

LONG TERM MANAGEMENT STRATEGY



Agenda Item #11

Dredging and Disposal Road Map

June 4, 1999

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Dredging and Disposal Road Map

Background

1. The In-Bay Dredging and Disposal Problem. High sedimentation rates in San Francisco Bay make it necessary to regularly dredge navigation and flood control channels. Most material dredged from the Bay has typically been disposed at the in-Bay disposal site near Alcatraz Island. The accumulation of a dredged material "mound" at the Alcatraz site and allegations that dredging and disposal of dredged material adversely impact the Bay's natural resources have drawn attention to these activities.

Originally the Alcatraz disposal site was approximately 100 feet deep. By the late 1980s, the top of the mound was less than 30 feet below the Bay's surface. More recently, available data indicate that while the top has eroded, the base of the mound appears to be widening. Regulatory agencies initially tried to address the mounding problem by imposing volume and timing restrictions on disposal. However, management of in-Bay disposal provides only a short-term solution. Therefore, a long-term regional management plan is needed for dredging and disposal in San Francisco Bay.

2. LTMS. On July 19, 1990, the San Francisco Bay Conservation and Development Commission (Commission) voted to join the U. S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (U.S. EPA), the San Francisco Bay Regional Water Quality Control Board (Regional Board), and the State Water Resources Control Board (State Board) to draft a Long Term Management Strategy (LTMS) for the placement of dredged material. Over 40 other agencies and groups are also involved in the LTMS program. The goal of the LTMS is to develop a plan for managing dredging and disposal in an economically and environmentally sound manner over the next 50 years. The LTMS plan is based on a series of technical studies. The Commission staff managed studies on the potential availability and feasibility of disposal and beneficial reuse of dredged material at diked bayland and upland sites. The U.S. EPA and Regional Board also studied disposal options in the ocean and in the Bay, respectively.

In October, 1998 the LTMS agencies finalized a Policy Environmental Impact Statement and Programmatic Environmental Impact Report (EIS/R) which analyzed the impacts of alternative dredging and disposal policies. The selected LTMS alternative recommends that in-Bay disposal be reduced over time to a level of one million cubic yards per year, with the remaining material either reused at upland sites or disposed in the EPA-designated ocean disposal site. The LTMS agencies are currently drafting a management plan to implement the selected LTMS alternative and conducting a series of workshops where interested parties can discuss elements of the preferred alternative. The draft management plan, currently scheduled for release at the end of 1999, will also contain proposed amendments to the *San Francisco Bay Plan*.

As part of the LTMS, a pilot Dredged Material Management Office (DMMO) was established to help coordinate and simplify the process of getting permits for dredging. Staff from the Corps, U.S. EPA, Regional Board, California State Lands Commission, and the Commission meet at the DMMO to jointly review dredging permit applications. The DMMO does not issue permits, but provides dredgers with a single application form and joint staff recommendations on sediment sampling and analysis plans; sediment testing results; and suitability determinations for dredged material proposed for in-Bay, ocean, upland disposal, or for beneficial reuse.

3. San Francisco Bay Plan Amendment. On May 21, 1992, the Commission amended the dredging findings and policies in the Bay Plan based partly on the following conclusions drawn from a *Dredging and Disposal Road Map*, dated April 4, 1992:

- There is a continuing need to dispose of dredged material from projects essential to maritime commerce, national security, and recreational use of the Bay.

- Capacity at in-Bay disposal sites is limited and cannot accommodate future dredging and disposal needs. Overuse of the Alcatraz disposal site could result in its closure.
- In-Bay disposal is controversial because of its potential environmental impacts.
- Presently (as of 1992) there are few alternatives to in-Bay disposal.
- In the future, it appears that alternatives to in-Bay disposal will be feasible and available. Dredged material can be used as a resource, but only if this alternative is aggressively pursued.
- To achieve broad support for solutions to Bay dredging problems, both environmental and economic concerns must be addressed.
- There is need for an interim disposal policy pending adoption of the LTMS plan.

