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DRAFT

Ocean Disposal Information: Programmatic EFH Consultation for the LTMS

This document has been prepared in support of a programmatic Essential Fisheries Habitat (EFH) consultation for the *"Long Term Management Strategy (LTMS) for Placement of Dredged Material in the San Francisco Bay Region."* The interagency LTMS program is a 50-year plan that covers all dredging and aquatic disposal activities in the San Francisco Bay region.

The discussion below summarizes the goals of the LTMS program and focuses on the role ocean disposal plays in the overall LTMS program, how EPA's designation process for ocean dredged material disposal sites avoids many impacts to EFH, how the dredged material evaluation process further minimizes impacts to EFH, and how extensive ocean disposal site monitoring has confirmed that no significant impacts to EFH have occurred over more than 12 years of ocean disposal activity.

HISTORICAL CONTEXT OF THE LTMS PROGRAM

The San Francisco Bay/Delta estuary is one of the critical maritime thoroughfares in the nation, supporting international trade, commercial and recreational fishing, and recreation. For over a century navigational channels through the estuary have been created, deepened, and maintained by dredging (the removal of sediments from the bottom) to enable ships to navigate safely into and out of ports, harbors, and marinas without running aground. Today's large commercial ships require deeper channels than ever before, and prospects are for even larger ships in the future. Dredging the region's channels, ports and associated docking, berthing and other facilities will continue to be necessary to maintain adequate depths for vessels to maneuver.

The San Francisco Bay/Delta system is also the largest and most significant estuary along the entire west coast of North and South America. Over 40 percent of the land area of the state of California — with 60 percent of the state's runoff — drains into the estuary where it mixes with the saline waters of the Pacific Ocean. Estuarine conditions support the most productive kinds of ecosystems in the world, but due to human activity they have been among the most degraded environmental systems. The San Francisco Bay/Delta exemplifies this trend. The past century of intensive human settlement and development in the Bay Area has severely stressed the estuary, and brought fundamental changes to the ecosystem. Chief among the causes of significant adverse impacts are extensive habitat loss from diking and filling of baylands and wetlands to create farming and industrial land (over 90 percent of the area's historic salt and brackish marshes have

been destroyed); huge diversions of fresh water from the estuary to Central Valley farms and to cities as far away as southern California (up to 75 percent of the flow of the Sacramento River is diverted before it reaches the estuary); and pollution from nonpoint and point-source discharges. Compared to these large-scale perturbations, changes associated with dredging and dredged material disposal are much less significant. However, even minor additional impacts to an already stressed ecosystem can be cause for concern, and dredging and disposal are activities that are often very visible to the public.

Throughout the 1980s and early 1990s, the public expressed concerns about the potential for both direct and cumulative effects of dredging and disposal activities on the already stressed resources of the estuary, and sought assurance that these activities are being properly managed with the health of the overall estuary in mind. In 1990, the state and federal regulatory agencies with primary authority to review and permit dredging and disposal activities in the San Francisco Bay region cooperatively initiated an integrated planning process for dredged material management. The resulting effort — the Long Term Management Strategy (LTMS) for Placement of Dredged Material in the San Francisco Bay Region — was organized to address dredging-related issues in detail and to develop a comprehensive dredged material management plan.

In the same general timeframe, other efforts to restore and improve environmental quality of the Estuary as a whole were also accelerating. EPA established the San Francisco Estuary Project (SFEP) in 1987 as a broad-based and cooperative program that brought together over 100 representatives from private and public interests in the region. The goals of the SFEP were to:

- Develop a comprehensive understanding of environmental and public health values attributable to the Bay and Delta and how they interact with social and economic factors;
- Achieve effective, united, and ongoing management of the Bay and Delta;
- Develop a Comprehensive Conservation and Management Plan (CCMP) to restore and maintain the chemical, physical and biological integrity of the Bay and Delta, including restoration and maintenance of: water quality; a balanced indigenous population of shellfish, fish, and wildlife; recreation activities in the Bay and Delta; and ensure that the beneficial uses of the Bay and Delta are protected; and
- Recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution.

The SFEP's CCMP (SFEP, 1993) identified five key challenges facing the estuary:

- Decline of biological resources (especially wetlands and related habitats);
- Increased pollution;
- Freshwater diversions and altered flow regime;
- Intensified land use and population; and
- Dredging and waterway modification.

The interagency LTMS program, which had recently begun its planning studies at the time, effectively became the arm of the SFEP (and the CCMP) charged with developing and implementing actions to address dredging and waterway modification issues for the region.

THE LTMS MANAGEMENT PLAN

Since the 1970s, the majority of dredged material in the San Francisco Bay region has taken place at four designated sites within the greater San Francisco Bay: Suisun Bay ("SF-16"), Carquinez Strait ("SF-9"), San Pablo Bay ("SF-10"), and Alcatraz ("SF-11") (Figure 1).

Figure 1. The LTMS planning area, showing the locations of the designated in-Bay disposal sites for dredged material:

- Suisun Bay (SF-16),
- Carquinez Strait (SF-9),
- San Pablo Bay (SF-10), and
- Alcatraz (SF-11).

Also shown is the San Francisco Bar Channel Site (SF-8). The San Francisco Deep Ocean Disposal Site (SF-DODS) is 55 miles west of the Golden Gate (outside this view).

Before the LTMS an average of approximately six million cubic yards of dredged material were

dumped in the Bay each year (with a maximum of 10 million cubic yards in 1986) (Figure 2).[1]

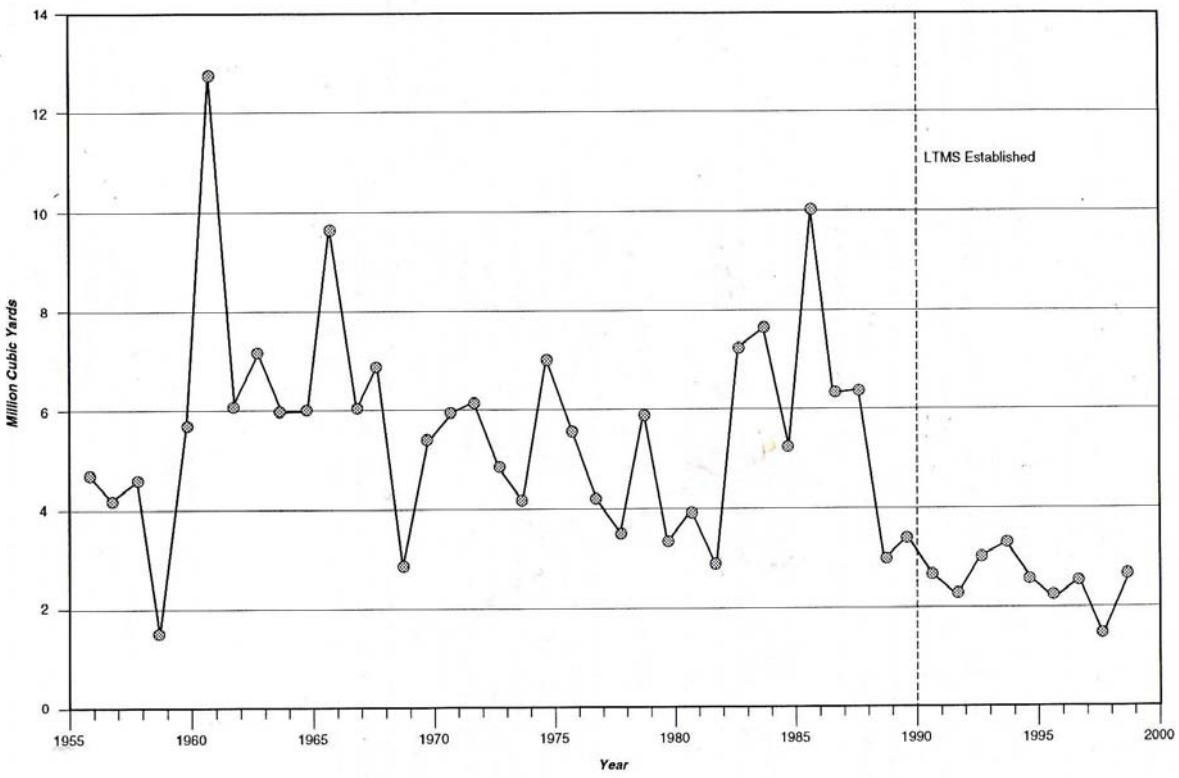


Figure 2. Annual unconfined in-Bay disposal volumes, 1955-1999.

Formal implementation of the LTMS began in 2001 with adoption of the LTMS Management Plan (LTMS 2001). The Management Plan was preceded by an extensive (8-year, $16 million) Federal-State planning effort which culminated in the *LTMS Final Policy EIS/Programmatic EIR* in 1998 (LTMS 1998). The "environmentally preferred alternative" in the EIS/EIR became the selected plan. That plan called for reversing the historic practice of dumping 80 percent or more of all dredged material back into San Francisco Bay. Instead, at least 80 percent of all dredged material would be placed at beneficial reuse or ocean disposal sites with only limited volumes of material being disposed in-Bay. Specifically, over time the LTMS plan aims for: at least 40 percent of all dredged material to be beneficially reused (e.g., for enhancing or creating new aquatic habitat, maintaining levees, or providing an alternate source of landfill daily cover); up to 40 percent of material to be discharged offshore at the EPA-designated San Francisco Deep Ocean Disposal Site (SF-DODS) when beneficial reuse is not feasible; and no more than 20 percent of dredged material to continue to be disposed in-Bay (the "40-40-20 Plan", Figure 3).

