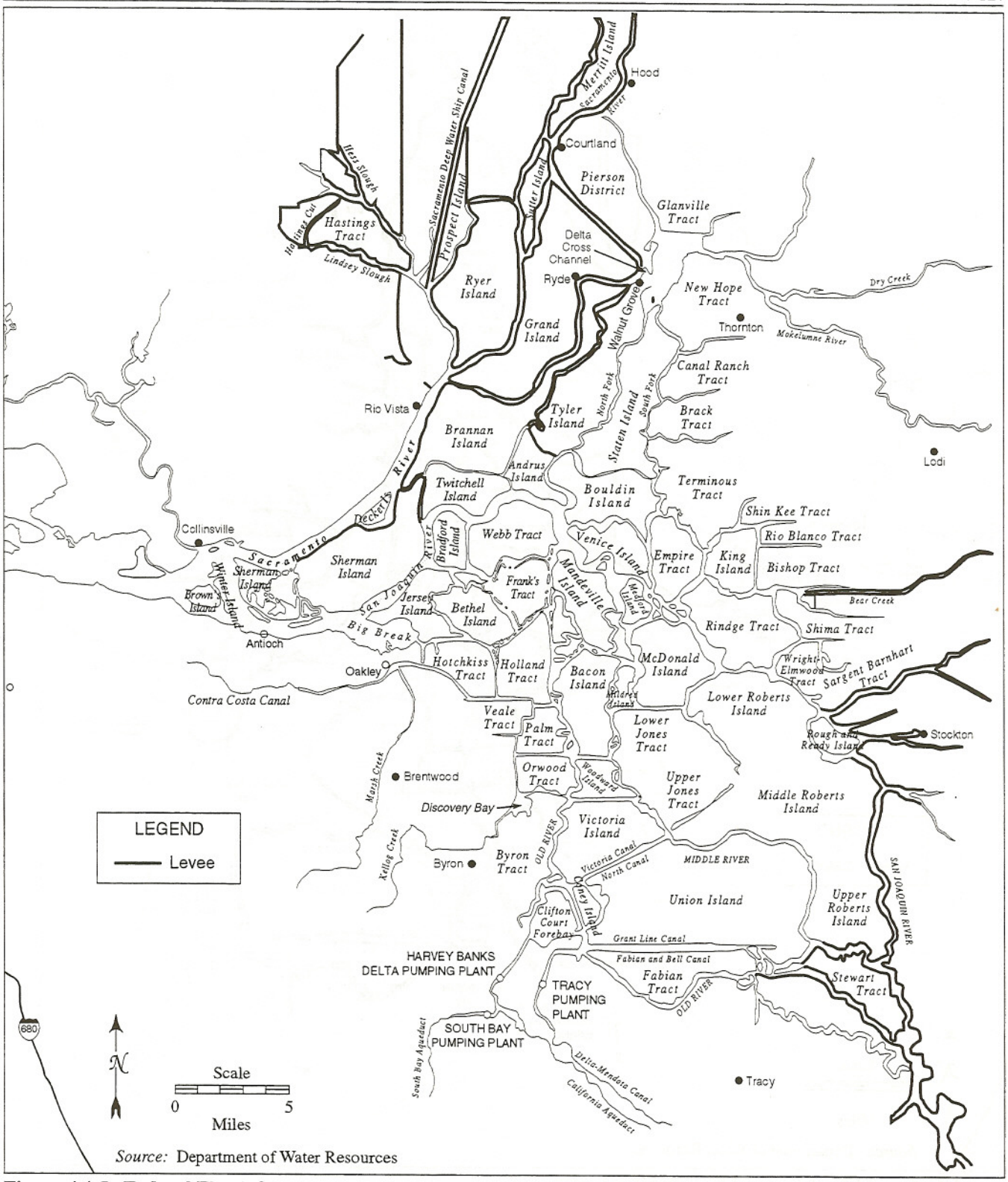


Figure 4.4-5. Federal Flood Control Project Levees

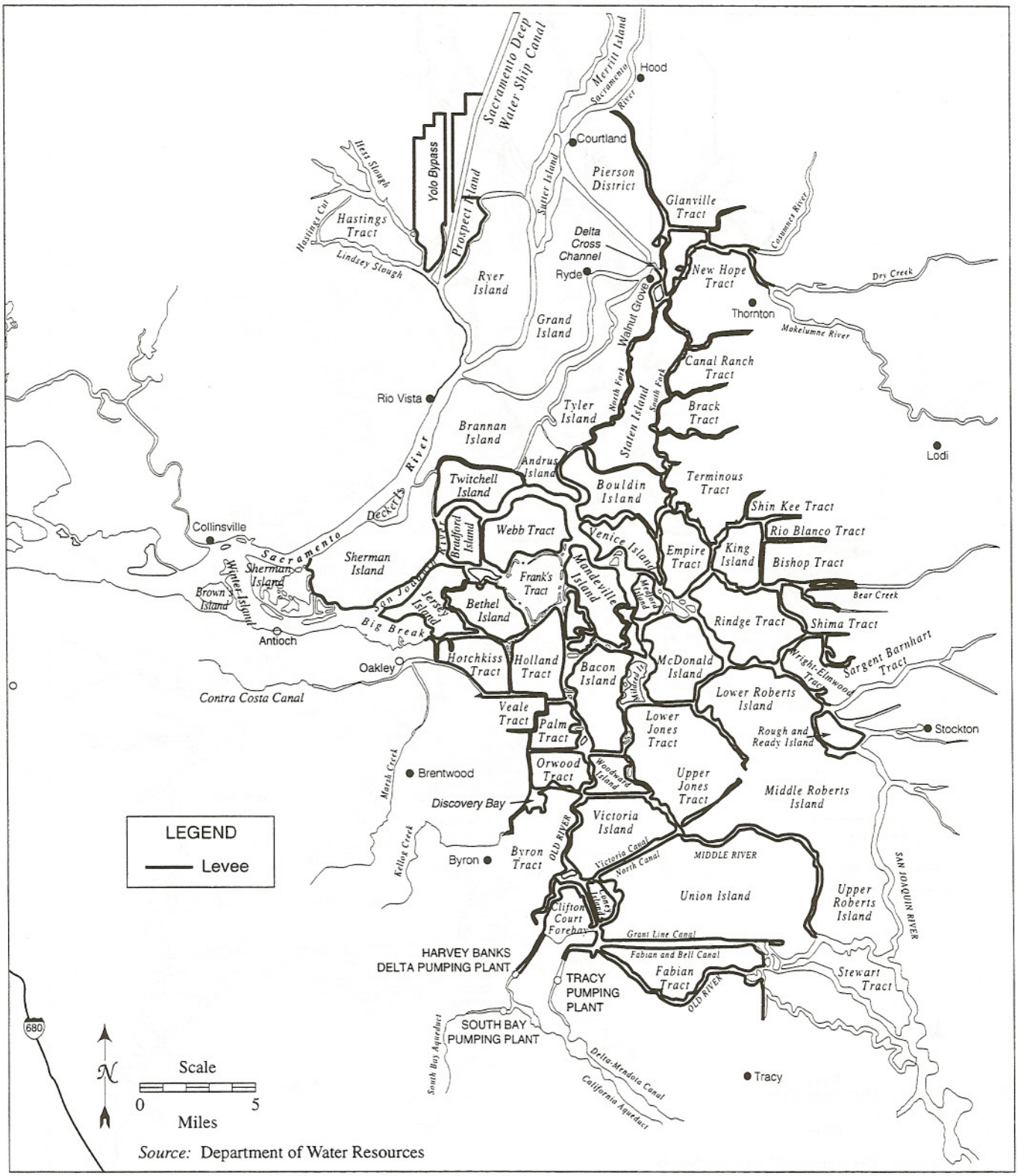


Figure 4.4-6. Local Flood Control Non-Project Levees

protecting sensitive riparian habitat. Design standards currently applied in the Delta incorporate COE, FEMA, and the DWR criteria.

Material sources for Delta islands levee maintenance include, in some cases, higher areas in each island or quarries or other sites outside of the Delta. The use of material dredged from maintenance dredging projects in and outside the Delta has also been demonstrated to be highly feasible on pilot project levee upgrades on Sherman, Twitchell, and Jersey islands.

The Sherman Island Dredged Material Demonstration Project, initiated in 1990, used 1,600 cy of dredged material from Suisun Slough to construct a landside berm. Water quality monitoring was conducted by the DWR over a 2-year period on the island adjacent to the berm that indicated no soil contamination or adverse impacts on water quality. In a second project, 50,000 cy of material dredged from Suisun Bay Channel and stored on Simmons Island were incorporated into the levees on Twitchell Island. The DWR monitoring to date has not indicated any significant water quality impacts from increased salinity. However, problems such as subsidence of levee toe-drain sampling sites were noted by the staff of the CVRWQCB.

A third dredged material demonstration project was initiated on Jersey Island in 1994 to further evaluate whether water quality impacts would result from the placement of saline dredged material on the landside of Delta levees. Approximately 56,000 cy of material from Suisun Bay and 24,000 cy from New York Slough were placed on the levees. This material was dredged by clamshell with excess water discharged at the dredging sites. Sites adjacent to the levees are being monitored to determine whether water quality impacts occur, to validate DWR's salt loading predictions, and to establish information that can be used to determine the potential for water quality impacts caused by larger projects. See Appendix K for more information.

Levee Reuse — General Siting Criteria

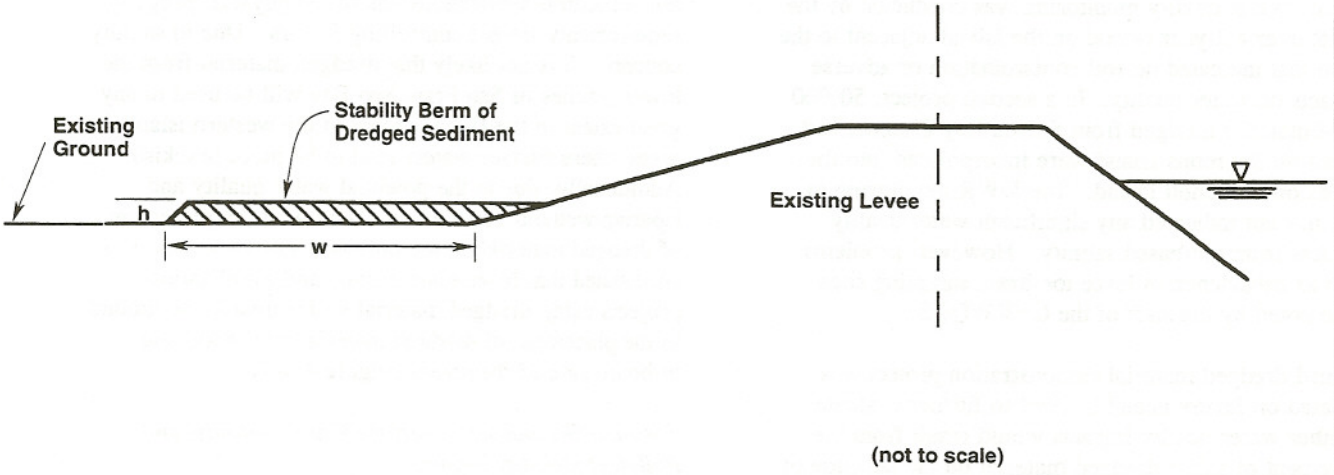
Levee rehabilitation projects using dredged material involve the transport of the material to the levee site by barge and the subsequent off-loading of the material by clamshell. Waterside access for barge delivery of dredged material is required. Depths to accommodate loaded barges should be a minimum of 15 feet MLLW. The off-loading clamshell can be located either on the levee top or on a waterborne barge.

