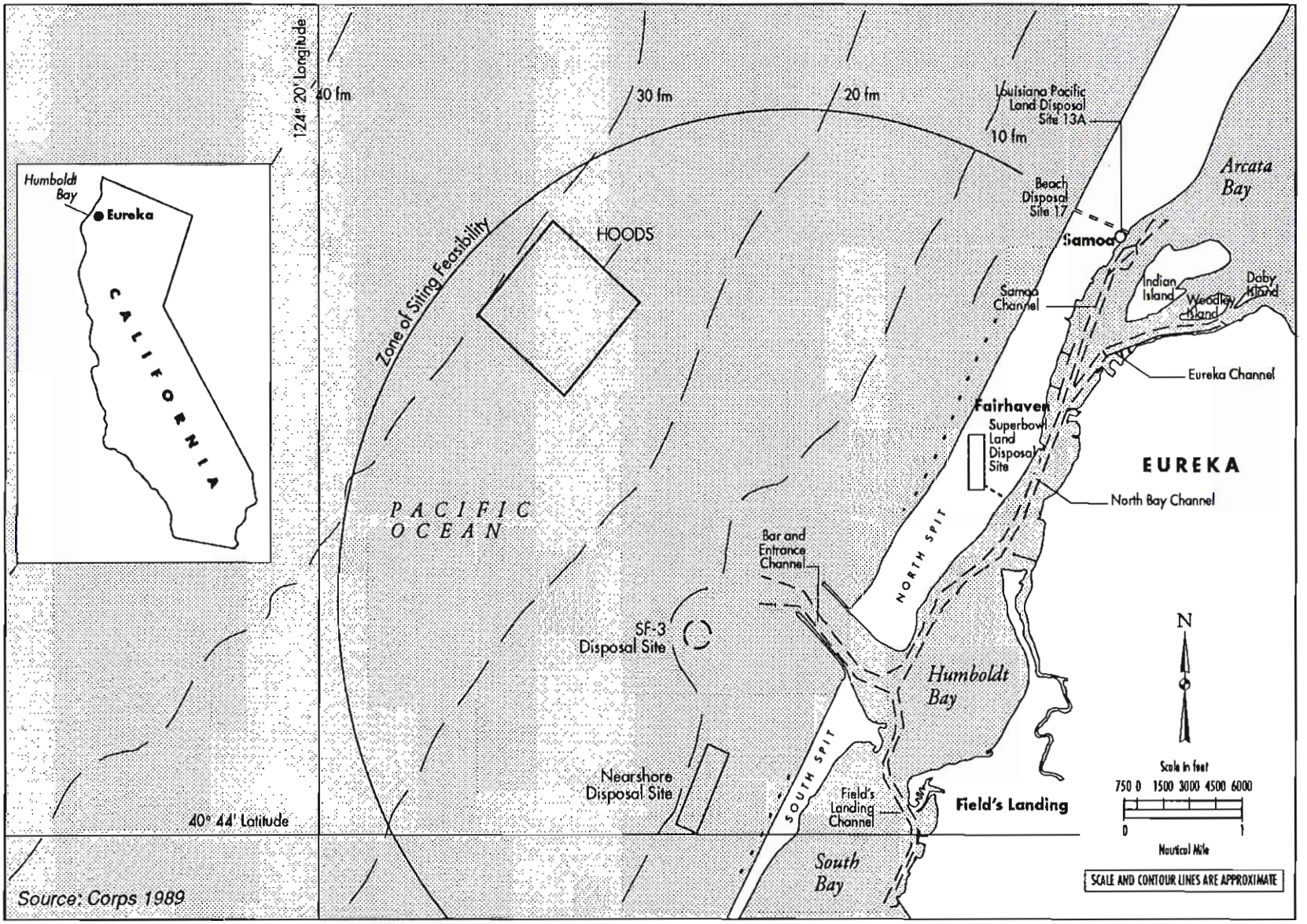
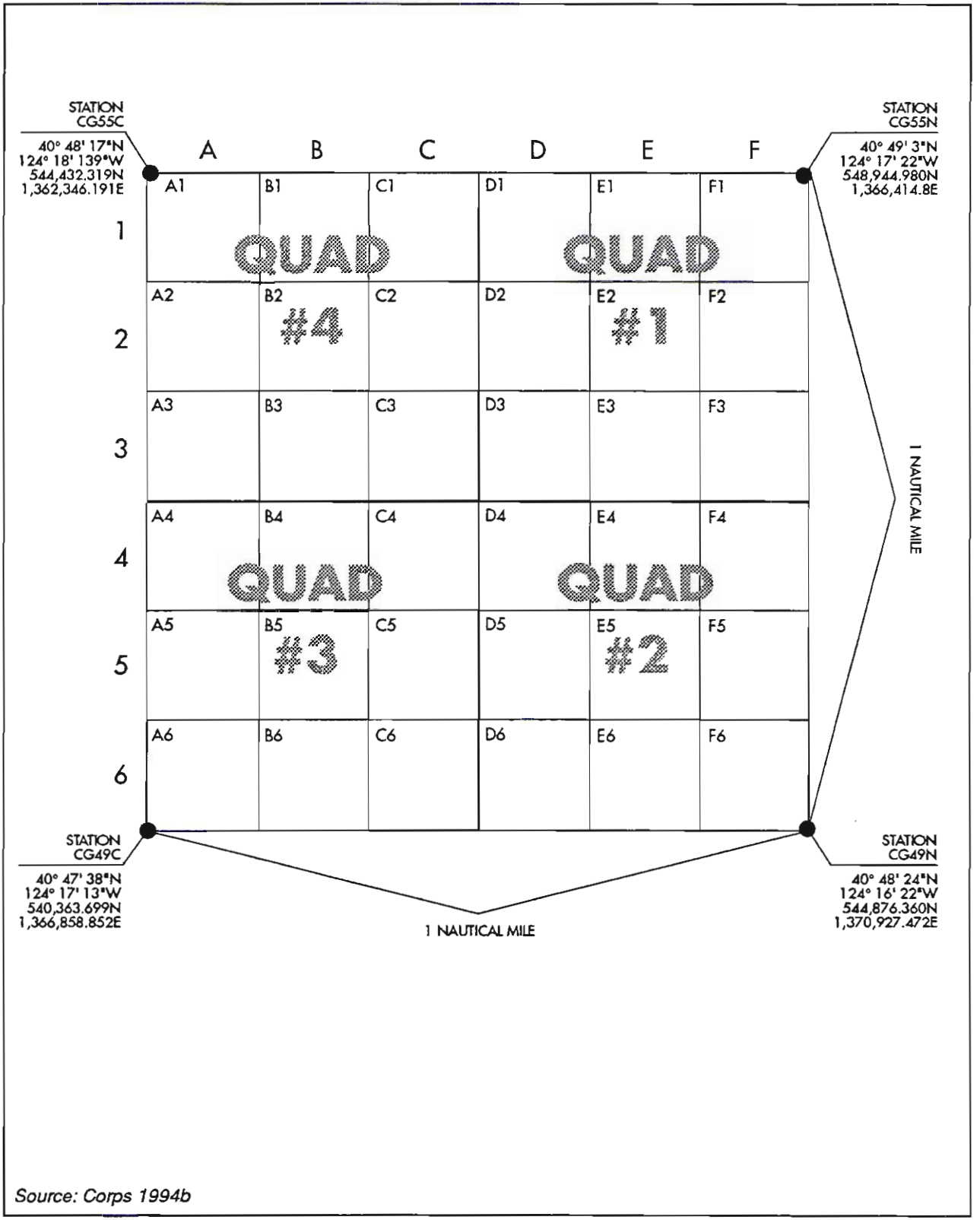