1 In the years just prior to adoption of the LTMS Management Plan, limits were placed on total in-Bay disposal volume: 6.7 million cubic yards could be disposed in a "dry" year, or 7.7 million cubic yards could be disposed in a "wet" year.

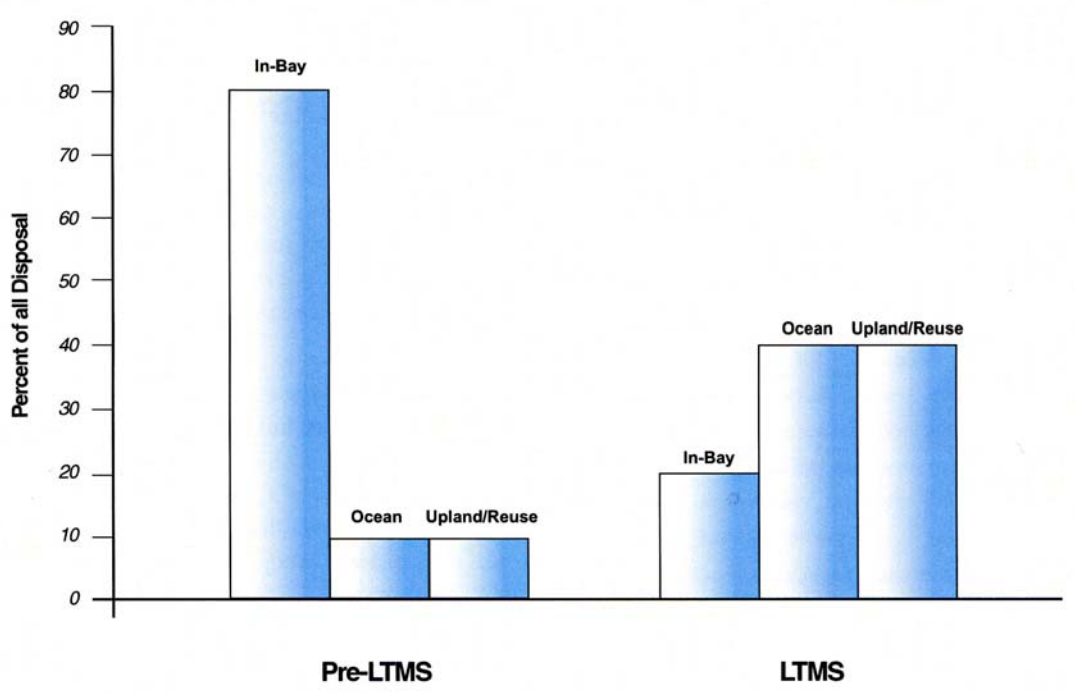


Figure 3. The pre-LTMS disposal situation compared to the LTMS goals. In the past, the vast majority of all dredged material was dumped in the Bay.

Transition to the LTMS Goals

The "40-40-20 Plan" could not be implemented over night. The main hurdle to achieving the 40-40-20 Plan was the lack of available multi-user beneficial reuse or upland placement sites. EPA designated the San Francisco Deep Ocean Disposal Site (SF-DODS) in late 1994 as a less damaging alternative to in-Bay disposal, for some projects while additional beneficial reuse capacity was being developed.

At the time the Management Plan was published, several major beneficial reuse sites were in the planning stages - including the Hamilton Wetlands Restoration Project, the Montezuma Wetlands Project, and the Mare Island Disposal Ponds Project[2] – but actual reuse site capacity was extremely limited. So the LTMS Management Plan instituted a Transition Period during which in-Bay disposal would be gradually but systematically reduced. The intent was to provide time for beneficial reuse sites to be developed and for dredgers to plan ahead for the logistic and potential economic changes that would attend changing over to a new way of managing their dredged material.

2 The proposal to reopen the Mare Island disposal ponds was ultimately withdrawn by the proponent.

For the Transition Period, the LTMS agencies agreed that instead of immediately limiting individual dredgers to volume allocations according to the relative sizes of their projects, dredgers would be allowed to make collective progress toward the LTMS goals on a voluntary basis. However, the public was concerned that the program should have "teeth" in the event that adequate progress was not made. Accordingly the Transition Period started by reducing maximum annual (collective) in-Bay disposal by over 50 percent, to 2.8 million cy per year, in its first year. Thereafter, a further volume reduction of 378,500 cy automatically occurs every three years. At the end of the 12 year Transition Period, the final in-Bay disposal volume limit of 1.25 million cy per year[3/] would be reached (Figure 4).

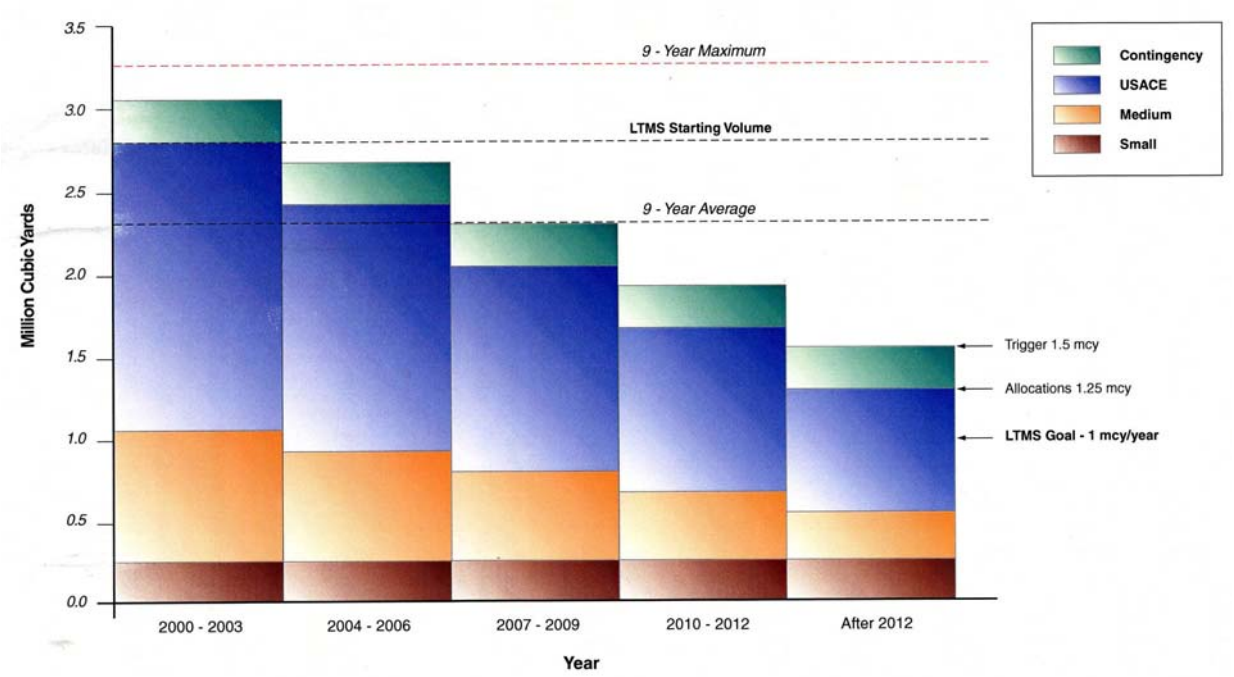


Figure 4. The LTMS Transition Period, showing how the annual in-Bay disposal volume limit automatically decreases every three years by 387,500 cy.

The Transition Period also includes a provision that, should the actual average disposal volume during any three-year period exceed the maximum allowed, project-specific regulatory limits (allocations) are initiated. These allocations would automatically occur unless BCDC Commissioners actively votes to *not* invoke them. Thus, the LTMS Management Plan provides a significant backstop for the Transition Period, ensuring that in-Bay disposal limits can be met even if dredgers' voluntary measures prove to be inadequate.

It is important to note that although the Transition Period places interim limits only on collective

3 This is slightly higher than the in-Bay disposal *goal* of 1 million cy per year, to allow for flexibility in managing individual permits.

in-Bay disposal volume while allowing voluntary efforts to increase ocean disposal and beneficial reuse, the LTMS agencies continue to screen individual dredging projects regarding alternatives. Projects that either have traditionally used upland or reuse sites, or that clearly could utilize the SF-DODS, etc., are expected to continue doing so.

The LTMS agencies have also worked to develop innovative ways to help dredging project proponents start phasing-in beneficial reuse or ocean disposal during the Transition Period, while letting them retain maximum operational flexibility. For example, in recent years the agencies have solicited "Integrated Alternatives Analyses" (IAAs) from all major dredgers. IAAs are planning documents that look holistically at all of a dredger's projects over a multi-year period (usually three years), and allow the dredger to propose a mix of alternatives for their overall dredging program. Compared to the more typical way of considering alternatives for individual dredging sites (and for individual dredging episodes at each site), IAA's help dredgers to reduce in-Bay disposal and increase ocean disposal and/or beneficial reuse during each three-year "step-down" period, while providing them as much operational flexibility as possible.