Typically, clamshell equipment requires positioning a haul barge in 100 feet of the off-loading crane and in 200 feet of the levee placement. Other options, although less desirable, include the hydraulic pump-out of the dredged material to a temporary settling pond followed by stockpiling of the material, or off-site barge berthing with rehandling of the dredged material and temporary stockpiling. Both of these methods would likely involve overland transport of the material to the levee rehabilitation site. The movement of the material into place at the site would normally occur separately from the off-loading process, but could occur simultaneously.

For many levee projects, dredged material is used in non-structural applications where the physical property requirements are not controlling factors. Due to salinity concerns, it is not likely that dredged material from the lower reaches of San Francisco Bay will be used to any great extent in the Delta, except in the western island areas where surface waters tend to be more brackish. Additionally, due to the potential water quality and riparian wetland impacts associated with the placement of dredged material on the outboard side of levees, it is anticipated that levee maintenance and stabilization projects using dredged material will primarily be limited to the placement of dredged material on the top and in-board side of the levees (Figure 4.4-7).

Potential Groundwater, Surface Water, Salinity, and Pollutant Mobility Impacts

A principal concern with the placement of dredged sediments from marine or brackish water at an upland location in the Delta is the potential degradation of water quality due to the introduction of salts or other pollutants (i.e., heavy metals) to the relatively clean freshwater environment of the Delta. Although placement of dredged material on an inside levee face would not result in direct contact of the material with outside surface waters, the exposure of this material to precipitation during the winter rainy season may result in runoff that could carry salts or other pollutants into an island's return water collection system or result in contamination of groundwater. Because of these concerns, the CVRWQCB enacted Waste Discharge Requirements (WDR) for the Jersey Island Dredged Material Reuse Demonstration Project. For this project, the WDR included a detailed site monitoring plan designed to address questions regarding potential salinity and other pollutant migration associated with the use of dredged material in this manner.



Note: Dimensions of berm are dependent upon recommendations of geotechnical consultant and available material.