Figure 1. Location of Past and Present Ocean and Land Dredged Material Disposal Sites Near Humboldt Bay, California



Source: Corps 1994b

Figure 2. Humboldt Open Ocean Disposal Site

The SMMP addresses the options available to the federal agencies for modification of activities at the site to avoid significant environmental impacts, or options to mitigate potentially adverse impacts. Management actions may include: (a) adjustment of permitting and monitoring procedures, (b) adequate enforcement of permit conditions, or (c) modification of disposal activities, either temporarily or permanently. Specific considerations may include a change in dredging or disposal practices, restrictions on amounts of dredged material disposal, revision of site size, use of the site for a limited time, or designation of a new site.

B. SMMP Objectives

1. The following specific objectives are included in the SMMP to ensure acceptable long-term use of the HOODS as the designated site. These objectives may be used to revise the configuration or location of the disposal site, and will accommodate disposal of acceptable dredged material without causing adverse impacts outside site boundaries:

   a. Define the overall strategy and rules for site use.

   b. Establish specific site use requirements to ensure compliance with the EPA's Ocean Dumping Regulations.

   c. Publish sediment testing and reporting requirements jointly agreed to by EPA Region IX and the Corps' San Francisco District to complement national guidance on sediment testing. This will be accomplished by publishing a San Francisco District Public Notice defining the proposed testing and reporting procedures to obtain comments from other agencies, prospective permit applicants, and contractors.

   d. Identify biological resources of concern based on the HOODS Final Environmental Impact Statement (U.S. Environmental Protection Agency, Region IX, 1995).

   e. Facilitate assessment of any potential problems which may be identified as a result of routine site monitoring, and implement changes to avoid such problems.

   f. Provide an instrument of agreement for site management between the EPA Region IX, the Corps' San Francisco District, the U.S. Coast Guard, and other concerned regulatory and resource agencies responsible for successful site operation or enforcement.