Progress Implementing the LTMS Management Plan to Date

2007 marks the halfway point in the transition to low in-Bay disposal volumes and significant beneficial reuse. The LTMS has made significant progress in addressing other CCMP issues related to Dredging and Waterway Modification as well:

- The initial LTMS implementation reduced maximum in-Bay disposal by over 50 percent immediately (to 2.8 million cy, from a pre-LTMS limit of 6.7 to 7.7 million cy).
- Since then, in-Bay disposal has remained within the Transition Period volume limits every year. In addition, the Transition has already included two automatic "step-downs" that have further reduced allowable in-Bay disposal, by an additional 757,000 cy per year.
- To date the designated deep-ocean disposal site, SF-DODS, has received over 11 million cy of dredged material that in the past would have been discharged in-Bay.
- The 322 acre Sonoma Baylands project used over 2.5 million cy of dredged material from deepening the Oakland federal channels to -42 feet, increasing intertidal and subtidal (channel) habitat for fishery resources in addition to creating substantial new tidal marsh.
- The Middle Harbor Habitat Enhancement Area, associated with the Port of Oakland 50-Foot Deepening Project, used approximately 6 million cy of dredged material to restore 180 acres of shallow water fishery habitat, with an emphasis on eelgrass, in a former deep water industrial (military port) operations area.
- The ~1,800 acre Montezuma Wetlands Project is in operation, accepting both clean "cover" material and more contaminated "foundation" quality material. Montezuma has a capacity of up to 12 million cy, and has already used over 3 million cy of dredged material (mostly from the -50 foot Oakland deepening project). Like Sonoma Baylands, Montezuma will result in increased intertidal and subtidal (channel) habitat for fishery resources in addition to creating substantial new tidal marsh.
- The initial 700+ acres of the Hamilton Wetlands project has come into operation. It has a

capacity of over 8 million cy, and will have accepted over 3 million cy by the time the Oakland -50 foot Deepening Project is completed in 2008. Like Sonoma Baylands and Montezuma, Hamilton will result in increased intertidal and subtidal (channel) habitat for fishery resources in addition to creating substantial new tidal marsh.

- Hamilton will be expanded to a 2,000+ acre, 25 million cy site with the addition of the "Bel Marin Keys Unit V" property.
- An "Aquatic Transfer Facility" (ATF) is being considered to more efficiently reuse a much greater percentage of Bay Area dredged material at the Hamilton site. The draft Environmental Impact Statement (EIS) for the Hamilton ATF is scheduled for release to the public in late 2007. (Establishment of the ATF would allow the LTMS agencies to discontinue virtually all disposal operations at the existing SF-9 and SF-10 in-Bay disposal sites for several years.)
- To date, ~1 million cy of sand dredged from the San Francisco Main Ship Channel has been diverted from disposal at SF-8 to directly nourish Ocean Beach. Also, sand dredged from projects in the Bay has recently been approved for beneficial reuse placement in the portion of the SF-8 closest to shore, to add material to the littoral transport system feeding Ocean Beach
- An interagency Dredged Material Management Office (DMMO) coordinates sediment testing and permit applications.
- DMMO has published comprehensive testing guidelines for dredged material, to ensure that significant contaminant-related impacts do not occur during dredging or disposal operations.
- Environmental work windows established under the LTMS program help to protect sensitive species by encouraging work during times that the species are not present. Working together with applicants, the LTMS agencies have significantly increased the proportion of dredging that occurs during these work windows.
- The LTMS agencies meet regularly with stakeholders and support an ongoing science program.

As this list shows, LTMS has already materially benefited fishery habitat in the San Francisco Bay area. Since the LTMS program began there has been much less material disposed in the Bay; and even less will be disposed as the Transition Period progresses. Over 15 million cy of dredged material has gone to beneficial uses, most of which have significant fishery habitat components; and the LTMS agencies are working to accelerate the pace of beneficial reuse. Over 11 million cy of dredged material that could not be reused has been diverted to the environmentally superior deep ocean disposal site; and ocean disposal will remain a long-term alternative to in-Bay disposal for times when beneficial reuse projects are not available.

The following sections focus on the significant roll ocean disposal plays in the success of the overall LTMS program for the San Francisco Bay area.

OCEAN DISPOSAL UNDER THE LTMS MANAGEMENT PLAN

As summarized above, the LTMS program for management of dredged material in the San Francisco Bay region (LTMS 1996; LTMS 2001) calls for minimizing dredged material disposal in the Bay and maximizing beneficial re-use of dredged material, to the greatest extent practicable. Reducing in-Bay disposal is one of the program's primary components for avoiding and minimizing risks and impacts to fishery resources and habitats, including EFH. Ocean disposal is a critical means for achieving the reduction of in-Bay disposal volumes, especially during the Transition Period when beneficial reuse alternatives are still becoming available and practicable to use. Two separate EPA-designated ocean disposal sites serve dredging needs in the Bay area. All EPA-designated ocean disposal sites are operated under a Site Management and Monitoring Plan (SMMP) which are available via the EPA Region 9 web site.[4]

SF-8: On the San Francisco Bar

The San Francisco Channel Bar Site, also known as SF-8, is situated approximately three miles offshore of the Golden Gate, immediately south of the San Francisco Main Ship Channel (Figure 5). SF-8 was originally designated for, and restricted primarily to, placement of sand from the USACE's annual maintenance dredging of the Main Ship Channel that crosses the San Francisco Bar [see 40 CFR 228.15(l)4]. The San Francisco Bar is a major ebb-tide feature outside the Golden Gate. It is in a high current and wave energy environment, and its substrate is essentially pure sand. The crest of the Bar ranges from 20 to 35 feet mean lower low water (mllw).

A safe navigation lane across the Bar is crucial for all vessels entering and leaving San Francisco Bay. Therefore the Main Ship Channel is maintained by USACE at -55 feet mllw. On average, approximately 400,000 cubic yards of sand are dredged from the Main Ship Channel each year, and placed back onto the Bar immediately to the south, at SF-8. In this manner, all the sand dredged from the Main Ship Channel is retained on the Bar as part of the regional littoral sand transport system, which ultimately contributes sand to local shorelines including Ocean Beach.

SF-8 is essentially a "side cast" disposal site. That is, the material placed there originates from the immediately adjacent ship channel, and consists of the same sand that would otherwise be naturally transported to the site even if the Main Ship Channel did not exist. Side casting the sand does not change the character of the site. Essentially no fines exist in this material, and no substantive fish habitat impacts are expected at this high energy sand bar location.

Since the LTMS program did not directly result in any change to the amount of Main Ship Channel dredging or the manner of placing that material at SF-8, the LTMS EIS/EIR and the LTMS Management Plan did not substantively address management of SF-8. However, recently USACE has been conducting pilot studies to determine the feasibility and benefits of placing sand from Main Ship Channel maintenance dredging closer to shore off Ocean Beach. The intent is to address shoreline erosion in this area more directly and quickly than afforded by placement

4 http://www.epa.gov/region09/water/dredging/disposalsites.html

offshore at SF-8. So far approximately 1 million cy of Main Ship Channel sand have been placed off Ocean Beach, and monitoring results from the pilot's first three years have been positive. USACE is now working to prepare a proposal to designate a permanent nearshore placement site.

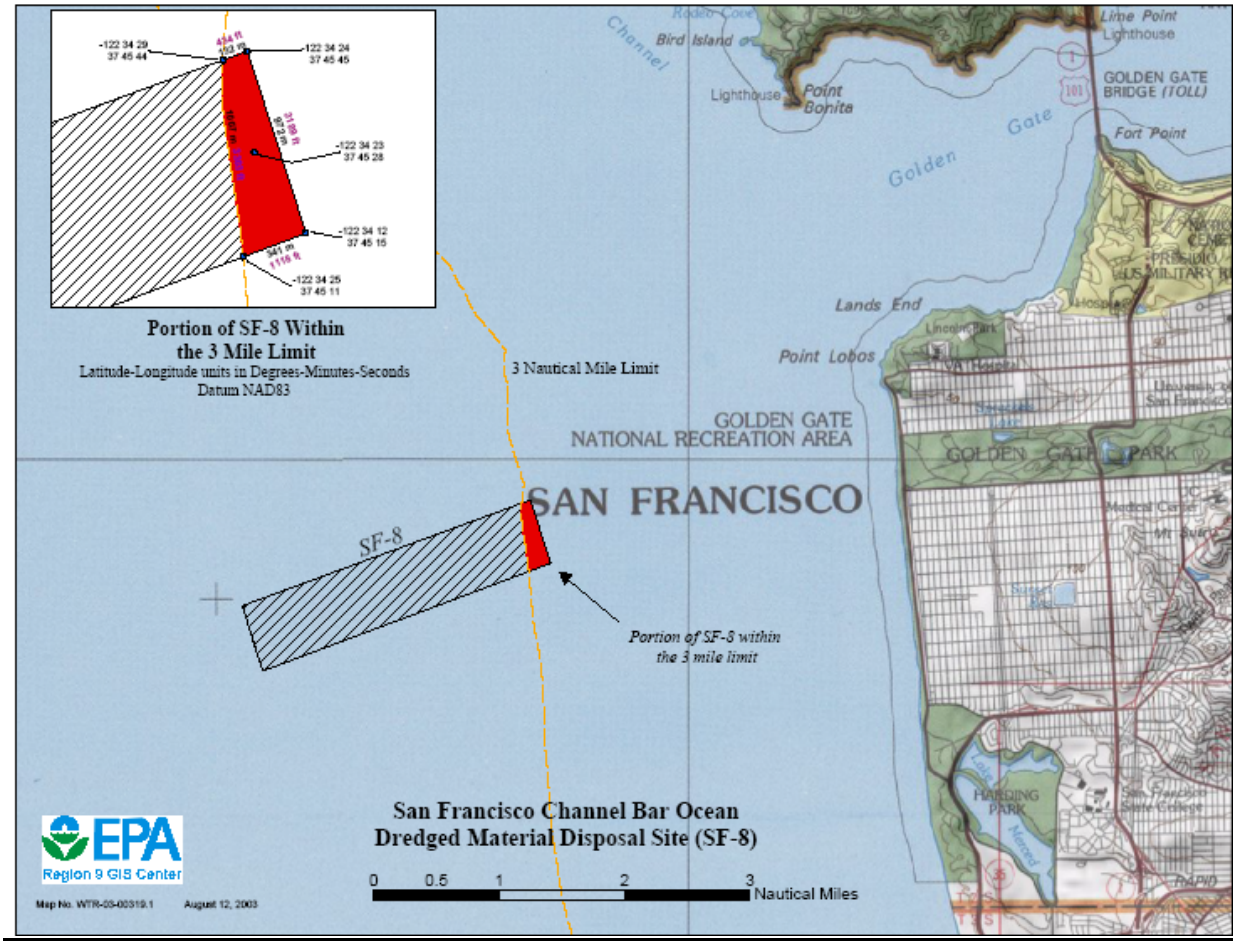


Figure 5. The San Francisco Channel Bar Ocean Dredged Material Disposal Site (SF-8). Note that the highlighted, easternmost portion of the disposal site (inshore of the 3-mile limit) is also regulated under Section 404 of the Clean Water Act.