Figure 4.4-7. Illustrated Levee Stabilization Berm

There are several potential routes of salinity loading to the Delta environment from using dredged material for levee maintenance and stabilization: (1) initial release of free saline water during dredged material placement; (2) surface water runoff and erosion from the placed material; (3) long-term release of pore water containing salts; (4) surface water infiltration through levees; (5) spillage during transfer and unloading of material from the barge; and (6) island flooding due to levee failure (not necessarily associated with a reuse project) and subsequent resuspension of dredged material at the placement site.

In addition to direct dissolution of salts or other soluble constituent of concern, dredged material placed in the upland environment such as on the side of a levee or constructed berm may undergo a change in pH. The pH of dredged sediments may drop as sulfides in the sediment are oxidized and acid is created. The acidification of the material may solubilize metals that would otherwise be stable and bound to the sediment in its previous anoxic aquatic environment.

The placement of dredged material in a fresh water setting in the Delta also poses concerns regarding bromide ions. Bromide is a constituent of total dissolved solids (TDS) and is found in higher concentrations in sea water than fresh water. Bromide ions are a concern in regard to municipal water supplies. When raw water containing bromide ions is chlorinated for use as drinking water, trihalomethane (THM) compounds are created. Regulated under federal drinking water standards, the increased THM levels may result in water that exceeds state or federal drinking water standards for THM content.

Water discharged from levee maintenance and stabilization project sites that uses dredged material must meet the established water quality standards of the appropriate RWQCB. Additionally, levee maintenance and stabilization projects that use dredged material would likely be required to implement site-specific water quality monitoring programs, as necessary.

Further, even if a flooded island is reclaimed, significant short-term water quality impacts could occur during flooding events. During a previous island flooding under low-flow conditions, chloride levels reached levels well above the recommended concentration of 250 ppm. Water at the Contra Costa Canal Intake had chloride concentrations at 440 ppm.

The rehabilitation of levees in the Delta and Bay Area may result in some benefits to water quality. The rehabilitation of levees would result in a continued benefit to the quality of water transferred through the Delta for use throughout the state. Without rehabilitation, if a levee on one of the western Delta islands fails and the island floods, then the following long-term problems would likely result: (1) the area of the saline water mixing zone would increase; (2) the rate of fresh and salt water mixing would increase; (3) the path for ocean salt water intrusion into the Delta would decrease; and (4) the amount of evaporation losses in the Delta would increase. All of these factors would result in increased salinity intrusion to the Delta and subsequent degradation of the water quality for all beneficial uses of Delta water.

Overall, the use of dredged material for Delta island levee repair and maintenance is considered beneficial. Adverse water quality impacts associated with such uses would tend to be short term and localized on individual islands. Cumulative impacts associated with salinity loading to island environments may be significant. However, intra-island cumulative water quality impacts would need to be evaluated on a site-specific basis and are not addressed in this Policy EIS/Programmatic EIR.

Plant Community Impacts

The use of dredged material for levee rehabilitation and repair may result in the loss of, or substantial disturbance to, locally occurring plant communities, including plant communities that are present in the footprint of a constructed levee stabilization berm. However, levee repair and maintenance activities using dredged material would not be expected to be substantially different from those which use other materials for levee stabilization.

Although a demonstration project has recently been implemented using dredged sediments on Jersey Island, there is relatively little information available on the magnitude of potential effects on the levee plant communities. In general, where saline material is introduced into a freshwater environment, these sites may not support local native vegetation (especially those plants that comprise locally designated natural communities, including riparian habitat and freshwater marsh). Leaching of salts and contaminants may affect plant distribution in the adjacent habitats (including toe drains).

Special Status Species

The potential loss or displacement of species of special status resulting from dredged material reuse for levee

repair and maintenance activities is primarily a habitat degradation issue (see section 4.4.2.4 above). Several wildlife species that occur in the Delta and diked baylands are protected under the state of California and federal Endangered Species Acts (ESA). A number of birds, amphibians, reptiles, fish, and insects are candidates for state and federal listing and protection.

Potential impacts to special status species have altered the historic methods of levee maintenance in the Delta region. For example, materials for levee maintenance were traditionally dredged from slough and river channels adjacent to the levees; today, however, such dredging practices in the Delta channels are severely restricted. These restrictions are due to the potential impacts to fish and wildlife, including two endangered fish species, the Delta smelt and the winter-run chinook salmon. The current methods, which include the use of on-island material sources and importing material (from upland or dredging sources), have eliminated the impacts associated with levee-side material source dredging.

Upland impacts to special status species also affect the placement of materials on Delta island levees. Many of the existing levees on these islands have extensive wildlife habitat functions. Additionally, special status plant species may occur in some Delta island levees locations (see section 4.4.2.4 above). The placement of material on island levees may have both direct and indirect adverse impacts to species of special status, including the loss of habitat through direct burial, or off-site migration of dredged material or constituents contained in the material (e.g., salt, heavy metals). Although both policy-level and project-specific mitigation measures could be implemented to reduce the potential of adverse impacts to species of special status (see Chapter 5), potential impacts and appropriate mitigation would need to be evaluated on a case-by-case, project-specific basis.

Levee Reuse — Resources of Concern Summary Matrix

As with all dredged material reuses in the upland/wetland reuse environment, the use of dredged material for levee repair and stabilization activities presents both potential adverse environmental impacts and potential benefits (Table 4.4-16). As explained above, it is assumed that much of the dredged material used for levee maintenance and stabilization in the lower reaches of the Estuary will come from rehandling facilities rather than directly from dredging projects, as is expected to occur in the Delta. For levee repair and stabilization activities where dredged material is rehandled prior to reuse, the potential impacts associated with such reuse would not differ significantly from impacts associated with the use of material from other sources. This is due to the ability to select material at rehandling facilities that would be suited for such use, considering matching salinity regimes and background constituent concentrations. In the Delta region, however, the potential adverse impacts and potential benefits associated with dredged material reuse are much more evident.

As indicated in Table 4.4-16, salinity associated degradation is the primary potential impact associated with the use of dredged material for Delta levee repair and stabilization activities. An increased salinity in this environment has the potential to impact existing riparian wetlands, plant communities (including cultivated crops), and groundwater and surface waters, all indirectly affecting fish and wildlife habitat. These potential impacts are considered to be cumulative since many of the agricultural chemicals used in the Delta region also contain salts or other constituents of concern.

The protection of Delta islands, associated habitats, and water supplies from flooding impacts are the primary benefits from the use of dredged material for Delta island levee work. Although these benefits could be realized through the use of other material sources for levee repair and stabilization, such sources are often difficult or expensive to obtain in the Delta region.

4.4.5.3 Rehandling Facilities

The environmental and regulatory aspects associated with rehandling facility projects typically include coordination with multiple federal, state, and local regulatory and resource agencies to ensure that the project is properly designed and constructed to protect the air, land, surface waters, and groundwater from adverse impacts. This typically includes multiple permit actions. Additionally, many of the potential rehandling facility sites contain seasonal wetlands or other habitats that may require mitigation. Dredged material typically needs drying or processing to treat, reduce, and remove contaminants, including salts, before it can be transported and used beneficially or disposed as a waste at a landfill site. Rehandling facilities are mid-shipment points for dredged material that needs to be first dried or processed before final placement or because the end-use site is land-locked.