2. The suitability of any dredged material proposed for disposal will be determined before disposal at the HOODS. This involves appropriate physical, chemical and biological testing of the proposed dredged sediments based on requirements and procedures defined in EPA's Ocean Dumping Regulations at 40 CFR Parts 220,

225, 227 and 228. The following information will be supplied by the permit applicant to EPA Region IX and the Corps' San Francisco District as part of the permit application process (33 CFR Parts 335 to 338):

a. Written documentation of the need to dispose the dredged material in the ocean, including a disposal alternatives analysis. This will be used to decide the proper disposal alternative for the sediments proposed for dredging.

b. A description of historical dredging and activities at or adjacent to the proposed dredging site that may have contaminated the sediments. The historical analysis will give the federal agencies information on potential sources of contamination at the site. Additional chemicals of concern may be identified by this report.

c. The quantity of dredged material proposed for disposal, including overdredge (tolerance) material. EPA Region IX and the Corps' San Francisco District will use this information to determine whether the HOODS can accommodate the amount of sediment proposed for disposal.

d. A recent condition survey of the proposed dredging area showing present hydrographic data at the proposed dredging site, including proposed dredging depths, overdredge depths, side slopes, and depths adjacent to the boundary of the proposed dredging area. This survey is required before field sampling occurs to locate the sampling stations at the proposed dredging site.

e. Characteristics and composition of the proposed dredged material, including physical, chemical, and biological tests. These data will be used by the federal agencies to determine whether the proposed dredged materials are suitable for disposal at the HOODS.

f. An estimate of the starting and ending dates for the dredging project. This information will be used to plan inspections at the dredging site or during disposal operations at the HOODS.

g. A debris management plan and the most likely types of equipment to be used in the project. This plan will address the disposal of materials other than approved sediment (such as piling, tires, metal debris, etc.) to assure that these other materials are not disposed of at the HOODS.

II. SITE MANAGEMENT

Site management consists of three major activities jointly administered by EPA Region IX and the Corps' San Francisco District. These activities are:

- ocean dumping permit requirements,

- site monitoring program requirements, and
- evaluation of permit compliance and monitoring results.

A. MPRSA Section 103 Permitting

Management decisions about the suitability of dredged material for ocean disposal will be guided by criteria set out in MPRSA and EPA's Ocean Dumping Regulations. MPRSA Section 103 authorizes the Corps to administer the permit program. This section provides for EPA review of Corps' Public Notices and permits. Initial opportunities for management decisions begin with the MPRSA Section 103 permitting process. Guidance on specific aspects of these regulations is provided in the Evaluation of Dredged Material Proposed for Ocean Disposal (the Green Book, U.S. Environmental Protection Agency and U.S. Army Corps of Engineers 1991). EPA Region IX and the Corps are developing regional guidance for sediment testing which should be used in addition to the 1991 Green Book. The current regional guidance is EPA (1991).

An adequate sampling plan must be developed by the permittee to characterize sediment quality. The sampling plan should address information listed in EPA Region IX's 1991 sediment testing requirements. This plan and the information listed in Section I.B.2. above are submitted to the Corps' San Francisco District and interested federal and state regulatory agencies. Early consultation with concerned federal and state regulatory and resource agencies is highly recommended to prevent delays in sampling, sediment testing and agency review. This consultation is normally conducted with the Corps' San Francisco District Permit and Regulatory Branch; however, it is advisable that the permit applicant or the Corps' Civil Works planner coordinate with EPA Region IX on the sampling before any sampling is conducted.

A reference site will be identified prior to the designation of the HOODS. Proposed dredging site sediment characterization test results are compared to similar information from the HOODS reference site to determine whether the sediment is suitable for ocean disposal. Management decisions related to the proposed dredged material and the disposal operations at the HOODS will be based on:

1. compliance with applicable criteria defined in the EPA's Ocean Dumping Regulations at 40 CFR Part 227,

2. the requirements imposed on the permittee under the Corps' Permitting Regulations at 33 CFR Parts 320-330 and 335-338, and

3. the potential for significant adverse environmental impacts at the HOODS from the disposal of the proposed dredged material.

For any environmental impact to be considered significant and, therefore, a basis for a management decision at the permitting stage, such an impact or change must be shown to be statistically significant and to pose an unacceptable risk to the marine environment or human health. These determinations will be based on appropriate statistical methods to

evaluate differences between the proposed dredged material and reference site conditions for the chemicals of concern, acute toxicity of the proposed dredged material, the magnitude of bioaccumulation, and potential ecological impacts. The main concerns are: (1) disposal of sediments that may cause significant mortality or bioaccumulation of contaminants at the disposal site or adjacent to the site boundaries, and (2) adverse ecological changes to the HOODS and the surrounding ocean floor. Changes in the benthic community inside the HOODS site could occur because coarser or finer grain sizes in dredged material are expected to allow different benthic species to colonize the site. If material is found moving off the disposal site, benthic community changes adjacent to the site may be evaluated to determine whether these changes are acceptable.

Management decisions will be implemented to reduce or mitigate any significant adverse environmental impacts. Management options for the permitting process may include: full or partial approval of dredged material proposed for ocean disposal, prohibition of sediments proposed for ocean disposal, or special management restrictions for ocean disposal of the proposed material such as limits on disposal quantities or disposal at specific areas within the HOODS site.