In recent years, EPA has also allowed clean sand from other dredging projects to be placed in the easternmost portion of SF-8, within the three mile limit (California state waters). Because sand from other sources constitutes new input to the offshore littoral sand transport system, EPA and the other LTMS agencies consider this to be beneficial reuse under the LTMS Management Plan. To date, only relatively small quantities of "new" sand have been placed in the easternmost area of SF-8. If a permanent nearshore placement site off Ocean Beach is eventually designated, that site should be available to other projects with clean sand, as well.

SF-DODS: Off the Continental Shelf

In 1993, EPA published a Final Environmental Impact Statement (EIS) identifying SF-DODS as the environmentally preferred alternative location for a new ocean disposal site to serve the needs of the San Francisco Bay region. In August 1994 EPA formally designated SF-DODS as a permanent ocean dredged material disposal site [59 FR 41243, 40 CFR 228.15(l)(3)]. The location of the disposal site was chosen based on evaluation of data collected from extensive oceanographic and biologic field studies, and computer modeling of disposal characteristics, conducted over approximately three years (see EPA, 1993).

As part of the disposal site designation process, consultation was completed with NOAA to evaluate potential impacts to endangered species and other marine species associated with dredged material disposal operations at the environmentally preferred alternative site, as well as potential adverse impacts to the habitat within and around the site. However, possible impacts to Essential Fish Habitat (EFH) were not evaluated explicitly because the Magnuson-Stevens Fishery Conservation and Management Act mandating EFH consultations had not yet been promulgated.

Description of SF-DODS

The San Francisco Deep Ocean Disposal Site (SF-DODS) is located approximately 55 miles offshore of the Golden Gate and 6 to 8 miles outside the outermost boundary of the Gulf of the Farallones National Marine Sanctuary (GFNMS) (Figure 6). It is off the continental shelf in water 8,200-9,850 feet (2,500–3,000 m) deep, making SF-DODS the deepest and farthest offshore of any ocean disposal site in the nation.

The disposal site itself is an oval with dimensions of 2.5 nautical miles east to west, by 4.5 nautical miles north to south. However, that is the shape and size of the overall site projected on the seafloor. Disposal operations must take place within a much smaller “surface disposal zone.” The surface disposal zone is a 600 m radius circle at the very center of the overall disposal site (Figure 7). The larger overall (oval) site boundary is the area of the seafloor within which most of the dredged material discharged within the surface disposal zone was expected, based on computer modeling conducted for the EIS, to deposit (settle) on the bottom.

Although all EPA-designated ocean disposal sites for dredged material are required to have SMMPs, SF-DODS is unique in that its SMMP was published via formal rulemaking [see 40CFR Part 228.15(l)(3)], so that the provisions of the SMMP are themselves regulations. The SMMP will be discussed further in the following sections.

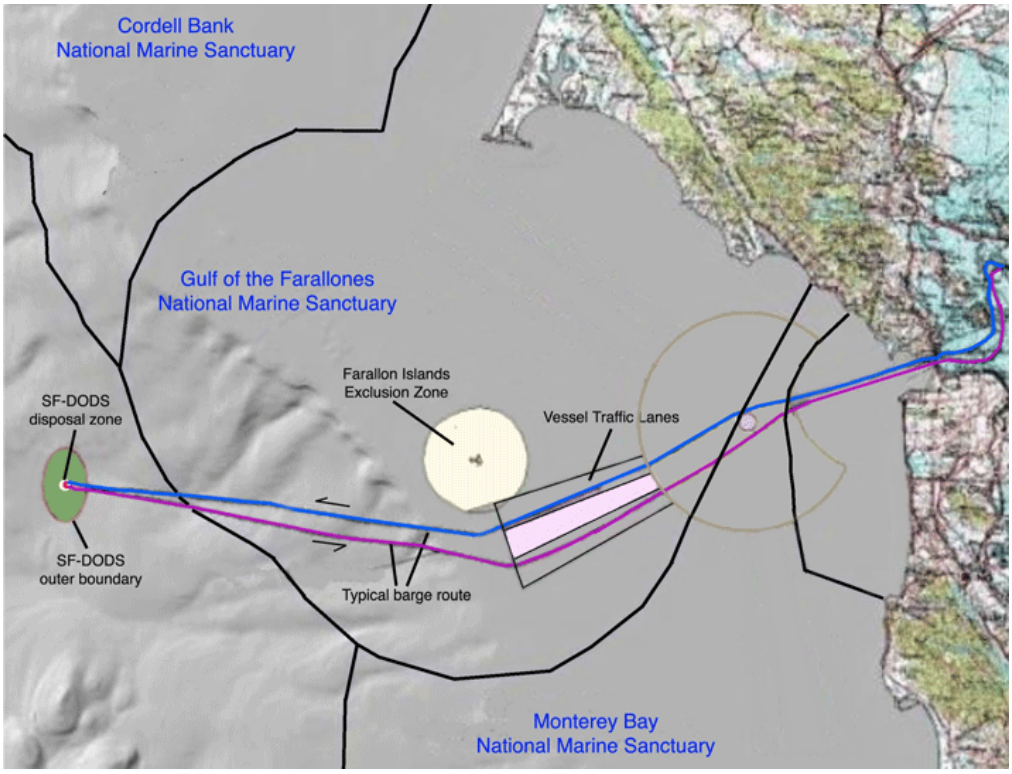


Figure 6. Location of SF-DODS in relation to San Francisco Bay, vessel traffic lanes, and the boundaries of three National Marine Sanctuaries. Also shown is a typical route for a barge disposing dredged material at the site.

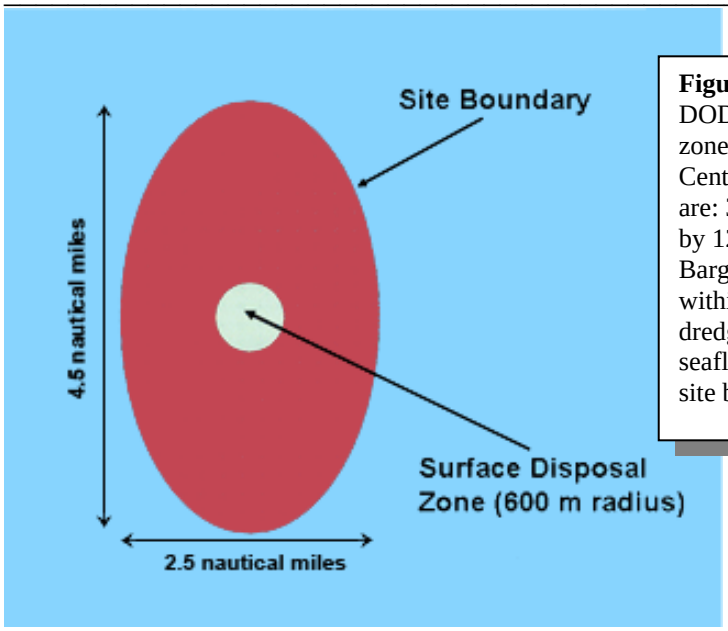


Figure 7. Shape and dimensions of the SF-DODS, showing the small "surface disposal zone" at the center of the overall site. Center coordinates of SF-DODS (NAD 83) are: 37º 39.0' North latitude, by 123 º 29.0' West longitude. Barges must discharge dredged material within the surface disposal zone, and the dredged material is expected to settle on the seafloor primarily within the larger (oval) site boundary.

EPA's Ocean Disposal Site Designation Process:
Avoiding Potential Fishery Impacts

Although EFH consultation was not explicitly conducted when SF-DODS was created, EPA's own site designation process and regulations (under the Marine Protection, Research, and Sanctuaries Act – MPRSA – and under the National Environmental Policy Act – NEPA) independently require evaluation of a variety of factors that are germane to any EFH evaluation. For example, EPA's MPRSA regulations include five general (40 CFR Part 228.5) and 11 specific (40 CFR Part 228.6) disposal site selection criteria. Four of the five general criteria, and six of the 11 specific criteria, are intended to directly reduce potential impacts to fisheries, and fish and shellfish habitat including water quality. These criteria most directly relevant to EFH are:

- "The dumping of materials into the ocean will be permitted only at sites selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries" [228.5(a)];
- "Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions … can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any … marine sanctuary, or known geographically limited fishery or shellfishery" [228.5(b)];
- "The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts" [228.5(d)];
- "EPA will, whenever feasible, designate ocean dumping sites beyond the edge of the continental shelf" [228.5(e)];
- the location of disposal sites must specifically be considered "in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases" [228.6(a)(2)];
- "Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity" must be considered [228.6(a)(6)];
- "Existence and effects of current and previous discharges and dumping in the area (including cumulative effects)" must be considered [228.6(a)(7)];
- "Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean" must be considered [228.6(a)(8)];
- "The existing water quality and ecology of the site" must be considered [225.6(a)(9)]; and
- "Potentiality for the development or recruitment of nuisance species in the disposal site" must be considered [225.6(a)(10)].