The current Bay Plan policies recognize that regular dredging is likely to continue, capacity of existing disposal sites is limited, and ocean and non-tidal disposal sites are necessary to accommodate future dredging projects. The Bay Plan was also amended to establish the policy basis for the Commission's involvement in the LTMS. This Commission action was consistent with the San Francisco Bay Dredging Act of 1991, which directed and funded the Commission's involvement in the LTMS and became effective on January 1, 1992. The LTMS management plan will contain proposed Bay Plan amendments necessary for the Commission's implementation of the long-term strategy for dredging and disposal in the region.

Summary of 1998 Dredging and Disposal Activities and Projections for 1999

Table 1 lists the actual and projected dredging and disposal activities in San Francisco Bay. The projections are based on data from DMMO permit applications, BCDC files, and in a few cases, personal communication with dredging project managers. The data for actual dredging activities are provided by the Corps. The locations of major dredging projects in the Bay Area are shown on Map 1.

1. Dredging. Projected dredging activity in 1998 was approximately 5,149,520 cubic yards (cy). The actual amount was 5,020,066 cubic yards, approximately as predicted. Almost half of the dredged material in 1998 was from new projects at the Port of Richmond and the Port of Oakland (Chart 1). The second largest portion of dredged material was from non-Corps maintenance dredging projects. Projections for 1999 suggest an increased amount of dredging compared to 1998, largely as a result of the Port of Oakland's proposed Berths 55-58 project (Chart 2). Maintenance projects not affiliated with the Corps are expected to make up about 28% of the projected total dredged volume for 1999.

2. Disposal. Less than a third (30%) of the material dredged in 1998 was disposed in the Bay (Chart 3). The deep ocean disposal site, located about 50 miles outside the Golden Gate, received the highest volume of material (43%), driven mainly by the deepening projects at the Port of Richmond and the Port of Oakland. Upland disposal, including Winter Island in the Delta, the Port of Oakland's Berth 10 drying facility, the Port of Richmond parking lot, and an upland site near Port Sonoma Marina, accounted for 16% of the total, a marked increase over 1997. This shows significant progress in reducing in-Bay disposal, consistent with the LTMS.

In 1999, about 23% of the material dredged is expected to go to upland sites (Chart 4), again including beneficial uses such as bolstering levees at Winter Island, with a majority of this total from the Port of Oakland's Berths 55-58 project. About 7% of the material is expected to go to the deep ocean disposal site; this material is all from maintenance projects rather than from new work as in previous years. About 70% of material dredged in 1999 is expected to be disposed in the Bay with a third of the total from proposed Bay fill for the Port of Oakland's Berths 55-58

project. The Alcatraz disposal site is projected to receive about half of the volume slated for in-Bay disposal. The volume projected for the Alcatraz disposal site is in part due to several proposed large maintenance projects (the Larkspur Ferry Terminal and Channel, for example). However, upland beneficial use of dredged material should increase in the coming years, as several upland sites (particularly Hamilton and Montezuma) are expected to come on-line (see below).

As illustrated in Chart 5, volumes for each type of dredging project except for Caltrans projects are projected to increase. In part, these increases are due to the uncertainty in projections. For example, projects are allowed an "over-dredge" depth beyond the design depth as a safety factor, and the volume of this over-dredge depth is included in projections. However, the entire volume of over-dredged material is generally not removed. As a result, for many projects the projected volume is less than the actual volume of material removed. This in part could explain the increased volumes proposed for 1999 in Chart 5. It is interesting to also note that the volume proportions by project type appear to be approximately constant in 1998 and 1999 (as also shown in Charts 1 and 2).

Chart 6 illustrates where the dredged material is proposed for disposal. The large increase in in-Bay disposal projected for 1999 compared to 1998 volumes is in large part due to the Port of Oakland's berths project, as approximately 1,654,000 cubic yards is proposed for in-Bay disposal. Upland disposal volumes projected for 1999 also increase largely due to the Port of Oakland project, as approximately 1,435,000 cubic yards of dredged material will be used upland. Projections also indicate an increase in the volume of material proposed for the Alcatraz disposal site and a decrease in the volume of material proposed for ocean disposal.