Table 4.4-16. Levee Reuse — Resources of Concern Summary Matrix

Resource	*Potential Impacts*	*Potential Benefits*	*Location*
Wildlife Habitat			
Riparian Wetlands	Salinity degradation	Levee stabilization and flood protection — habitat preservation	• On-site impacts • On-site and regional benefits
Levee	Salinity degradation	NA	• On-site impacts
Inner Island	Salinity degradation	Levee stabilization and flood protection — habitat preservation	• On-island impacts
Plant Communities			
Levee	Salinity impacts — habitat degradation	Levee stabilization and flood protection — habitat preservation	• On-site impacts • On-site benefits
Inner Island	Salinity impacts — habitat degradation	Levee stabilization and flood protection — habitat preservation	• On-site impacts • On-site benefits
Water Quality			
Agricultural Uses	Salinity degradation	Flood salinity plume protection	• On-site impacts • Regional benefits
Municipal Use	Salinity degradation	Flood salinity plume protection	• On-site impacts • Regional benefits
Domestic Use	Salinity degradation	Flood salinity plume protection	• On-site impacts • Regional benefits
Special Status Species	On-site and inner-island habitat degradation (salinity)	Flood protection — habitat preservation	• On-site and inner-island impacts • Regional impacts

Dried material from rehandling sites can be used for a variety of purposes. One of the more promising uses is as capping, lining, and daily and final cover material at landfills. The volume of material that can presently be taken to and reused at landfills in the project vicinity is extremely limited, in part because existing rehandling opportunities are very restricted. Over the next 50 years, the potential for using dried material for other purposes, such as highway construction, could also be high. There are several facilities in the Bay Area that have been used to rehandle and reprocess relatively small volumes of dredged material from specific dredging projects: at Port Sonoma-Marin, near the mouth of the Petaluma River; in the City of Petaluma, Sonoma County; and in the City of San Leandro, Alameda County.

A rehandling facility for landfill cover is typically a diked area for the temporary storage, drying, and processing of dredged material for excavation and transport to a landfill. Sites being considered in the LTMS are based on the placement of dredged material in lifts (elevations) of approximately 4 feet to allow for rapid drying of the material. Typically a large percentage of the dredged material that may eventually be rehandled by these types of facilities is expected to be slightly contaminated and unsuitable.

The types of dredged material that are processed in a rehandling facility can range from coarse-grain materials (cobbles, gravels, and sands) to fine-grain materials (silts and clays). Fine-grained materials, such as silts and clays, are the predominant material dredged from the Bay.

Rehandling facilities offer the potential to treat, reduce, or remove contaminants, including salts in dredged material. Rehandling facilities could also be designed to permanently store dredged material that is contaminated or unsuitable for unconfined aquatic disposal.

The cumulative capacity of rehandling facilities in the region would be sized to minimally accommodate material with elevated contaminant levels that is considered NUAD.

Dredged material from a rehandling facility, as described above, can be used for any beneficial reuse (end use) for which the dried material has suitable physical and chemical characteristics. Other potential

uses include general and/or engineered construction fills, soil amendment production operations, and any other use that is accepted by regulatory agencies, environmentally acceptable, and economically feasible. Through the LTMS, several potential opportunities for expanding existing rehandling opportunities have been identified.

Rehandling Facilities — Overview

A variety of policies and mitigation measures presented in this section and in Chapter 5 could be adopted and implemented to expand dredged material rehandling opportunities in the region to minimize or avoid potential impacts. Presently, rehandling facilities in the region have been used to process relatively small volumes of material from specific dredging projects. The ability to rehandle the volume of dredged material that could potentially be reused in the region (e.g., at landfills) is therefore extremely limited.

Dried material from rehandling sites can be used for a variety of purposes. One of the more promising uses is in landfills as capping, lining, and daily and final cover material. Rehandled dredged material could also be used for restoring and constructing levees. The capacity at rehandling facilities should be sufficient to serve a variety of reuse opportunities throughout the region. Siting goals for rehandling facilities would include the provision of adequate capacity to serve the range of reuse needs in the region for the next 50 years. The planning area for rehandling facilities would, therefore, be the entire Planning Area.

Rehandling Facilities — General Siting Requirements

Implementation of the LTMS would result in constructing or expanding rehandling facilities designed to dry and/or treat dredged material at key locations throughout the region. The development of such a network of rehandling facilities is necessary to efficiently process dredged material and thus increase upland dredged material reuse and disposal opportunities. Facilities siting would consider dredging and end uses locations as well as physical site characteristics (e.g., access to deep water, land-side transportation facilities) and environmental and land use constraints.

Habitat Conversion Impacts

Construction of rehandling facilities located in the diked baylands could result in the conversion of existing habitats to industrial uses. The existing ecological value of the diked baylands varies, influenced by human management practices and physical characteristics. Many sites include wetland habitat, which is particularly important for supporting waterfowl and shorebirds. The conversion of this habitat to industrial use would result in the loss of some important habitat functions for local and migratory shorebirds and waterfowl, including supplemental foraging habitat during high tides for small shorebirds, loss of nesting habitat for resident species, and winter storm refugia. Compared to existing diked baylands habitat, rehandling facilities would provide extremely limited habitat value. Therefore, no direct habitat benefits would be associated with the development and operation of rehandling facilities. Impacts from the conversion of habitats would be less likely for rehandling facilities that would be sited outside the baylands (e.g., in urbanized areas).

Construction of rehandling facilities prior to the implementation of the LTMS Policy-Level Mitigation Measures could result in potentially significant habitat conversion impacts. As discussed in Chapter 5, the significance of impacts associated with the development of rehandling facilities (i.e., the loss of seasonal wetlands) could be reduced through careful site selection, minimizing impacts associated with habitat function losses (i.e., rehandling facilities could be preferentially sited in areas with less acreage of existing seasonal wetland habitat).

Water Quality and Pollutant Mobility Impacts

The physical properties of dredged material affect the storage capacity of the site due to material bulking and sorting characteristics. The chemical characteristics of dredged material can affect surface waters or leach into groundwater during off-loading and processing waters. The dredged material characteristics of concern for rehandling facility end-product uses such as landfill use include grain size, permeability, chemical content and concentration, and water content.

Under existing regulations for discharging waste to land, California Code of Regulations (CCR) Title 23 (Waters), Division 3 (State Water Resources Control Board), Chapter 15 (Discharges of Waste to Land), the state Department of Toxic Substances Control (DTSC) determines whether a waste is "hazardous." The SWRCB, together with the nine RWQCBs, classifies wastes as "designated," "non-hazardous," "solid," or "inert." Typically, classification of dredged material depends on the pollutant levels in the material. DTSC regulates hazardous waste and the SWRCB regulates

discharge of non-hazardous waste to land. Regulations for discharging waste to land were revised to address Subtitle D of Part 258 of 40 CFR; these revised regulations were finalized in 1997.