Taken together, the site selection criteria are intended to ensure that EPA ocean disposal site designations avoid significant impacts to any important fishery or supporting marine habitat to the

maximum extent practicable, even before any dredged material is permitted to be disposed there. The site designation EIS (EPA, 1993) specifically considered these site selection criteria for each of several alternative offshore study areas (Figure 8). The EIS evaluation was based on an intensive data set including extensive biological field investigations, and oceanographic data collection coupled with state of the art sediment dispersion and deposition modeling. Available commercial fishery catch data were also evaluated (Figure 9). The location that best met all the site selection criteria, including minimizing the potential for impacts to fisheries and supporting marine habitats, was Alternative Site 5 in Study Area 5. This was identified as the environmentally preferred alternative in the EIS. EPA then selected the environmentally preferred alternative location to designate as the SF-DODS.

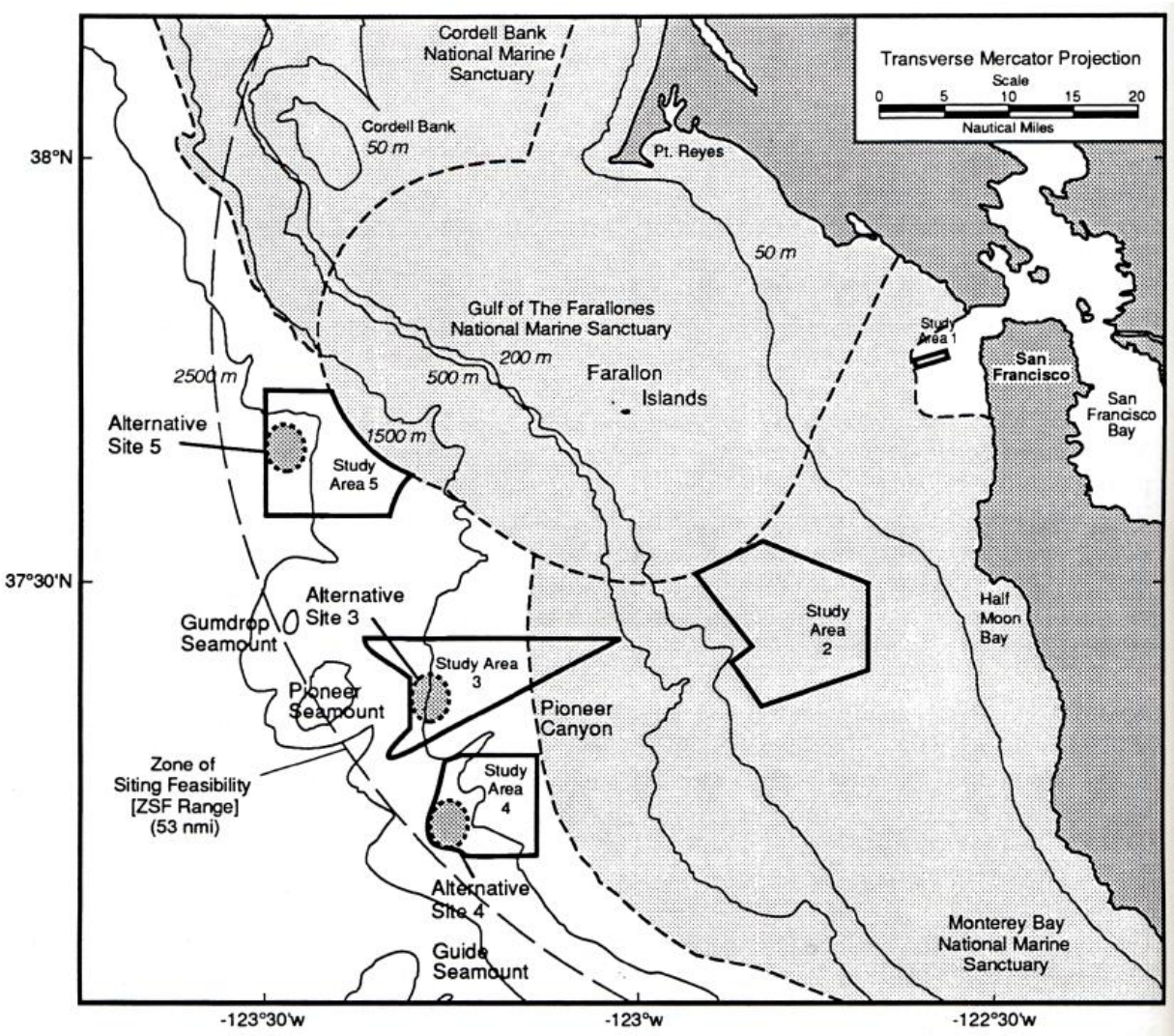
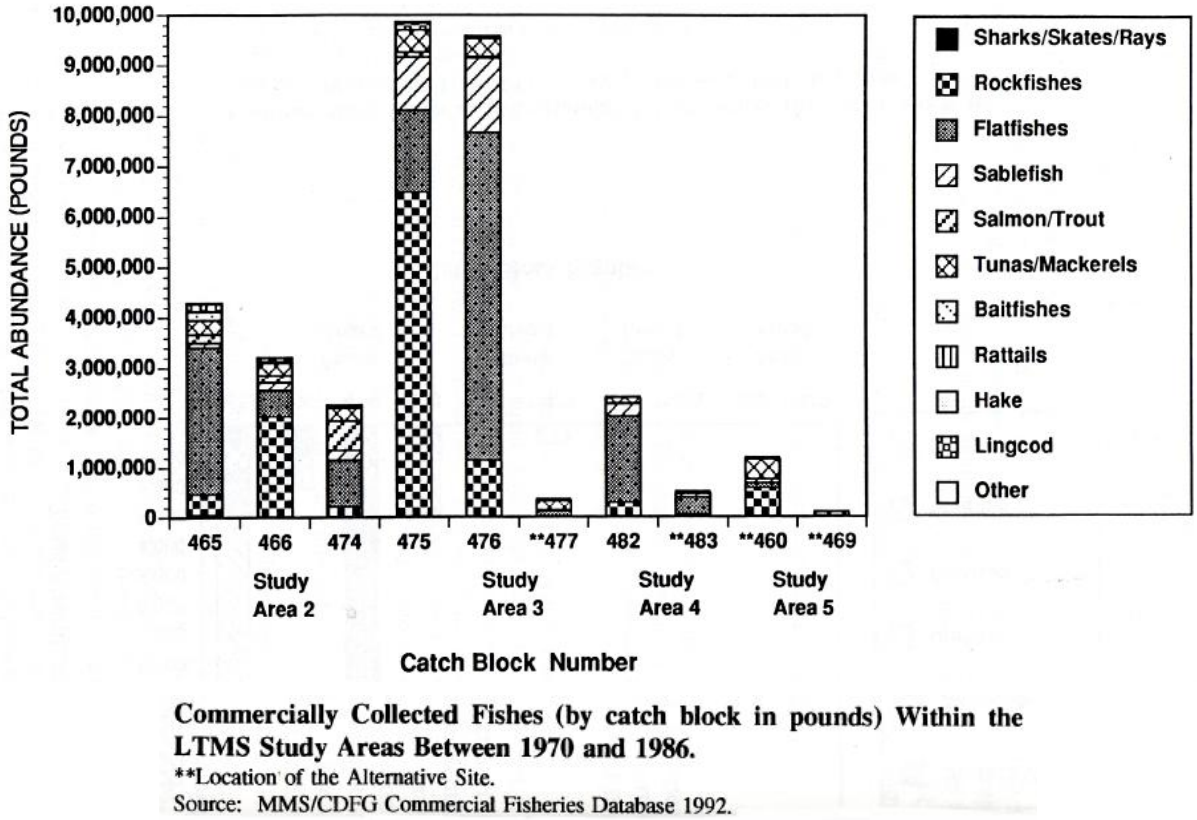


Figure 8. Location of study areas and alternative disposal sites evaluated in the site designation EIS (EPA, 1993).



Commercially Collected Fishes (by catch block in pounds) Within the LTMS Study Areas Between 1970 and 1986.
**Location of the Alternative Site.
Source: MMS/CDFG Commercial Fisheries Database 1992.

Figure 9. Commercial fish catch data for the Study Areas evaluated in the site designation EIS (EPA, 1993). The SF-DODS is within Study Area 5, which is within catch block numbers 460 and 469. These blocks had among the lowest overall commercial fisheries catches for the 16-year period of record available at the time.

Even though the SF-DODS location was selected on the basis of minimizing the potential for any adverse impacts, there were still a number of concerns raised by the public. Among these were:

- Whether the pre-dredging and disposal physical, chemical, and biological evaluations required under the national EPA/USACE Ocean Testing Manual (OTM) (EPA/USACE 1991) is adequately protective against potentially toxic or overly contaminated material being dumped at the SF-DODS (or any site);
- The possibility of impacts from disturbance, accidents, or spills from disposal vessels transiting past the Farallon Islands and through the Gulf of the Farallones National Marine Sanctuary en route to the disposal site;
- The possibility for intentional “short dumping” since the site is far off shore and disposal vessels would generally not be able to be tracked from shore either visually or by radar;
- The feasibility of monitoring the seafloor for potential impacts of disposal, since routine monitoring of such a deep disposal site had not been conducted before in the U.S.; and
- Whether suspended sediment plumes from disposal operations at the site could drift into the Sanctuary, and if so whether adverse impacts to water column organisms might occur.