Future Upland Alternatives to In-Bay Disposal

As part of developing the LTMS, a work group studied reusing and disposing dredged material at a variety of upland sites. As a part of this effort, over 100 upland sites were examined and ranked for beneficial reuse projects, rehandling facilities, or confined disposal based on engineering, environmental, and land use criteria. While many sites were considered to have a high feasibility for upland disposal and/or reuse of dredged material, few of them have become available in recent years despite strong support from the LTMS agencies. This is due both to logistical difficulties in bringing large sites that can achieve economies of scale on-line and the differential cost between in-Bay disposal and beneficial reuse. Two large projects now moving toward implementation—the Hamilton Wetlands Restoration Project and Montezuma Wetlands Project—have a combined capacity of 27 million cubic yards. Table 2 summarizes current and potential dredged material disposal options, and locations of these sites are shown in Map 2. Below, several of the most promising upland reuse/disposal sites are discussed in more detail.

1. Hamilton Wetland Restoration Project. The site is located in Marin County, and was part of the former Hamilton Army Airfield, closed since the 1970s. The area is situated in diked historic baylands which have subsided to an average elevation of 5 feet below sea level. The State Coastal Conservancy and the Commission, with the Hamilton Restoration Group of interested citizens and agencies, developed a conceptual plan for restoring the area to wetlands and are currently preparing a final design. The restoration plan proposes using about 10,600,000 cy of dredged material to raise the site to elevations appropriate for the establishment of 914 acres of tidal and non-tidal wetland habitats.

An EIS/EIR and feasibility study as a federal project were issued in December 1998. Funding for the federal portion of the project for construction by the Corps is included in the 1999 Water Resources Development Act currently under review by Congress.

2. Montezuma Wetlands Restoration Project. The project is sponsored by Levine-Fricke Restoration Corporation, the site owner, which proposes to restore wetlands on 1,800 acres of the 2,600-acre site, located in Solano County at the mouth of Montezuma Slough, by raising site elevations using dredged material to support wetlands. Construction of wetland habitat would

allow for the disposal of both clean cover material and material with slightly elevated contaminant levels buried under the clean material. The sponsors also propose to construct a dredged material rehandling and dewatering facility on a 165-acre portion of the site. The site is currently used for livestock grazing, and is surrounded by agricultural uses, residential development, and managed and tidal wetlands.

The estimated capacity of the site is approximately 17,000,000 cy for the wetlands restoration project, and 400,000 cy per year for the rehandling facility. Disposal fees are estimated to range from \$6 to \$10 per cubic yard of material, depending on the quality and quantity of material. A final EIS/EIR for the project has been completed, and the Solano County Board of Supervisors approved the project in early 1999. However, the adequacy of the EIS/R has been challenged in court, and the case is pending.

3. Mare Island Confined Disposal Facility. This project is located at the former Mare Island Naval Shipyard in Solano County, which has been closed and most of the property transferred to the City of Vallejo. To generate revenue, the City would like to charge dredgers for disposal of dredged material seven of ten existing ponds, which were used by the Navy for disposal of dredged material from berthing areas. Adjacent to the site are salt marshes and the San Pablo Bay Wildlife Refuge managed by the U. S. Fish and Wildlife Service (USFWS). The USFWS has expressed an interest in obtaining and restoring the three remaining ponds as part of a proposed interpretive center for the refuge.

In March, 1998, the City of Vallejo released a feasibility study which concluded that operation of the ponds as a disposal site for material unsuitable for aquatic disposal would be highly economically feasible, even if the three ponds were transferred to the USFWS refuge and not used for further disposal. The site capacity is estimated to be 12,000,000 cy, with disposal cost at about \$7 per cy of dredged material. The City would charge dredgers a tipping fee beyond this "break even" cost. The costs to implement this project are relatively low because extensive site preparation would not be needed.