Existing regulatory information, such as the Federal Water Quality Criteria and the State of California Water Quality Objectives, may also be management decision triggers in some cases. Such mathematically precise tests cannot be applied to all proposed dredged material disposal projects. Most permit reviews will require the agencies' best professional judgment to manage the MPRSA Section 103 permitting process properly. The Corps' San Francisco District staff will prepare the Public Notice and EPA Region IX will participate in its review. EPA Region IX will only approve, disapprove, or propose conditions on the draft of the MPRSA Section 103 permit, because EPA must review the MPRSA Section 103 permit as specified in 40 CFR Section 220.4(c). The possible management options for the draft permit will be concurrence or denial.

B. Conditions at the HOODS

Conditions at the HOODS were documented in EPA Region IX's Final EIS for the proposed designation action (U.S. Environmental Protection Agency, Region IX, 1995). These two documents will be used, with reference site data, to evaluate future changes at the site. As part of the three-tiered site monitoring program, EPA Region IX and the Corps' San Francisco District can evaluate the physical, chemical, and biological parameters:

1. inside the HOODS site boundaries,

2. over an area adjacent to the HOODS site boundaries that may be found to be affected by dredged material disposal, and/or

3. at the reference site or sites.

Both agencies are particularly concerned with effects at the HOODS site boundary and the adjacent area. When evaluations of biological resources of concern are made, a

reference site or sites will be used as the point of comparison for data obtained from the areas adjacent to the HOODS and stations within the HOODS.

C. Surveillance and Enforcement of Permits

Once dredging and disposal activities have begun, management responsibilities, including surveillance and inspection of dredging and disposal operations, will be initiated to ensure compliance with permit conditions. Surveillance of the disposal operations will be carried out by the U.S. Coast Guard with the assistance of EPA Region IX and the Corps' San Francisco District. EPA Region IX has the authority to enforce against illegal dumping activities, including non-compliance with permit conditions. Section 105 of MPRSA defines EPA's enforcement authority over these permits. Management options by the Corps' San Francisco District could involve the temporary or permanent withdrawal of a permit by the Corps' San Francisco District.

Surveillance and inspection may consist of one or more of the following activities:

1. On-board inspection by EPA Region IX or the Corps' San Francisco District staff to ensure that transportation and disposal of the sediment occur within the designated dump zone, and that the permittee complies with all the permit terms and special conditions.

2. On-board inspection by a certified inspector hired by the permittee or a regulatory agency to ensure that transportation and disposal of the sediment occur within the designated dump zone, and that the permittee complies with all the permit terms and special conditions.

3. Plots of barge navigation course while inside the confines of the disposal site. Permittees may be required to provide a record of the barge navigation course, annotated with the coordinates at the beginning and end of the disposal operation. For example, dumping contractors will be required to navigate using an electronic positioning system or other approved navigation system with sufficient accuracy to dispose of dredged material at specific locations within the disposal site.

4. The permittee will be required to prepare a detailed postdredging hydrographic survey of the dredging site to determine the quantity of dredged material disposed at the HOODS and to confirm that only permitted dredged material was disposed at the site. This survey will be compared to the predredging survey. An estimate of the total amount of dredged material disposed at the HOODS site should be provided based on pay yardage and any non-pay overdredged sediment.

III. SITE MONITORING

A. Overview

The site monitoring activities were designed specifically for the HOODS. They are an integral part of the SMMP framework. The major concerns and hypotheses are explained in Exhibit A. Implementation of site monitoring is a shared responsibility of EPA Region IX and the Corps' San Francisco District. The primary purpose of the site monitoring activities is to evaluate the impact of the disposal on the marine environment at the HOODS.

Monitoring activities will ensure that the area of acceptable impact is primarily restricted to the disposal site and that unacceptable environmental impacts do not occur beyond the site boundaries. To accomplish this, the site monitoring activities have been designed to:

- Identify the physical extent of dredged material disposal at the HOODS and to see whether material is moving outside the site boundaries.

- Identify what effects sediment moving outside the disposal site are having on sensitive benthic resources identified by EPA Region IX and the Corps' San Francisco District compared to similar benthic resources at a reference site or sites.

- Determine whether body burdens of chemicals of concern exist in benthic resources that show significant adverse impacts at the HOODS compared to the reference site, and determine whether any potentially adverse impacts on resident fisheries resources or other amenities are possible, if significant body burden impacts are found.

The site monitoring activities are designed as a three-tiered hypothesis testing framework. Management decisions at each tier are defined for sediment fate and effects, body burdens of chemicals of concern or benthic biological community effects. Each tier will require a management decision based on the information gathered. If the null hypothesis for a particular tier is rejected, then a more complex set of tests are invoked at the next higher tier to determine the extent of impacts. Sequential-tiered testing is used to facilitate rapid, accurate and economical collection of information for use by the EPA Region IX and the Corps' San Francisco District in the management process. If monitoring results show that significantly adverse environmental impacts are predicted to occur or have occurred, then management actions may be necessary to avert or minimize such impacts.