These issues of public concern are addressed both by the ocean dumping regulations and their associated dredged material testing guidelines, and by a number of specific management and monitoring provisions included in the SF-DODS SMMP itself. The ocean dumping regulations are discussed in the next section. Following that, a discussion of the specific SMMP requirements for SF-DODS is presented.

Dredged Material Regulations:
Further Minimizing Potential Impacts

In addition to avoiding impacts via careful consideration of the best location to designate an ocean disposal site, EPA's regulations are also very strict about both when dredged material can be considered for disposal, and the quality of any material that is allowed to be disposed.

First, the need for ocean disposal must be established (40 CFR Part 227.14-16). If it is practicable (feasible and affordable) to reuse dredged material for beneficial purposes, EPA will not concur in the USACE's issuance of an ocean disposal permit, even if that material is chemically and biologically suitable for ocean disposal. The beneficial reuse of as much Bay area dredged material as possible is also a fundamental goal of the LTMS. The LTMS agencies and regional maritime and environmental interests have made great strides in increasing both the capacity for and the feasibility of beneficial reuse since the LTMS Management Plan was published in 2001. Nevertheless, to date beneficial reuse has been practicable for less than half of the dredged material being generated in the area. Aquatic disposal presently remains necessary for the remainder. Whenever feasible, ocean disposal of this remaining material is environmentally preferable to disposal at the traditional in-Bay sites. As noted, over 11 million cubic yards of suitable dredged material have been diverted from in-Bay disposal to SF-DODS to date. This substantial reduction of in-Bay disposal volumes has materially helped the region achieve, and remain in compliance with, the LTMS disposal targets for each of the first six years of LTMS implementation.

Second, even when beneficial reuse is not feasible so that ocean disposal may be proposed, only dredged material meeting strict guidelines for disposal suitability are allowed to be discharged. EPA's ocean dumping regulations (see especially 40 CFR Part 227) specify that certain prohibited constituents may not be disposed in the ocean at all (227.5), while other constituents may only be discharged if they are present in no more than "trace" amounts (227.6). The regulations further specify that "trace" is to be determined based on the results of certain toxicity bioassays and bioaccumulation evaluations in relation to an appropriate reference sediment site. EPA and USACE have jointly published national sediment testing guidance that describes how this testing is to be done (the 1991 Ocean Testing Manual, "Evaluation of Dredged Material Proposed for Ocean Disposal", EPA-503/8-91/001).

Note that the EPA regulations, and the Ocean Testing Manual based on them, substantially fulfill the United States' implementation of an international treaty, the "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter", also known as the London

Convention of 1972. The London Convention, the MPRSA, EPA's ocean dumping regulations, and the EPA/USACE sediment testing requirements all ensure that dredged material that is potentially toxic, or that may cause significant bioaccumulation of contaminants into the food web, may not be disposed in ocean waters. This protection is in addition to and independent of the avoidance of potential impacts afforded by careful up-front selection of the disposal site itself. The remaining public concerns needed to be addressed on a site-specific basis. EPA therefore incorporated a number of extra provisions into the SMMP.

SF-DODS Site Management and Monitoring Plan Requirements: Protecting Against and Monitoring For Unexpected Impacts

The SMMP for SF-DODS sets forth requirements for all major aspects of site use and management, including a maximum disposal volume limit of 4.8 million cy per year (tied directly to the LTMS Management Plan), restrictions on barge loading and transportation in bad weather (to minimize risk of spillage or leakage during transit through the Marine Sanctuaries), and navigation restrictions (to avoid disturbance near the Farallon Islands). In addition, there are extensive provisions for monitoring all disposal operations to ensure compliance with these restrictions, and for comprehensive environmental monitoring of the site:

- Compliance monitoring of each disposal project. The SMMP mandates:
  - Inspection of each disposal vessel for proper loading and other requirements, prior to departing for SF-DODS
  - Automatic, tamper-proof satellite tracking of the route of each disposal trip
  - Automatic, tamper-proof monitoring of disposal vessel load (draft and bin sensors)
  - Automated alerts when operations are potentially outside of required parameters
  - Extensive record-keeping of all disposal operations

- Annual physical-chemical-biological monitoring of the disposal site
  - Dredged material deposition patterns ("footprint mapping")
  - Chemical characterization (on and off footprint)
  - Benthic community sampling (on and off footprint)

- Regional monitoring. Several years of monitoring for any regional impacts to:
  - Seabird and marine mammal populations or distributions
  - Pelagic organism populations or distributions (including juvenile fish)
  - Water quality parameters (including nutrients)

- "3rd year confirmatory monitoring" was required that addressed:
  - Oceanographic conditions (additional current meter deployment)
  - Plume monitoring
  - Field bioaccumulation studies
  - Solid phase chemistry and bioassays, to compare with pre-dredge testing

Compliance monitoring takes place on a project-by-project basis, and EPA takes enforcement

action when necessary. The following discussions briefly summarize the results of the various monitoring studies of the SF-DODS itself. Note that EPA is now in the process of preparing a detailed technical report synthesizing the last 12 years of monitoring. This synthesis report is expected to be complete in early 2008.

SF-DODS Annual Monitoring: Confirming That No Significant Impacts Have Occurred

The SF-DODS has been monitored annually since the site was formally opened for dredged material disposal and began receiving material in 1995. This disposal site receives the most intensive monitoring of any disposal site in Region 9, and it is one of the most actively and intensively monitored sites in the nation. To date 12 years of monitoring data have been collected for SF-DODS, at an average cost of approximately $1 million each year.

Overall, the management goal for the SF-DODS is that impacts be primarily physical (burial, grain size changes, etc.), that even these effects are largely limited to the disposal site boundaries, and that no significant off-site chemical or biological effects occur. Although the site was originally designated based on evaluating the impacts of disposal of up to 6 million cy per year (and no significant adverse impacts were expected at that volume), EPA later reduced the maximum annual disposal volume to 4.8 million cy per year to dovetail with the LTMS Management Plan. In actuality, the site has received no more than about 3 million cubic yards of dredged material in any one year and most years have seen much lower disposal volumes than that. (The lowest annual volume has been on the order of 200,000 cubic yards. Over the last few years most disposal has been from USACE maintenance dredging of the Oakland Harbor and Inner Richmond Harbor federal channels, and from the Port of San Francisco Pier 35 project, overall totaling about 400,000-1,000,000 cubic yards per year.) Figure 10 summarizes disposal volumes at SF-DODS through 2006.

Disposal Footprint Mapping. Given the great depth of SF-DODS, acoustic methods are not sufficiently accurate to identify relatively thin build-ups of dredged material on the seafloor. Therefore footprint mapping is performed using a Sediment Profile Imaging (SPI) system (Figure 11). This system, which is physically lowered to the seafloor, captures images of a cross section of the upper 10-30 cm of sediment, and can detect deposits of dredged material that are as little as several millimeters thick. An example SPI image is shown in Figure 12. Dredged material footprint maps are compiled each year from the SPI images. The footprint maps are then used to determine the on site and off site stations to be sampled for chemical and biological monitoring (discussed below). A typical dredged material footprint map is shown in Figure 13.

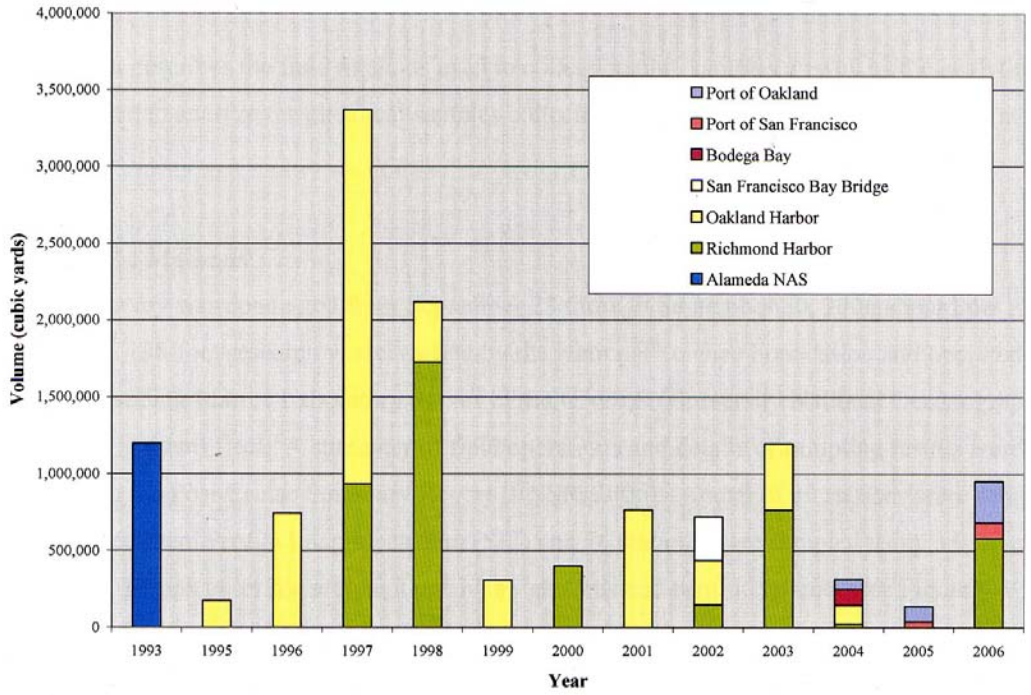


Figure 10. Volumes of dredged material disposed at SF-DODS 1993-2006. (Note: the 1993 disposal was US Navy material placed at a one-time-use site in the same location, but before designation of the SF-DODS as a permanent disposal site.)