Much of the existing pipeline needed to transfer dredged material from scows to the ponds is operable, but some repair would be necessary to start up the facility. Further, as part of base closure, the Navy is required to remove unexploded ordnance from the ponds; this process will last at least through the year 2000. Subsequent project review under state and federal environmental law would then be required. Lastly, the City of Vallejo would need to obtain state and federal permits to operate the facility. At this time, the City has not initiated the environmental review nor the permitting process.

4. Port of Oakland Berth 10. The Port of Oakland's Berth 10 Rehandling Facility is located along the waterfront of the Oakland Outer Harbor. The facility is currently used by the Port to de-water dredged materials that are unsuitable for unconfined aquatic disposal. Materials typically are dried on-site for up to two weeks, to a level sufficient to meet landfill requirements for water content. Site capacity is roughly 10,000 cubic yards of wet dredged material. The Port has indicated some willingness to allow use of the site by other dredgers. However, to date this has not occurred due to the limited site capacity.

5. Port of Richmond Parking Lot. The Port of Richmond remediated and capped a 53-acre auto storage lot using dredged material from its -38 foot deepening project. In addition, the site has been used to dry dredged material from a Caltrans bridge retrofit project. The Port of Richmond has expressed interest in expanding use of the site as a regional dredged material rehandling facility, and has allowed the site be studied further for this use as a part of the Dredged Material Reuse Project, funded by the California Coastal Conservancy, in which the Commission participates along with other members of the regulatory, business, and environmental communities.

6. Redwood Landfill. Redwood Landfill, located east of Highway 101 between Novato and Petaluma in Marin County, has potential as a long-term dredged material disposal site. The landfill has already received dredged material from several Bay projects and could use further material for daily cover and to raise elevations in portions of the site. A major issue in the use of Redwood Landfill is the transportation of material to the site; the site's access to Highway 101 is considered too dangerous. It may be possible to construct an off-loading facility for barges using the Petaluma River, but potential impacts to the nearby Petaluma Marsh resulting from the construction and use of the facility would be a key consideration.

7. Winter Island. The Corps used dredged material from Suisun Channel to restore levees at Winter Island in Contra Costa County in 1998 and plans to again in 1999. The owner and local sponsor of the facility is the Winter Island Reclamation District, which operates a duck club on the island. The site capacity is approximately 100,000 cy per drying cycle, with disposal costs of \$15 per cy of material.

8. Sherman Island. Sherman Island in Sacramento County is another Delta location that has been proposed for material from the dredging of Suisun Channel and New York Slough. Immediately east of Winter Island, Sherman Island plays a critical role in protecting the Delta's water supply for millions of Californians from salt water intrusion. Dredged material could provide needed levee stabilization and other benefits on Sherman Island. The Corps is proposing to dispose material from the maintenance dredging of Suisun Channel and New York Slough at Sherman Island in the year 2000.