The use of rehandling facilities or end-product uses such as landfill reuse do not generally result in water quality and pollutant mobility impacts, because these sites are required to meet the regulatory requirements of state and federal laws that effectively ensure the isolation of material, thereby preventing the release of pollutants to the environment. For this reason, the operation of rehandling facilities would have no significant impacts on ground or surface water quality.

Rehandling facilities also offer the potential to treat, reduce, or remove contaminants including salts from dredged material. Additionally, by operating as a confined disposal facility, rehandling facilities could be designed to permanently store NUAD dredged material. Such operations would be covered by existing state and federal regulation regarding potential waste stream discharges to land or receiving waters.

Fish and Wildlife Impacts

The construction of rehandling facilities could result in the direct depletion of important terrestrial and avian habitat due to habitat conversion Potential habitat conversion, as well as potential pollutant mobility and associated water quality impacts from development of rehandling facilities, are discussed above (see section 4.4.4.3).

Noise Impacts

Noise receptors are present in and adjacent to proposed rehandling facilities used to process dredged materials for upland disposal (e.g., landfills, construction fill materials). As explained above (see section 4.4.2.5), both humans and wildlife are considered noise receptors. However, federal, state, and local guidelines and standards have primarily been developed to protect human receptors. CEQA Guidelines Appendix G, Significant Effects, states that a project will result in a significant adverse impact if it causes "a substantial increase in the ambient noise level in areas sensitive to noise adjacent to the project site."

Rehandling facilities are considered an industrial use. The location of these facilities, however, will likely be outside existing urbanized environments. Existing ambient noise in the proposed development areas is generally generated by train, highway, and occasional jet fly-over sources. Human receptors in the existing non-urban settings are limited. Some wildlife could be sensitive to noise created by the construction and operation of rehandling facilities. For example, existing salt marsh areas adjacent to many of the potential upland/wetland habitat reuse locations may support wildlife that may be susceptible to noise.

Noise associated with the construction and operation of rehandling facilities would include sources such as tugboats, scows, pump-out barges, trucks and trains used to transport the dredged material, transfer station pumps, and construction equipment. Analysis conducted for the COE for the Oakland Harbor Deep-Draft Navigation Improvements (USACE and Port of Oakland 1994) found that noise impacts associated with dredged material off-loading and processing sites would be insignificant beyond 1,500 feet. In many cases, because rehandling facilities need to be sited near suitable road access, the noise level generated at a site would be comparable to the relatively high ambient background noise cause by vehicular traffic (USACE and Port of Oakland 1994).

Traffic Impacts

The construction and operation of rehandling facilities will result in an increase in truck traffic in the areas where such facilities would be located. Preliminary estimates based upon the dredged material volume figures (presented in section 4.4.3) indicate that under a high upland reuse scenario, approximately 780,000 cy of material would be rehandled each year. Haul-truck capacities range from 10 to 20 cy and material shrinkage (due to drying) would be approximately 20 to 40 percent. Resulting truck traffic requirements would be approximately 64 to 170 trucks per day for all rehandling facilities combined. Under the medium upland reuse scenario, truck trips would be reduced to approximately 31 to 85 round trips per day for all rehandling facilities.

There are many variables in the above truck traffic estimates. For example, rehandling operations do not generally allow for a steady-state of dredged material processing and subsequent continuous end-product availability. Dredged material will likely be off-loaded and processed by cells (internally contained dredged material storage areas). Then, dried dredged material would likely be excavated and transported to an end-use location on a cell-by-cell basis. During such periods, truck transportation to and from a rehandling site may greatly increase. The potential traffic-related impacts, including accident rates, of this increased traffic would depend on the location of the rehandling facility and

existing traffic volume-to-capacity (V/C) ratios. Given the worst-case scenario of an additional 170 truck trips per day, truck accident rates and associated human health and injury risk from the transport of processed dredged material from constructed rehandling facilities to end use sites would be minor. Specific impacts would be considered at the project-specific EIS/EIR level. As discussed in Chapter 5, the increase in truck traffic could be reduced through careful site selection and appropriate truck haul-route selections.

Rehandling Facilities — Resources of Concern Summary Matrix

As presented in Table 4.4-17, the principal potential impacts for rehandling facilities result from the siting and construction of the facilities, rather than the operation of the facilities. The absence of operational impacts is primarily due to the existing state and/or federal regulation regarding the facility operations discussed above. The principal developmental impact associated with rehandling facilities is the potential loss of wildlife habitat due to the conversion of non-urban sites to industrial uses. Unlike dredged material reuse for tidal wetland creation, the losses of existing habitat would not be mitigated to any degree by the development or operation of rehandling facilities. As explained in Chapter 5, such habitat loss would need to be mitigated. Additionally, while the reuse of dredged material in general is regarded as beneficial, no direct benefits have been assigned to the development or operation of rehandling facilities.

4.4.6 Additional Potential UWR Impacts of Concern

4.4.6.1 Odor and Dust Impacts

Emissions of particulate matter with particles ten microns or less (PM_{10}) in the form of wind-blown dust could occur during earth-moving activities related to site preparation and sediment handling at upland habitat restoration sites, levee maintenance and stabilization projects, and rehandling facilities (see following text box). Such dust emissions could occur at individual reuse sites and along the transportation routes to or from the reuse sites. Except for the truck haul routes, these upland reuse sites are generally a considerable distance from sensitive receptors. The potential for fugitive dust, wind patterns, and the distance between emissions sources and sensitive receptors must be considered to ensure that impacts to human populations remain insignificant.

In most cases, potential dust emissions from a reuse site can be mitigated through the application of best management practices (BMPs). For example, minimizing dust by watering down sediment during dredged material movement or processing activities would ensure that dust emissions remain insignificant. At rehandling facilities, the loading of processed material into trucks would likely be only a minor source of dust emissions, since sediments would have a relatively moderate water content. If, however, processed materials are dry enough to emit dust, trucks could be covered and/or loads sprayed with water so that dust would not be generated during transport of the sediments to landfill sites. At levee maintenance and stabilization project sites, exposed dredged material on the levee will eventually be covered with vegetation and thereby produce a minimal amount of fugitive dust.