B. Reference Site(s)

Because the HOODS site has been used as an interim disposal site, pre-dumping conditions cannot be used as a reference for site monitoring. A reference site, or sites, as

appropriate, shall be used to document background conditions for comparison in site monitoring activities at Tiers 2 and 3, and to evaluate the suitability of sediment for ocean disposal as part of the sediment testing program. A reference site or sites will serve as a basis for determining natural variability in the future at a site not affected by dredged material disposal. The reference site or sites will be located approximately 0.5 nmi from the HOODS within the same depth ranges of the HOODS. The site(s) will be located within an area which is removed from any potential influence of disposal activities, yet close enough that the sediments and biotic communities are in the same water mass and exposed to the same influences (except previous dredged material disposal).

IV. TIERED MONITORING AND MANAGEMENT DECISION OPTIONS

Appropriate management responses will be decided by EPA Region IX and the Corps' San Francisco District on a case-by-case basis. This SMMP does not attempt to specify particular responses to any predicted or actual adverse impact resulting from disposal activities. It does address possible management options, including those defined within the Ocean Dumping Regulations. The timing of monitoring surveys and other activities will be governed by agency funding resources, the frequency of disposal at the HOODS and acceptance or rejection of null hypotheses. The following information provides examples of actions to be considered for each tier.

A. Tier 1 - Sediment Transport Evaluation

The concerns for the sediment deposition and transport are: identifiable progressive movement or accumulation of disposed dredged materials that may affect any shoreline, marine sanctuary or critical biological area; and consistent detection of significant amounts of dredged material outside the disposal site using side-scan sonar, bathymetric surveys, sub-bottom profiling, sediment profile camera surveys, or other appropriate oceanographic survey methods. It is expected that Tier 1 (target) mapping surveys of the deposits within the disposal site would be conducted annually. If the null hypothesis for Tier 1 is rejected, then management decisions could include:

1. Revise size or location of the dump zone, or move dump zone to the upcurrent portion of the HOODS based on current data.

2. Enforce permit conditions on navigation and placement of barges.

3. Limit the amount of dredged material disposed at the site each year.

4. Reconfigure the disposal site boundaries.

5. Specify dredged material density or modify the consistency (i.e., percent clumping) of disposal material.

6. Evaluate the effect of sediment movement outside the HOODS site on sensitive benthic communities under Tier 2 or 3.

7. Implement other feasible and responsible management options that are developed as the monitoring program progresses.

8. Limit designation of the HOODS to a finite time and initiate environmental studies for a new disposal site.

9. Designate a new disposal site.

B. Tier 2 - Physical Impacts on Biological Resources of Concern

If dredged material moving out of the HOODS site is affecting sensitive biological resources identified by EPA Region IX and the Corps San Francisco District, then identification of these impacts will occur in Tier 2. An assessment of the sensitive benthic resource will be made by comparing the specific resources of concern at the HOODS to the same type of resources at a reference site or sites. Resources of concern could be benthic infauna, benthic epifauna, recreational fisheries or commercial fisheries resources.

Biological samples collected and archived from the reference site(s) as part of confirmatory monitoring will be used for this evaluation.

Possible responses to rejection of the Tier 2 null hypothesis could include:

1. Restrict disposal to specific locations within the dump site to allow portions of the disposal site to recolonize.

2. Restrict disposal to upcurrent portions of the disposal site based on seasonal current patterns to prevent material from moving outside the site boundaries.

3. Enforce permit conditions on navigation and placement of barges.

4. Determine extent of adverse impacts on commercial and recreational fisheries resources or human health.

5. Evaluate body burden impacts on bioaccumulation effects in Tier 3.

6. Reconfigure the disposal site boundaries.

7. Implement other feasible and responsible management options that are developed as the monitoring program progresses.

8. Initiate environmental studies for a new disposal site.

9. Designate a new disposal site.

C. Tier 3 - Body Burden Analysis of Biological Resources

During the permitting process, proposed sediment is tested to determine whether there is a potential for the sediment to cause test species to bioaccumulate contaminants at a higher level than those animals exposed to the reference sediment. Proposed dredged material that shows the potential to cause significant bioaccumulation cannot be permitted for ocean disposal without the District Engineer seeking a waiver from the EPA Ocean Dumping Regulations.

If sensitive benthic resources outside the HOODS boundaries are significantly affected by disposal, then monitoring of body burdens of resident species will occur in Tier 3. EPA Region IX will conduct Tier 3 monitoring as part of its oversight responsibilities for site designation. Body burdens of chemicals of concern will be assessed by comparing tissues of specific resources of concern at the HOODS to the same resources collected from a reference site or sites. These tests should not be confused with testing of proposed dredged materials that must be conducted for each permit application. The resources of concern would be the same as those identified in Tier 2 or higher trophic levels that feed on the benthic resources.