TABLE 1

Project	Disposal Site	Dredged Volume (cubic yards)		
		1998 Projected	1998 Actual	1999 Projected
<i>Federal Corps projects</i>				
Petaluma River - Across the Flats	Hamilton Army Airfield (base cleanup)	300,000	0	0
	San Pablo (SF-10)	0	148,842	0
Pinole Shoal	San Pablo (SF-10)	40,000	66,986	400,000
Port of Oakland Outer and Inner Harbors	Alcatraz (SF-11)	0	222,317	0
	Deep Ocean (SF-DODS)	0	0	500,000
Port of Richmond Shipping Channels	Alcatraz (SF-11)	80,000	254,700	300,000
Redwood City Harbor	Alcatraz (SF-11)	0	115,658	0
San Leandro Channel	Alcatraz (SF-11)	0	0	0
San Rafael Canal - Across the Flats	Upland Disposal	0	0	0
	Alcatraz (SF-11)	0	0	0
Suisun Bay Channel	Suisun Bay (SF-16)	150,000	104,942	0
	Winter Is. (levee restoration)	110,000	208,394	100,000
Southampton Shoal	Alcatraz (SF-11)	0	15,100	0
<i>Federal non-Corps projects</i>				
Coast Guard Station (Golden Gate)	Alcatraz (SF-11)	0	0	15,000
Coast Guard Station (Yerba Buena Island)	Alcatraz (SF-11)	0	0	35,000
<i>Port Maintenance Projects</i>				
Port of Oakland Berth Maintenance	Deep Ocean (SF-DODS)	0	0	0
	Alcatraz (SF-11)	0	129,918	168,700
	Berth 10 (upland rehandling)	0	10,418	0
Port of Redwood City Berth Maintenance:	Alcatraz (SF-11)	16,600	39,950	10,000
	Upland Disposal	6,000	4,665	0
Port of Richmond Berth Maintenance (in 1998, other maintenance included with "Port of Richmond Deepening" under New Work)	Alcatraz (SF-11)	20,000	22,093	20,000
Port of San Francisco Central Basin	Alcatraz (SF-11)	275,000	0	270,000
Port of San Francisco Berth Maintenance	Alcatraz (SF-11)	0	88,256	97,680
	Upland Disposal	0	0	22,000
<i>Caltrans Projects</i>				
Benicia-Martinez Bridge Retrofit	Carquinez (SF-9)	62,000	0	17,500
Carquinez Bridge Retrofit	Carquinez (SF-9)	5,700	0	14,000
San Mateo-Hayward Bridge Retrofit:	Alcatraz (SF-11)	80,900	25,176	0
	Upland Disposal	18,000	33,321	0

TABLE 1

Project	Disposal Site	Dredged Volume (cubic yards)		
		1998 Projected	1998 Actual	1999 Projected
<i>Other Maintenance Projects</i>				
Aeolian Yacht Club	Alcatraz (SF-11)	12,000	18,605	0
Arques	Alcatraz (SF-11)	0	0	16,300
	Upland	0	0	15,600
Bel Marin Keys	Upland Disposal	10,000	0	10,000
Benicia Port Terminal Company	Carquinez (SF-9)	15,000	90,000	90,000
Black Point Launch Ramp	San Pablo (SF-10)	200	0	150
Brisbane Marina	Alcatraz (SF-11)	94,000	0	30,000
Candlestick Point	Alcatraz (SF-11)	0	6,825	0
City of Benicia - Benicia Marina	Carquinez (SF-9)	0	20,955	40,000
Clipper Yacht Harbor	Alcatraz (SF-11)	600	500	350
Corinthian Yacht Club	Alcatraz (SF-11)	20,000	20,315	0
Exxon Dock - Benicia	Carquinez (SF-9)	20,000	14,800	18,000
Foster City Lagoon	Alcatraz (SF-11)	92,900	0	0
Glen Cove Marina	Carquinez (SF-9)	0	3,375	0
Kappas Marina	Alcatraz (SF-11)	17,000	0	22,316
Larkspur Ferry Terminal/Channel	Alcatraz (SF-11)	25,000	0	677,000
Loch Lomond Marina	San Pablo (SF-10)	20,000	46,585	20,000
Marin Yacht Club	San Pablo (SF-10)	4,000	0	17,000
Oyster Point Marina	Alcatraz (SF-11)	110,178	0	58,000
Paradise Cay	Alcatraz (SF-11)	9,000	0	27,000
PG&E - Antioch Power Plant	Upland Disposal	2,182	0	0
PG&E - Pittsburg Power Plant	Upland Disposal	43,054	0	0
Port Sonoma Marina (1998 at field across Highway 37; 1999 is for use of ponds on-site)	Upland Disposal	240,000	343,318	60,000
Redwood City Harbor	Alcatraz (SF-11)	0	115,658	0
Richmond Long Wharf - Chevron	Alcatraz (SF-11)	280,000	187,800	350,000
San Francisco Drydock:	Alcatraz (SF-11)	233,500	143,750	110,000
San Francisco Marina	Alcatraz (SF-11)	0	52,902	55,000
San Francisco Yacht Club	Alcatraz (SF-11)	0	9,593	1,500
San Leandro Marina	Alcatraz (SF-11)	0	26,170	0
San Rafael Rock Quarry	San Pablo (SF-10)	0	0	27,600
Schnitzer Steel	Alcatraz (SF-11)	10,000	0	15,000
Schoonmaker	Alcatraz (SF-11)	0	0	11,900
Sierra Point Marina	Alcatraz (SF-11)	0	0	224,000
Tosco (previously Unocal) Dock - Rodeo	Carquinez (SF-9)	65,000	84,705	15,000
Valentine residence	Alcatraz (SF-11)	0	0	120
Vallejo Yacht Club/Vallejo Marina	Carquinez (SF-9) or upland	0	0	100,000