Odor impacts could result from dredged material reuse in upland areas depending on the sediment's concentration of sulfide compounds or decomposing organic matter that is exposed to the atmosphere. It is not expected that disposal activities would generate significant odor impacts based on results of previous dredging and disposal activities in the San Francisco Bay region. Historically, handling of dredged sediments in the Bay Area has generated only minimal

Table 4.4-17. Rehandling Facilities — Resources of Concern Summary Matrix

Resource	*Potential Impacts*	*Potential Benefits*	*Location*
Wildlife Habitat			
Seasonal Wetlands	Habitat conversion — loss of shorebird and migratory bird species habitat	NA	• On-site impacts
Palustrine Wetlands	Loss of waterfowl, shorebird, and migratory bird species refugia	NA	• On-site impacts
Plant Communities	Habitat conversion — loss of agricultural crop land and palustrine wetland plant species	NA	• On-site impacts
Special Status Species	Habitat conversion; adjacent habitat degradation	NA	• On-site impacts

Particulate Matter with Particles 10 Microns or Less (PM_{10})

PM_{10} is produced by a wide range of activities including natural wind erosion, combustion of fossil fuels, mining, and transporting and handling of minerals. PM_{10} is of concern because the small particles can pass through the bronchial passages in the lungs and into the alveoli where they can be retained indefinitely. If PM_{10} contains water soluble compounds, the soluble portion can be absorbed and transported through the blood system to other organs where they can cause damage.

complaints from the public (USACE and Port of Oakland 1994; USACE and Port of Richmond 1995; and USACE and Contra Costa County 1995). This is due to the relatively small amounts of sulfide and organic compounds found in the dredged sediments and the distance between where sediments were handled and the adjacent population that enabled odors to sufficiently disperse. Generally, the greatest potential for odor impacts would occur during sediment drying activities, where sediments are continually turned over for maximum exposure to the atmosphere. Such activities would not generally occur during levee maintenance or habitat restoration. Any potential impact could be mitigated at rehandling facilities by decreasing the frequency of sediment disturbance. This would potentially extend required drying periods.

4.4.6.2 Archaeological and Cultural Resources Impacts

Dredged sediment disposal has the potential to affect archaeological or cultural resources in upland or wetland reuse sites. The risk of encountering such resources increases with the number of reuse sites needed, which in turn is related to increasing volumes of upland or wetland placement. The potential for significant impacts or benefits on archaeological and cultural resources cannot be determined at this programmatic level of analysis. All future upland or wetland reuse projects would need to conduct the appropriate analysis consistent with the State Historic Preservation Office (SHPO), including conducting surface surveys to identify resources. If significant resources are identified, options for avoiding or mitigating any impacts would be determined on a site-specific basis.

4.4.7 Conclusions Regarding Upland and Wetland Reuse

Dredged material is a valuable resource when properly used. When political, economic, regulatory, and environmental conditions are effectively coordinated and managed, dredged material is available for a variety of beneficial uses. These include wetland restoration, levee maintenance and stabilization, and improving rehandling facilities and associated end uses such as landfill cover and construction fill. Significant benefits can be achieved on both on a local and regional level.

Adverse impacts, however, may also be associated with the upland/wetland reuse of dredged material. As indicated in Table 4.4-18 and the text above, these benefits and impacts depend on the reuse location and operational practices. The potential adverse impacts presented in Table 4.4-18 are addressed by the policy-level mitigation measures described in Chapter 5.

Table 4.4-18. Resources of Concern — UWR Summary Matrix

Resource	*Reuse Environment/Type*	*Potential Impacts*	*Impact Location*	*Potential Benefits*	*Benefit Location*
Ground and Surface Water	Habitat restoration	Yes	On-site and off-site	Yes	On-site and regional
	Levee maintenance and stabilization	Yes	On-site and off-site	Yes	On-site and regional
Wildlife Habitat	Habitat restoration	Yes	On-site	Yes	On-site and regional
	Rehandling facilities	Yes	On-site	NA	NA
Plant Communities	Habitat restoration	Yes	On-site	NA	NA
	Levee maintenance and stabilization	Yes	On-site and inner island	Yes	On-site and inner island
	Rehandling facilities	Yes	On-site	NA	NA
Special Status Species	Habitat restoration	Yes	On-site	Yes	On-site and regional
	Rehandling facilities	Yes	On-site	NA	NA

4.5 THE PACIFIC OCEAN ENVIRONMENT

The San Francisco Deep Ocean Disposal Site (SF-DODS) was formally designated in 1994 by EPA, following detailed study of potential alternative sites. Studies were conducted in accordance with the LTMS Ocean Studies Plan. The Ocean Studies Plan was developed in coordination with the LTMS Ocean Studies Work Group, reviewed by the Policy Review Committee, and approved by the Executive Committee. The site designation process included extensive opportunities for public review and comment. A Draft Environmental Impact Statement (EIS) was published in December 1992. EPA revised the EIS in consideration of public comments, and published the Final EIS (FEIS) in August 1993 (USEPA 1993a). The SF-DODS was identified as the environmentally preferred alternative in EPA's EIS, and the site was formally proposed for designation in a proposed rule published in the *Federal Register* on February 17, 1994 (USEPA 1994c). EPA's site selection criteria for ocean disposal are summarized in the following text box. Final revisions to the proposed site designation were made following review of additional public comments on the proposed rule, and EPA published its site designation final rule in the *Federal Register* on August 11, 1994.

4.5.1 Setting

The SF-DODS is located in the open ocean on the lower continental slope approximately 50 nautical miles (nmi) west of San Francisco (Figure 4.5-1). Water depth at the site ranges between approximately 2,500 meters (m) and 3,000 m (8,200 feet and 9,800 feet). The ocean bottom is moderately sloping in this area and contains numerous gullies and canyons. The topography around the site is such that the spread of dredged material disposed there would tend to remain contained within the site's boundaries. The SF-DODS encompasses an area of approximately 6.5 square miles and is in a location considered to be depositional in nature.

The SF-DODS is located approximately 6 nmi west of the outer boundary of the Gulf of Farallones National Marine Sanctuary (GOFNMS), and approximately 25 nmi west of the Farallon Islands. Other protected areas within GOFNMS include the Farallon National Wildlife Refuge, the Farallon Islands Area of Special Biological Significance, and the Farallon Island Game Refuge. The Farallon Islands and adjacent areas are protected because "they contain a wide diversity of sensitive habitats and biological resources, including threatened or endangered species" (USEPA 1993a). The Farallon Islands contain "the most important marine bird breeding sites on the west coast of the continental United States" and "one of the most important pinniped haulout grounds in California" (USEPA 1993a). Numerous protected brown pelicans, peregrine falcons, whales, and dolphins concentrate around or on the Farallon Islands. The closest boundary of these protected areas to the SF-DODS is that of the GOFNMS, which extends from the Farallon Islands to within 6 nmi of the SF-DODS.

Approximately 10 nmi north of the SF-DODS is the boundary of the Cordell Banks National Marine Sanctuary. This area was protected because of the unique combination of upwelling, underwater topography and wide range of depths at the Cordell Banks. The area is highly productive and contains a unique associated of subtidal and deep-water species including many special status species. The Cordell Banks is located over 20 nmi from the SF-DODS. The northernmost tip of the Monterey Bay National Marine Sanctuary is also over 20 nmi from the SF-DODS. However, the unique habitat areas of this sanctuary are located many miles south of the boundary. These national marine sanctuaries and other special biological resource areas are described in more detail in the following text box.