Possible responses to rejection of the Tier 3 null hypothesis could include:

1. Re-evaluate bioaccumulation testing and analytical procedures before issuing disposal permits.

2. Define the levels of contaminants in dredged material that would be suitable for ocean disposal, or restrict the quality of material to be dredged.

3. Determine extent of adverse impacts on commercial and recreational fisheries resources or human health.

4. Implement other feasible and responsible management options that are developed as the monitoring program progresses.

5. Initiate environmental studies for a new disposal site.

6. Designate a new disposal site.

D. Periodic Confirmatory Monitoring

The EPA may require confirmatory monitoring activities periodically on an other than annual basis. This monitoring may include but not be limited to periodic sediment chemistry, benthic sampling and community analysis, studies of sediment transport, bathymetric surveys, mound stability evaluations, or additional water current studies if it is determined that the dredged material is accumulating or moving more than expected. Confirmatory monitoring may also include conducting bioassays of sediments taken from the disposed dredged material footprint using one or more appropriate sensitive marine species consistent with applicable ocean disposal testing guidance ("Green Book" or related Regional Implementation Agreements), as determined by the Regional Administrator, to confirm whether contaminated sediments are being deposited at the HOODS despite pre-disposal testing of sediments. Other confirmatory activities may include testing for bioaccumulation by placement of near-surface arrays of appropriate filter-feeding organisms (mussels) in and around the disposal site for at least one month during active site use, to confirm whether substantial bioaccumulation of contaminants may be associated with exposure to suspended sediment plumes from multiple disposal events.

If a concern for water column impacts develops, EPA Region IX and the Corps' San Francisco District may require the permittees to monitor their discharge plumes as a special condition of the MPRSA Section 103 permit. The agencies would require the permittee to comply with the Limiting Permissible Concentration of the disposed dredged material and prevent unacceptable impacts on pelagic fisheries resources or coastal areas from the disposal plumes. If required, plume tracking would occur on a limited basis only, unless a management decision is made to continue these measurements.

E. Cancellation of the Designated Site

An overall management decision to cease all disposal activities at the site, either on a temporary or permanent basis, is also an option if other corrective actions are ineffective in preventing adverse environmental impacts beyond the site boundary. Temporary halts will allow the opportunity for further study to investigate means of preventing further impacts. If EPA Region IX and the Corps' San Francisco District determine that the HOODS has caused unacceptable environmental impacts, permanent cessation of disposal operations could be required. Closing the disposal site may be preceded by identification of an acceptable alternative ocean disposal site. Monitoring of the closed site may continue to ensure that adverse effects do not worsen and to allow remedial actions to proceed in a timely manner.

V. REFERENCES

U.S. Environmental Protection Agency, Region IX. 1991. EPA Region IX general requirements for sediment testing of dredged material proposed for ocean dumping.

U.S. Environmental Protection Agency, Region IX. 1995. Final environmental impact statement (FEIS) for the designation of an ocean dredged material disposal site off Humboldt Bay, CA.

U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1991. Evaluation of dredged material proposed for ocean disposal, testing manual. EPA Report 503/8-91/001. Prepared by EPA Office of Marine and Estuarine Protection, Washington, DC.

HUMBOLDT BAY (HOODS) OCEAN DREDGED MATERIAL DISPOSAL SITE SITE MONITORING PROGRAM

I. INTRODUCTION

Disposal of dredged material is expected to change benthic conditions inside the HOODS boundary because the variation of grain sizes in dredged material disposed at the HOODS is expected to allow different species to colonize the area. Site monitoring activities are necessary to assure that long-term unacceptable adverse environmental impacts do not occur within the HOODS site or beyond the site boundaries. A three-tiered monitoring program has been designed to evaluate conditions at the HOODS. Tier 1 consists of periodic physical surveys of the disposal site to determine the areal extent of disposed dredged material and whether material is being deposited outside of the disposal site boundaries. If significant adverse impacts on selected biological resources are suspected based on the Tier 1 survey, data on physical impacts (Tier 2) and body burdens of chemicals of concern (Tier 3) at the HOODS site and adjacent areas will be compared to a reference site.

The HOODS site monitoring activities are a part of the overall HOODS SMMP. The site monitoring program is based on testing specific hypotheses at three sequential tiers. Several aspects of the site monitoring program were developed in direct response to concerns identified in the HOODS Final Environmental Impact Statement (FEIS). These concerns include questions on the movement of dredged material disposed at the HOODS and possible associated impacts on resident marine resources or fisheries resources if the disposed sediments move outside the site boundaries. Procedures defined in the site monitoring program should provide data required to make management decisions; however, the site monitoring program will be managed with the flexibility to modify, delete or substitute new monitoring procedures as other needs are identified.