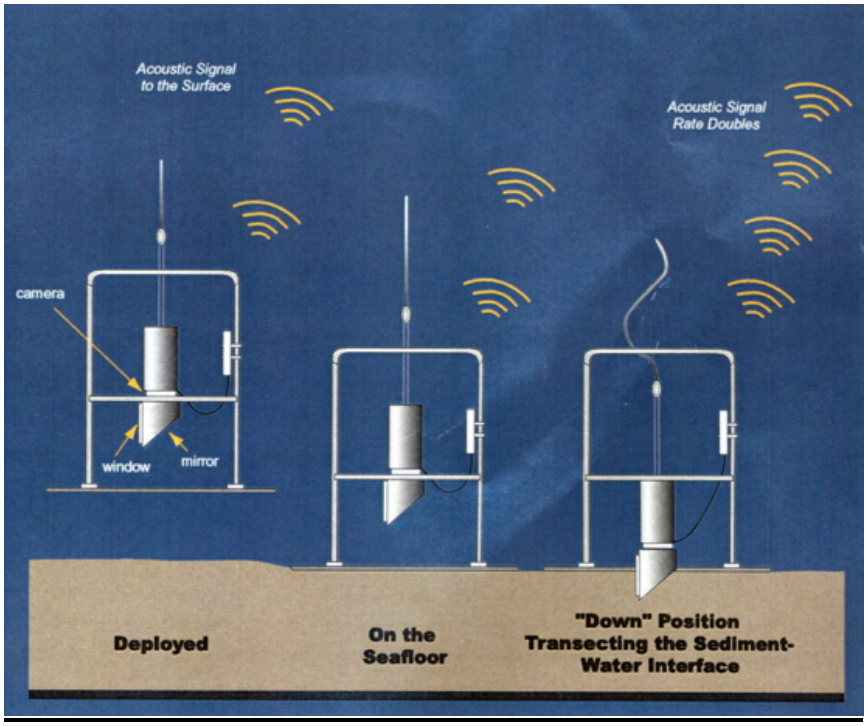


Figure 11. Schematic of the Sediment Profile Imaging (SPI) System (courtesy of Germano and Associates).

Figure 12. Example Sediment Profile Image (approx. 15x30 cm cross section). Hi-resolution photos of the upper several cm of sediment can identify a number of important parameters not easily assessed with traditional acoustic bottom mapping techniques. These include thickness of newly deposited dredged material, depth to redox discontinuity, grain size and texture, and the successional "stage" of the benthic infaunal community. This image of an undisturbed bottom shows no dredged material deposit, and the presence of a "stage 3" community as indicated by the large feeding void.

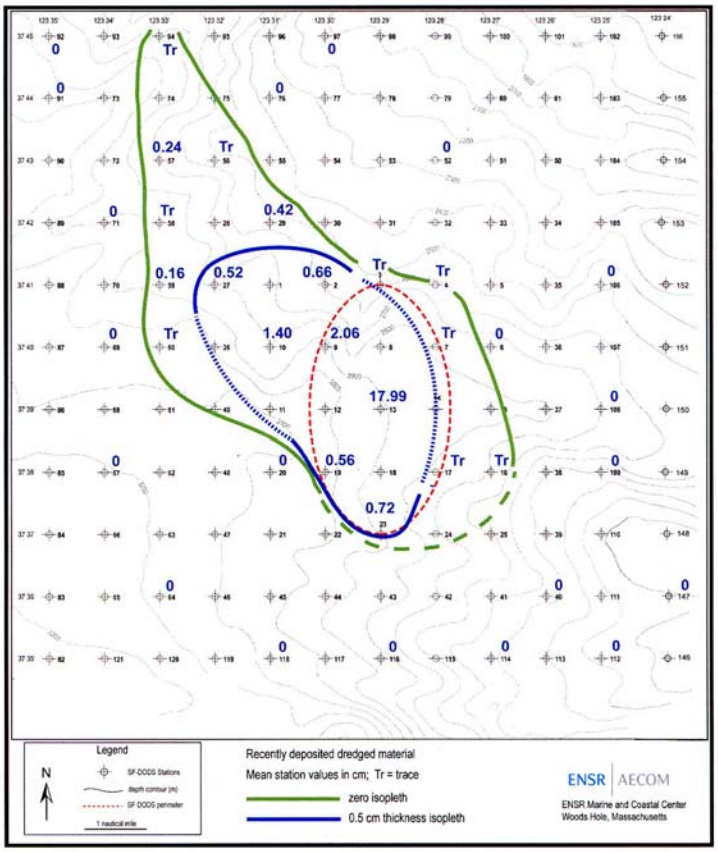


Figure 13. Dredged material distribution and thickness (in cm) measured during the 2006 SF-DODS survey. At the time of this survey, approximately 700,000 cy of material had been discharged at the site since the previous survey. Note that outside the disposal site boundary there are no deposits of 5 cm or greater (the thickness considered significant in the EIS).

The annual footprint mapping has confirmed that significant deposits in any one year have been restricted to within the disposal site boundaries with only very limited exceptions. As expected based on computer dispersion modeling performed for the EIS, the deposition of material outside the disposal site boundaries in any one year has generally been less than 5 cm, an annual deposition rate identified in the EIS as not likely to cause significant physical impacts to most infauna or epifauna present. Figure 14 shows a comparison of the deposit predicted based on the computer model used for the EIS, with the actual deposit found by site monitoring survey.

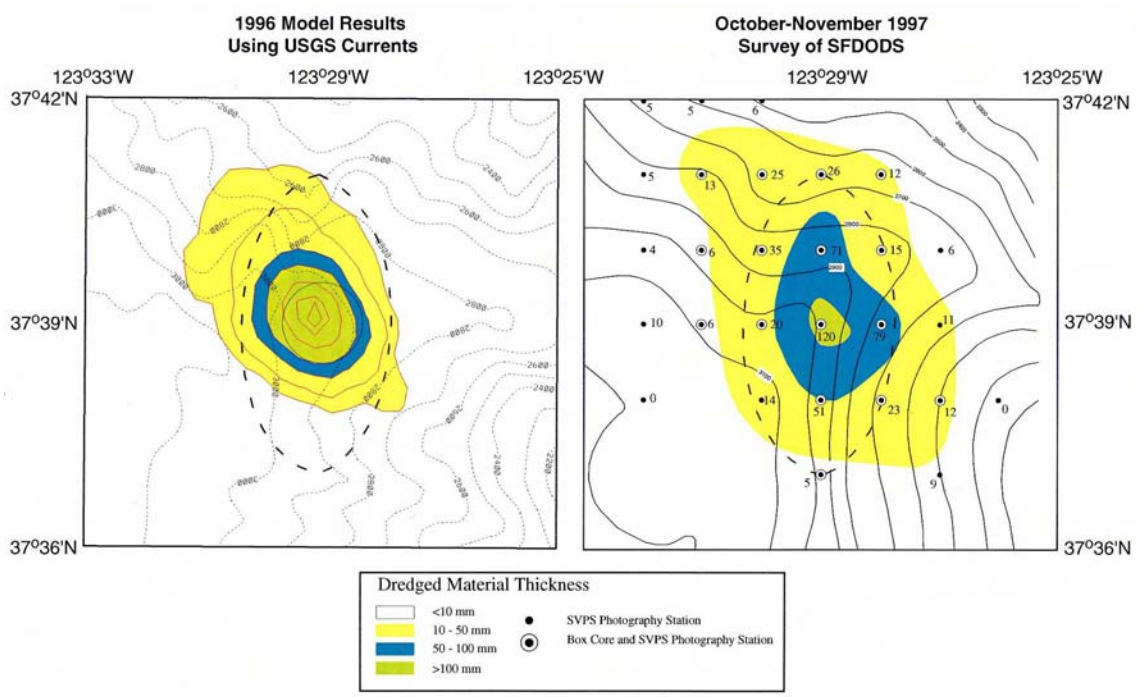


Figure 14. Predicted and actual dredged material deposit at SF-DODS, for 1996 (from SAIC, 2001). Left panel is the computer model prediction of deposition pattern and thickness. Right panel shows actual deposition pattern and thickness (in mm) from annual site monitoring.

Sediment Chemistry. Each year, sediment samples from both on site and off site (beyond the dredged material deposit) have been retrieved via boxcore for chemical and biological (infaunal community) analyses. The chemical monitoring has confirmed that levels of contaminants in the dredged material actually deposited at the site are consistent with pre-disposal sampling and testing results for dredging projects discharging material at SF-DODS (Table 1). In other words, the pre-disposal sampling and testing programs have in fact been adequately representative of the material eventually dredged and disposed there from a chemical contamination standpoint – major "hot spots" have not fallen through the cracks.