TABLE 1

Project	Disposal Site	Dredged Volume (cubic yards)		
		1998 Projected	1998 Actual	1999 Projected
<i>New Work</i>				
Port of Oakland 42' Project	Galbraith golf course	10,000	211,592	0
	Deep Ocean (SF-DODS)	1,000,000	391,516	0
Port of Oakland Berths 55-58 Project	MH Shoreline Park-in Bay	0	0	1,654,000
	MH Shoreline Park-upland			1,435,000
Port of Richmond 38' Deepening (included some maintenance dredging of Port)	Deep Ocean (SF-DODS)	1,554,156	1,728,633	0
	Port of Rich. Parking Lot	0	12,333	0
Port of San Francisco North Ferry Terminal Deepening	Alcatraz (SF-11)	7,900	0	0
Port of San Francisco South Ferry Terminal Deepening	Alcatraz (SF-11)	8,650	0	0
	Upland Disposal	1,000	0	0
Wickland Oil, Proposed Point Orient Terminal	Upland Disposal	80,000	0	0
Total Dredging Volumes		5,149,520	5,020,666	7,070,716
<i>Summary by Disposal Site</i>				
Alcatraz (SF-11)		1,393,228	1,495,286	2,514,866
Carquinez (SF-9)		167,700	213,835	294,500
San Pablo (SF-10)		64,200	262,413	464,750
MH Shoreline Park in-Bay		0	0	1,654,000
Sidecast		0	0	0
Suisun Bay (SF-16)		150,000	104,942	0
Deep Ocean (SF-DODS)		2,554,156	2,120,149	500,000
Upland Disposal (all types)		820,236	824,041	1,642,600
<i>Summary by Project Type</i>				
Federal projects		680,000	1,136,939	1,350,000
Port Maintenance Projects		317,600	295,300	588,380
CalTrans projects		166,600	58,497	31,500
Other Maintenance Projects		1,323,614	1,185,856	2,011,836
New Work		2,661,706	2,344,074	3,089,000

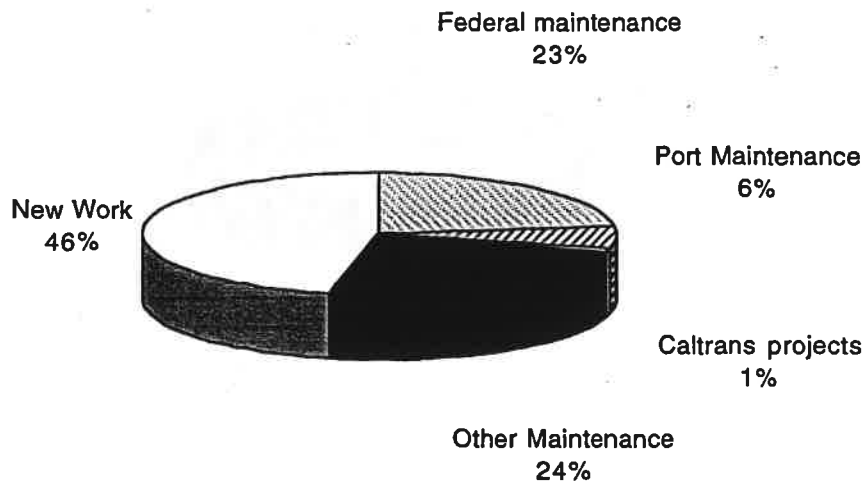


Chart 1. 1998 Disposal volumes (actual) by project type.