II. OBJECTIVES

One of the major objectives of the HOODS site monitoring activities is to detect potentially adverse impacts beyond the HOODS site boundaries. Adjustments in site use will be selected to prevent adverse impacts from occurring in areas adjacent to the HOODS. Scientific analysis of the fate of the disposed dredged material is essential to meet this objective. With regard to physical sedimentation impacts, the objective is to determine whether benthic biological resources of concern have been adversely affected by sediment movement out of the site. The objective of biological monitoring is: (1) to determine if the ODMDS is causing detrimental bioaccumulation in resident infauna, epifauna or fisheries resources, (2) to provide early detection of potential threats to marine community structure, and (3) to evaluate whether potential impacts on biological resources will adversely affect higher trophic levels.

III. SITE MONITORING OVERVIEW

The site monitoring activities designed for the HOODS involve sequential collection of physical and biological data to help achieve the objectives outlined above. These objectives are defined to ensure compliance with state and federal laws, to provide guidance for EPA Region IX and Corps' San Francisco District staff for site management, and to address the concerns raised by other interested parties. The following concerns are addressed:

A. Sediment Impacts at the HOODS and Outside the Site Boundary

- Adverse physical environmental impacts on benthic communities near the ODMDS boundary.
- Habitat alterations displacing resident benthic communities near the ODMDS.

B. Water Column Impacts Outside the HOODS Site Boundaries

- Potential violation of established criteria at or beyond the site boundary at any time, or violation of criteria within the site boundary 4 hours after disposal.

C. Biological Impacts at the HOODS and Outside the Site Boundary

- Bioaccumulation of contaminants.
- Significant alteration in benthic communities based on bioaccumulation of contaminants.
- Significant changes in the resident epifauna or fish communities.

Each of these concerns is addressed in the site monitoring activities summarized in Table 1. Monitoring in a particular tier is based upon a testable hypothesis. If the null hypothesis for a specific tier is accepted, advancement to the next tier is not necessary. If the null hypothesis is rejected, an appropriate management action can be considered, or the prescribed monitoring from the next tier may be required. Information on management actions is provided in the HOODS SMMP.

Table 1. Tiered Monitoring at the HOODS Ocean Dredged Material Disposal Site

TIER 1

- Periodic bathymetric, side-scan sonar and/or sub-bottom surveys of the HOODS funded by the Corps' San Francisco District based on site use.

TIER 2

- Assessment of sedimentation impacts on biological resources of concern as identified by EPA Region IX and the Corps' San Francisco District. This tier is triggered if dredged material moving out of the disposal site is determined by Tier 1 analysis to be a potential adverse impact to benthic resources.

TIER 3

- Body burden analyses of chemicals of concern in identified biological resources based on EPA Region IX's site designation and management oversight responsibilities. This tier is triggered if dredged material deposited outside of the disposal site is found to contain contaminants which could potentially cause adverse impacts to benthic resources.

CONFIRMATORY MONITORING

- Additional monitoring requirements imposed as needed by EPA Region IX or the Corps' San Francisco District to evaluate sediment dispersion, sediment quality, and extent of benthic impacts.

Tier 1 bathymetric, side-scan sonar and/or sub-bottom surveys are expected to be scheduled on an annual basis, although this schedule may be modified based on the frequency of disposal, the amount of dredged material disposed at the HOODS, and the results of the monitoring activities. EPA Region IX and the Corps' San Francisco District will evaluate the survey data to test the Tier 1 hypothesis. We will determine whether movement of material out of the HOODS may cause adverse impacts on biological resources of concern adjacent to the site. If management options require additional monitoring, then physical (Tier 2) or biological impact (Tier 3) evaluations will be conducted as needed.

Monitoring actions described in Tiers 2 and 3 involve analyses of data from the HOODS in relation to a reference site described in Section II.A of the SMMP. The characteristics of the reference site or sites will represent the conditions of the HOODS before disposal of dredged material occurred. Thus, meaningful comparisons can be made between the sites to determine the impacts of dredged material disposal operations at the HOODS. Future reference site measurements will provide information on natural variability and periods of any unusual conditions in the region.

IV. DETAILS OF TIERED MONITORING

A. Tier 1 - Bathymetric Survey of the Site

Hypothesis: Dredged material accumulation outside of the HOODS boundary averages less than 4 inches (10 centimeters) relative to the bottom sediment surface defined at the time of site designation.

Monitoring at Tier 1 is designed to determine whether significant amounts of dredged material move beyond the HOODS boundary, thus providing an indication of potentially adverse impacts to nearby benthic resources of concern. Tier 1 monitoring is designed to evaluate the accumulation of dredged material outside of the disposal area, relative to baseline conditions at the time of site designation. Equipment such as precision bathymetry, side-scan sonar, sub-bottom profiling, or other similar oceanographic survey techniques will be used to detect accumulation of dredged material greater than 4 inches (10 centimeters) relative to the bottom sediment surface at the time of site designation. These data will have a resolution of 0.5 inch to test the Tier 1 hypothesis. If Tier 1 analyses show sediment movement outside the site boundary and the null hypothesis is rejected, then management options will be evaluated to mitigate the impacts, or monitoring in Tier 2 can be scheduled.