	2006 SF-DODS Site-Wide		2006 SF-DODS DMF		2006 SF-DODS Ambient		SF-DODS 1996–2005 Results		SF-DODS 1990–1991 (Baseline Data)	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Conventionals (DW) (%)										
Total Solids	30.8	55.0	34.9	55.0	30.8	32.8	28.2	65.2	24.6	31.5
TOC	1.01	3.17	1.01	2.51	2.85	3.17	0.50	5.60	3.20	3.90
Fines	41.9	97.83	41.92	79.44	88.1	97.83	30.1	98.44	77.00	96.00
Metals (mg/kg)										
Arsenic	2.93	8.30	2.93	8.30	3.50	4.43	1.40	9.90	4.40	6.62
Cadmium	0.13	0.528	0.139	0.292	0.29	0.528	0.10	2.80	0.280	0.380
Chromium	51.7	86.10	51.70	80.50	84.5	86.10	31.1	120.0	100.0	167.0
Copper	24.0	64.20	24.00	45.40	42.4	64.20	7.30	62.0	41.00	62.00
Lead	6.17	19.80	6.17	19.80	7.44	8.43	4.40	44.0	5.25	12.00
Mercury	0.08	0.222	0.087	0.222	0.13	0.161	0.02	0.30	0.13	0.21
Nickel	50.0	86.40	50.00	76.00	83.2	86.40	4.80	97.0	77.00	115.0
Selenium	0.40	3.90	0.40	2.90	3.50	3.90	0.23	5.00	2.80	9.37
Silver	0.24	0.634	0.240	0.634	0.49	0.618	0.04	2.40	0.45	0.87
Zinc	54.5	113.0	54.5	94.7	102.	113.0	34.8	140.0	99.0	147.0
Pesticides/PCBs (µg/kg)										
Dieldrin	0.73	1.3	0.73	1.2	1.3	1.3	0.3	3.4	-	-
Total DDT	2.26	4.60	2.26	4.60	3.80	4.50	0.6	11.5	-	-
Total PCBs	55.8	104	55.8	95	103	104	1.6	21	-	-
Alpha-BHC	0.73	3.0	0.73	3.0	1.3	1.3	0.2	12.0	-	-
SVOCs (µg/kg)										
Total LPAH	17.4	1298	17.4	1298	22.9	33.4	4.4	163.0	92	92
Total HPAH	36.8	3229	36.8	3229	56.7	97.6	12.0	1436	220	220

Table 1. Summary of surface sediment chemistry at SF-DODS (modified from ENSR, 2007). Minimum and maximum values are given for all stations monitored in 2006 ("Site-Wide"), for the 2006 dredged material footprint ("DMF"), for 2006 stations without dredged material ("ambient"), for all previous monitoring results combined (1996-2005), and for the 1990-1991 (pre-disposal) baseline. Note, individual PAHs, PCB congeners, and DDT isomers are not shown. Non-detect compounds, including organotins and a number of other pesticides, are also not shown.

Benthic Community Monitoring. Benthic biology samples from both the dredged material footprint and reference (ambient) sediments have also been collected annually, and archived. These samples were recently analyzed (ENSR, 2005) to assess any benthic community changes associated with dredged material disposal operations over the first 10 years of site use. It was determined that no long term adverse impacts have been occurring in the vicinity of the SF-DODS and that even on site, there is rapid re-colonization and re-establishment of benthic communities that are indistinguishable from other comparable benthic communities in adjacent areas containing ambient undisturbed sediments.

Regional Pelagic Monitoring. For the first several years of disposal operations at SF-DODS, regional monitoring of water column parameters and pelagic organisms (principally plankton and juvenile fish) was also conducted seasonally each year. The results of this monitoring are presented in McGowan et al., 2003, and very briefly summarized below.

Upper water column monitoring was conducted from 1996 through 2001. The monitoring surveys were focused on water quality parameters including nutrients, and pelagic organisms including species important to commercial and recreational fisheries, over a study area of about 25 square nautical miles centered on the SF-DODS. These studies characterized the distribution and abundance of species, and later assessed physiological condition of species, within and outside of the boundaries of the SF-DODS. The biological data were complemented by oceanographic measurements (i.e., physical and chemical seawater properties) in order to differentiate whether any patterns seen were caused by disposal of dredged materials or by naturally occurring variations on physical and chemical properties of seawater in the region.

Analysis of the data showed no direct or indirect effects of disposal operations on population abundance, species distribution, or physiological condition of selected zooplankton, fish larvae, or juvenile fishes that could be related to the use of the SF-DODS. Negative impacts of dredged material disposal at the SF-DODS on upper water column organisms outside of the disposal site boundaries were not observed. Instead, regional oceanographic conditions and seasonal and interannual variability, including El Nino and La Nina events, appeared to be the major influences on the distribution and abundance of species.

"3rd Year Confirmatory Monitoring." Finally, the SMMP called for a "3rd year confirmatory monitoring" program (actually conducted in the fourth year of site use) to more intensively address some uncertainties from the site designation EIS. These studies included:

- Re-deployment of current meters, and use of the new data to compare with and confirm the predictive computer modeling conducted for the original site designation EIS regarding plumes and bottom deposition of sediments;
- Deployment of mid-water sediment traps and caged mussels, to confirm plume movement and to evaluate the potential for bioaccumulation as a result of long-term exposure to repeated suspended sediment plumes;
- Performance of benthic toxicity bioassays and bioaccumulation tests on sediment

collected after discharge and deposition at SF-DODS, as a check on whether pre-dredge sediment testing adequately represents the sediment actually deposited at the site.

The results of the 3rd year confirmatory monitoring studies are presented in Battelle (2000) and SAIC (2001). The additional year of current meter information confirmed that the mid- and deep-water currents are of low velocity that would not transport suspended sediment particles great distances.

The sediment trap and caged mussel studies confirmed that long-term bioaccumulation was not occurring via water-column exposure to suspended sediment plumes from repeated disposal events, either within the disposal site itself or nearer to the Sanctuary boundary. However, an additional finding from the sediment trap deployment was that disposal barges appeared to be leaking or spilling some sediment en route, before ever reaching SF-DODS. Based on this evidence, EPA spent considerable time analyzing the automatic draft sensor data for well over 1,000 disposal trips, and determined that certain disposal barges were in fact chronically losing material during transit. In addition to taking enforcement action (including significant monetary penalties as well as requiring that disposal barges be repaired and better maintained), EPA improved and tightened the tracking, sensing, and reporting requirements for all site users. Today all projects include an automated e-mail alert system that notifies EPA and other key agencies whenever disposal trip experiences a potential problem (such as loss of one foot or more of vessel draft during transit, or disposal outside the specified Surface Disposal Zone). This way any problems are discovered immediately, and corrective action can occur right away.

The toxicity and bioaccumulation tests conducted on dredged material retrieved from the disposal site confirmed that pre-dredge sediment testing in accordance with the Ocean Testing Manual (EPA and USCE, 1991) has been representative of the material approved for disposal. Pre-disposal testing is designed to representatively sample the in situ sediment, and to identify and eliminate from ocean disposal any material that is significantly contaminated, that is toxic to water column or benthic organisms, or that presents a food web risk due to bioaccumulation. However, the pre-dredge testing is based on discrete sediment samples taken throughout the area to be dredged, and public concerns often center on whether the sampling is adequate to catch “hot spots” if the sediment quality in the area is heterogenous. Post-disposal testing is a direct check on this concern. Sediments retrieved from SF-DODS during the confirmatory monitoring were subjected to the same solid-phase toxicity and bioaccumulation bioassays as pre-dredged sediments are subjected to. In all cases, the bioassays again passed: there was no benthic toxicity and no significant bioaccumulation. These results, along with the annual chemical monitoring and the presence of healthy, diverse benthic communities on and around the disposal site, confirm that the pre-dredge testing is adequately and accurately characterizing the material actually discharged at SF-DODS.

CONCLUSIONS

The LTMS program for management of dredged material in the San Francisco Bay region (LTMS 1996; LTMS 2001) calls for minimizing dredged material disposal in the Bay and maximizing beneficial re-use of dredged material, to the greatest extent practicable. Reducing in-Bay disposal is one of the program's primary components for avoiding and minimizing risks and impacts to fishery resources and habitats, including EFH. Ocean disposal is an environmentally superior alternative to the traditional unconfined aquatic disposal sites within San Francisco Bay and Estuary. As such, SF-DODS is integral to achieving the overall goals of the LTMS, especially during the Transition Period when beneficial reuse alternatives are still becoming available and practicable to use.

This evaluation has summarized several reasons why, under the LTMS program, ocean disposal of sand at SF-8 or of other dredged material at SF-DODS represents no significant threat to marine resources, fisheries, or Essential Fish Habitat. In particular:

- The SF-DODS location was specifically selected to avoid any conflicts with or impacts to marine resources, fisheries, or marine habitats to the maximum extent possible.
- Only suitable dredged material may be disposed at SF-DODS, and only after the need for ocean disposal has been established for each project.
- Intensive monitoring of SF-DODS confirms that the pre-dredge sediment testing program mandated by regulation and by EPA/USACE joint national guidance is representatively characterizing the material, and that toxic or highly contaminated material is not being discharged.
- No significant adverse physical impacts have been identified off site, and no indication of any significant chemical or biological impacts have been found either off site or on site.
- Regionally, juvenile fish and plankton populations and distribution patterns have not been adversely affected by disposal operations.
- Recolonization of benthic communities has been much more rapid and robust than had previously been anticipated by the scientific community. In fact, the intensive, multi-year monitoring of SF-DODS has resulted in the collection of an unprecedented amount of new information about the deep ocean benthic environment that has important scientific value far beyond the disposal site management needs of SF-DODS itself.

On this basis, EPA and USACE believe that a finding of "no effect" to EFH is appropriate concerning the ocean disposal aspects of the LTMS, and that no additional conservation measures are warranted beyond the extensive and active site management activities that are already in place.

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