The SF-DODS was specifically located to minimize impacts to aquatic resources or conflicts with other uses of the ocean or the sanctuaries. The disposal site is located off the productive continental shelf, as far as feasible from any of the national marine sanctuaries. It optimally avoids unique habitats, important commercial or recreational fishery areas, and shipping lanes. It is in a "depositional" area that minimizes the spread or movement of dredged material on the bottom, facilitating benthic monitoring and the implementation of any changes in management practices that may be necessary over time. Finally, it is in an area previously affected by a variety of historic dumping activities, so that compared to other potential locations for an offshore disposal site, cumulative impacts of dredged material disposal are minimized at SF-DODS. Each of these is discussed in the paragraphs that follow.

4.5.2 Physical Environment

The following discussions of the physical environment and processes in the vicinity of the SF-DODS is summarized from the *Final Environmental Impact*

EPA'S OCEAN DISPOSAL SITE SELECTION CRITERIA

Once the need for an ocean disposal site is established and the economic Zone of Siting Feasibility is identified, alternative sites are compared in an EIS based on EPA's ocean dumping criteria found at 40 CFR 228. These include five "general" criteria that must be met to the greatest extent possible, and 11 "specific" criteria that represent additional important factors that EPA must consider when evaluating a site. EPA's general and specific Ocean Dumping Criteria are described below.

General Site Selection Criteria - 40 CFR 228.5

(a) The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shell fisheries, and regions of heavy commercial or recreational navigation.

(b) Locations and boundaries of disposal sites will be so chosen that temporary perturbances in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shell fishery.

(c) If, at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Sections 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.

(d) The sizes of the 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. The size, configuration, and location of any disposal site will be determined as part of the disposal site evaluation or designation study.

(e) EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

Specific Site Selection Criteria - 40 CFR 228.6(a)

(1) Geographical position, depth of water, bottom topography, and distance from the coast;

(2) Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases;

(3) Location in relation to beaches and other amenity areas;

(4) Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packaging the waste, if any;

(5) Feasibility of surveillance and monitoring;

(6) Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any;

(7) Existence and effects of current and previous discharges and dumping in the area (including cumulative effects);

(8) Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean;

(9) Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys;

(10) Potential for the development or recruitment of nuisance species in the disposal site; and

(11) Existence at, or in close proximity to, the site of any significant natural or cultural features of historical importance.

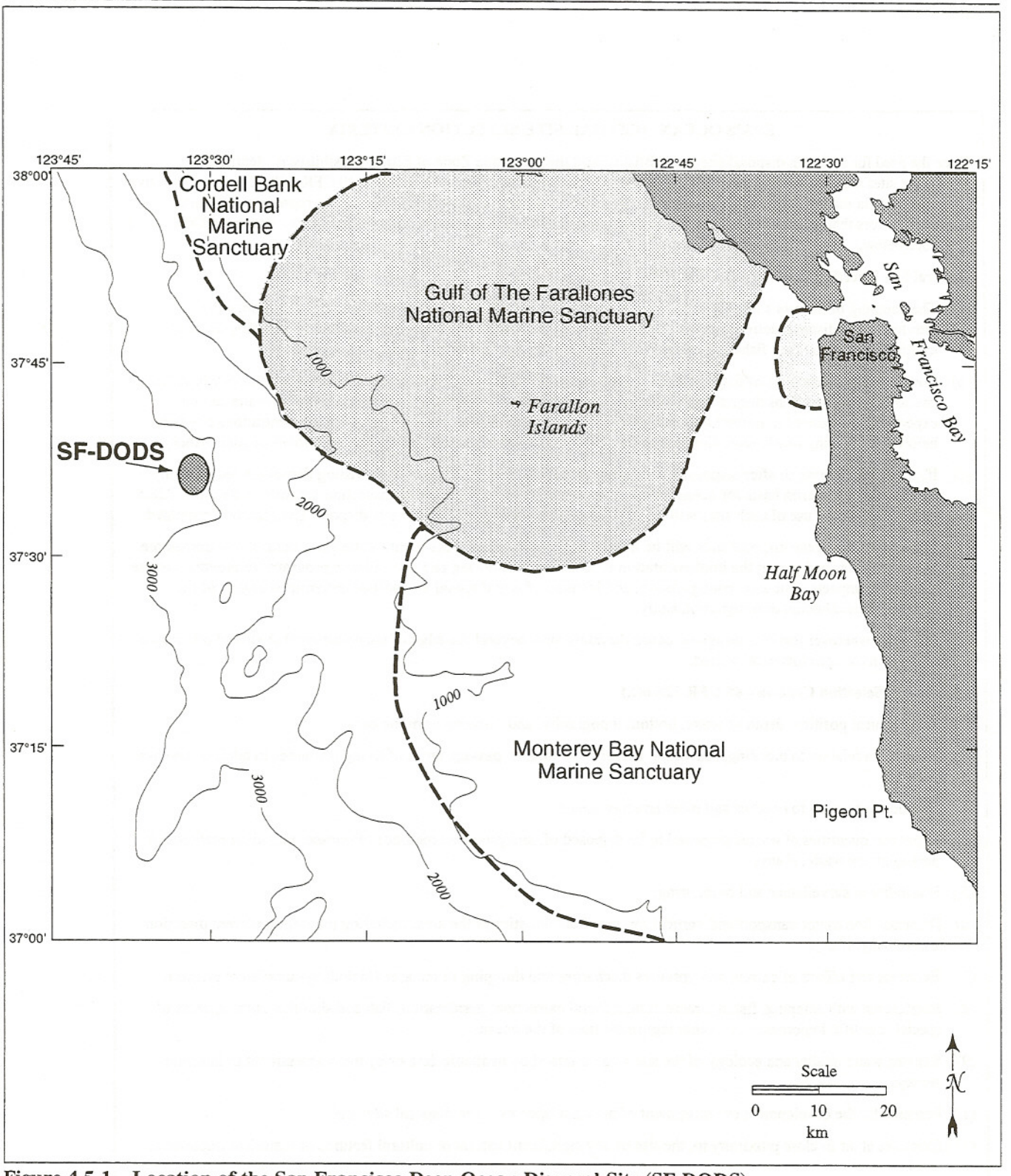


Figure 4.5-1. Location of the San Francisco Deep Ocean Disposal Site (SF-DODS)

National Marine Sanctuaries and Special Biological Resource Areas Offshore San Francisco

Six areas are designated as marine sanctuaries, refuges, or special biological resource areas in the vicinity of the SF-DODS. Four of these are federally protected: Gulf of the Farallones National Marine Sanctuary (GOFNMS), Cordell Banks National Marine Sanctuary (CBNMS), Monterey Bay National Marine Sanctuary (MBNMS), and the Farallon National Wildlife Refuge. The other two are protected by the State of California: Farallon Islands Area of Special Biological Significance and the Farallon Islands Game Refuge. Collectively, these six areas contain a wide diversity of sensitive habitats and biological resources, including threatened or endangered species. The Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 was designed to protect and manage discrete areas having special ecological, recreational, historical, and aesthetic resources. The GOFNMS, CBNMS, and MBNMS are three of 11 designated national marine sanctuaries in the United States. All national marine sanctuaries are administered by NOAA's Sanctuaries and Reserves Division.