B. Tier 2 - Sediment Impacts on Biological Resources of Concern

Hypothesis: Dredged material accumulation at or beyond the HOODS boundary does not show significant adverse impacts on biological resources of concern based on sediment physical properties compared to similar biological communities at a reference site or sites.

Tier 2 monitoring activities are designed to detect significant changes in biological resources of concern as a result of dredged material movement outside the HOODS. Biological resources of concern will be identified by EPA Region IX and the Corps' San Francisco District based on information contained in the HOODS EIS, the survey of the HOODS and information on fisheries resources in the area.

If benthic infauna are identified as a resource of concern, then analysis of this community can be accomplished by examining sediment profiles using techniques including but not limited to sediment profiling camera surveys taken in areas where dredged material has accumulated significantly. This type of information can be compared to other locations within the HOODS, zones outside the HOODS that have not been affected by dredged material disposal, or a reference site(s). The sediment profiling camera method has the advantage of providing in situ estimates of grain size distribution and infaunal community structure (Rhoads and Germano 1982). In addition, depending on the characteristics of previously deposited materials, newly deposited material can be differentiated by the photographs to indicate the rate of deposition at the site boundary for accumulation depths of from 2-8 inches (5-20 centimeters). Publications on this photographic profiling technique indicate that oxidized surface layer of previously deposited dredged material can be identified photographically when covered by similar material for up to a year (Germano and Rhoads 1984).

If resident benthic epifauna (invertebrates or fish) are identified as biological resources of concern, then bottom trawls can be used to sample areas where dredged material has accumulated. Samples can be compared to locations within the HOODS, zones outside the HOODS, or a reference site(s). The Tier 2 sampling is limited to assessment of physical impacts, such as the loss of a biological resource based on sediment movement, grain size changes or other effects from direct contact with disposed dredged material. Disposal of dredged material with a different grain size than the ambient sediments at the disposal site will change the biological community characteristics of the HOODS. Different species may colonize the disposal area because they can live in the finer or coarser grained dredged material. Simple changes in community structure in response to grain size changes are not considered significant impacts at the HOODS. If Tier 2 analyses show significant adverse impacts to biological resources of concern and the null hypothesis is rejected, then management options will be evaluated to mitigate the impacts, or monitoring in Tier 3 can be scheduled.

C. Tier 3 - Analyses of Body Burdens in Biological Resources

Hypothesis: Contaminant body burdens in biological resources of concern at stations where dredged material has moved out of the HOODS and within the HOODS are not significantly greater than body burdens detected in similar biological communities at a reference site or sites.

Analysis of contaminant body burdens will be conducted as part of EPA Region IX's site designation and management oversight responsibilities. If chemicals of concern (listed in EPA Region IX's August 1989 sediment testing guidance) bioaccumulate to a higher

degree at the HOODS compared to a reference site(s), significant adverse impacts could affect resident biological communities at the HOODS or the adjacent areas where dredged material has moved out of the site. Tier 3 monitoring is designed to determine whether the HOODS is a site of significant bioaccumulation and to provide early detection of the potential for adverse impacts on nearby biological resources or human health.

Tier 3 monitoring will assess the concentration of chemical contaminants in resident infaunal or epifaunal organisms at the HOODS or other areas where dredged material has moved outside the site. The body burdens of organisms collected at or adjacent to the HOODS will be compared to similar organisms at a reference site(s). Collection of resident organisms for this analysis does not need to be quantitative. However, a large enough sample of the target species should be collected to provide adequate tissue for analysis. Sampling devices such as box cores, grabs or benthic sleds may be used. Selection of target species for this portion of the monitoring program should follow the protocols outlined in U.S. Environmental Protection Agency (1987) guidance.

If the Tier 3 hypothesis is rejected, management decisions will be evaluated to mitigate any impacts, or EPA Region IX and the Corps' San Francisco District will consider closing the HOODS and initiating the designation process for another suitable site.

V. REFERENCES

Germano, J. D. and D. C. Rhoads. 1984. REMOTS sediment profiling at the Field Verification Program (FVP) disposal site. Dredging '84: Proceedings of the conference, ASCE, November 14-16, Clearwater, FL, pp. 536-544.

Rhoads, D. C. and J. D. Germano. 1982. Characterization of organism-sediment relations using sediment profiling imaging: an efficient method of Remote Ecological Monitoring of the Seafloor (REMOTS system). Marine Ecology Progress Series, 8:115-128.

U.S. Environmental Protection Agency. 1987. Bioaccumulation monitoring guidance: 1. Selection of target species and review of available bioaccumulation data. EPA 430/9-86-005.

U.S. Environmental Protection Agency, Region IX. 1991. EPA Region IX general requirements for sediment testing of dredged material proposed for ocean dumping, effective date: August 1989, 8 pages.

U.S. Environmental Protection Agency, Region IX. 1995. Final environmental impact statement (FEIS) for the designation of an ocean dredged material disposal site off Humboldt Bay, CA.