Gulf of the Farallones National Marine Sanctuary

The GOFNMS encompasses 948 square nmi of nearshore and offshore waters, most of which lie in the Gulf of the Farallones. The Sanctuary extends from approximately the western edge of the continental shelf (35 nmi offshore) to the coasts of Marin and Sonoma counties. The SF-DODS is off the continental shelf, approximately 6 nmi west of the GOFNMS boundary and nearly 25 nmi west of the Farallon Islands. The selection of the GOFNMS as a sanctuary occurred on January 16, 1981 (Title XV CFR Part 936), and was based on the high concentration of biological resources living within or migrating through its boundaries. These resources include: marine vegetation (particularly kelp, eelgrass, and salt marsh species); benthic fauna; fish; marine birds; and marine mammals.

One of GOFNMS' most extensive resources is its marine bird population. The Farallon Islands are the most important marine bird breeding site on the west coast of the continental United States. There are 16 species of marine birds known to breed along the Pacific coast. Twelve of these species, including the American black oystercatcher, ashy storm-petrel, Brandt's cormorant, Cassin's auklet, common murre, double-crested cormorant, Leach's storm-petrel, pelagic cormorant, pigeon guillemot, rhinoceros auklet, tufted puffin, and western gull, have colonies on the Farallon Islands. The Farallon Islands serve as the nesting grounds for a significant portion (up to 85 percent) of the world populations of ashy storm-petrels, Brandt's cormorants, and western gulls as well as 80 percent of California's nesting Cassin's auklets. In addition, large numbers of California brown pelicans roost on the Farallon Islands regularly during summer and autumn. Endangered peregrine falcons also winter on the islands. Aquatic birds also are found within the Sanctuary's lagoon, coastal bay, and four estuaries. Breeding species include the American coot, cinnamon teal, gadwall, great blue heron, great egret, killdeer, mallard, pied-billed grebe, and snowy plover. An additional 20 aquatic bird species summer in the region, and seven species occur as spring and fall migrants.

Marine mammals also are a significant part of the Sanctuary's biological resources. Twenty species of whales and dolphins have been sighted in the Sanctuary, occurring either as migrants or regular inhabitants. Of these, Dall's porpoise, harbor porpoise, and Pacific white-sided dolphin are considered common resident species. Large baleen cetaceans including gray whales and endangered blue and humpback whales are important migratory species. The Farallon Islands also serve as one of the most important pinniped haul-out grounds in California. California's largest mainland breeding population of harbor seals occurs within the Sanctuary, along with breeding herds of northern elephant seals and northern sea lions. The threatened southern sea otter is an occasional visitor to the Sanctuary.

(continued . . .)

National Marine Sanctuaries and Special Biological Resource Areas Offshore San Francisco
(continued)

Cordell Banks National Marine Sanctuary

The CBNMS encompasses 397 square nmi of ocean water overlying the northernmost submerged seamount on the California continental shelf. The CBNMS was designated on May 24, 1989 (Title XV CFR Part 942). Ocean depths within the Sanctuary range from 35 m (at the peak of the Bank) to 1,830 m. The SF-DODS is located within approximately 10 nmi of Sanctuary boundaries; however, the Bank itself is located over 20 nmi from the site. The combination of upwelling, underwater topography, and the wide range of depths at Cordell Bank provides for a highly productive environment with unique associations between subtidal and deep-water species. Endangered or threatened marine mammal and reptile species, including blue, right, finback, sei, sperm, and humpback whales; Guadalupe fur seals; northern sea lions; and green, loggerhead, leatherback, and Pacific Ridley sea turtles; as well as the depleted northern fur seal, often are found at Cordell Bank. Due to its rich biological diversity, Cordell Bank is visited frequently by divers and fishermen.

Monterey Bay National Marine Sanctuary

The MBNMS encompasses 4,024 square nmi, ranging from Marin County to Cambria. It is the nation's newest Marine Sanctuary, designated on September 18, 1992 (Title XV CFR Part 944). The SF-DODS is located approximately 35 nautical miles from the MBNMS boundary at its closest point. The MBNMS supports a high diversity of marine resources. Monterey Canyon and its associated topographic features promote seasonal upwelling of nutrient-rich waters which support diverse biological assemblages of plankton, algae, invertebrates, fishes, marine birds, sea turtles, and marine mammals. Monterey Bay provides abundant prey items for many species of migratory marine birds. This area is an important habitat for winter populations of ashy storm-petrel and Cassin's auklet, among others. Several endangered species are observed regularly within the Sanctuary. The endangered California brown pelican is observed throughout the Sanctuary and along the coastline. Right whales, with a world-wide population estimated at only about 200, have been seen in waters off Half Moon Bay. Highly sensitive nearshore and offshore uses and resources within the Sanctuary include commercial fisheries, aquaculture operations, kelp harvesting, estuaries, sloughs, sandy beaches and rocky intertidal habitats, and nearshore littoral habitats. The commercially important Dungeness crab is harvested in local Sanctuary waters.

Other Special Biological Resource Areas

The Farallon National Wildlife Refuge is maintained by the U. S. Fish and Wildlife Service and includes Noonday Rock; North, Middle, and Southeast Farallon islands; and Maintop Island. It is primarily a migratory refuge for 12 species of marine birds (including auklets, cormorants, guillemots, murres, puffins, and storm-petrels) but also serves as an important habitat for five species of pinnipeds. The Wildlife Refuge is approximately 20 nmi due east of the SF-DODS.

The Farallon Island Area of Special Biological Significance (ASBS) includes 2.2 square nmi of waters surrounding but not including Noonday Rock; North, Middle, and Southeast Farallon islands; and Maintop Island. Within the ASBS are a highly diverse intertidal community and abundant marine mammal populations, including California and northern sea lions, elephant seals, and harbor seals. Rare and endangered species such as the California brown pelican; peregrine falcon; and blue, finback, humpback, sei, and sperm whales also occur in the area. The Farallon Island ASBS is approximately 20 nmi due east of the SF-DODS. This ASBS was designated under CSWRB Resolution No. 74-28; waste discharges within such areas are prohibited to preserve and maintain natural water quality.

The Farallon Islands Game Refuge, under California Department of Fish and Game jurisdiction, encompasses the Farallon Islands and Noonday Rock and their surrounding waters extending 1 nmi from the coastline of each island. It has an area similar to the combined areas of the Farallon National Wildlife Refuge and Farallon Islands ASBS. The regulations governing the use of the Game Refuge are coincident with those of the Wildlife Refuge and ASBS.