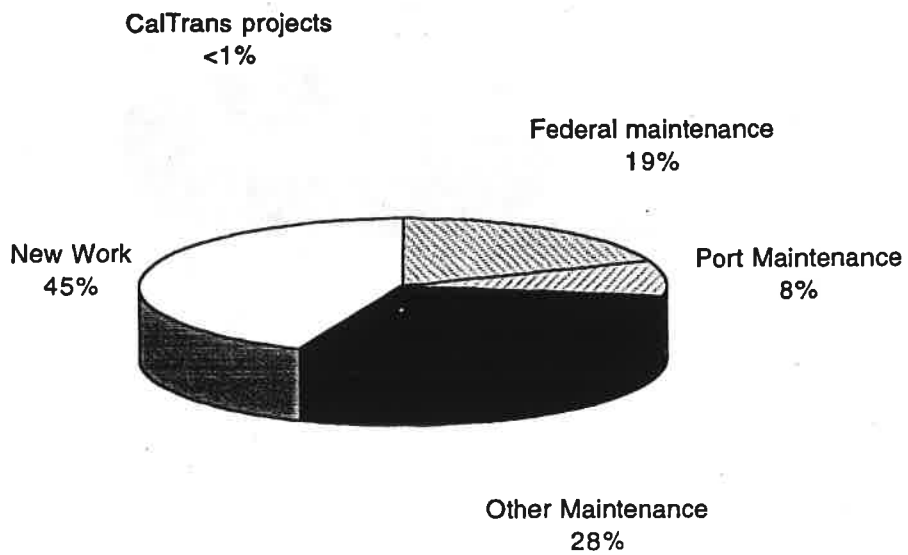


Chart 2. Projected 1999 disposal volumes by project type.

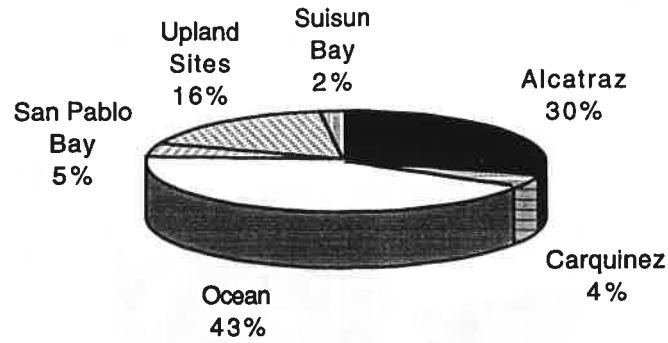


Chart 3. 1998 Disposal volumes (actual) by disposal site

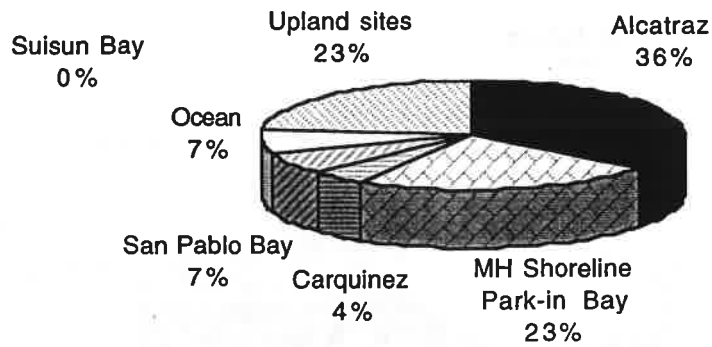


Chart 4. Projected disposal volumes in 1999 by disposal site.

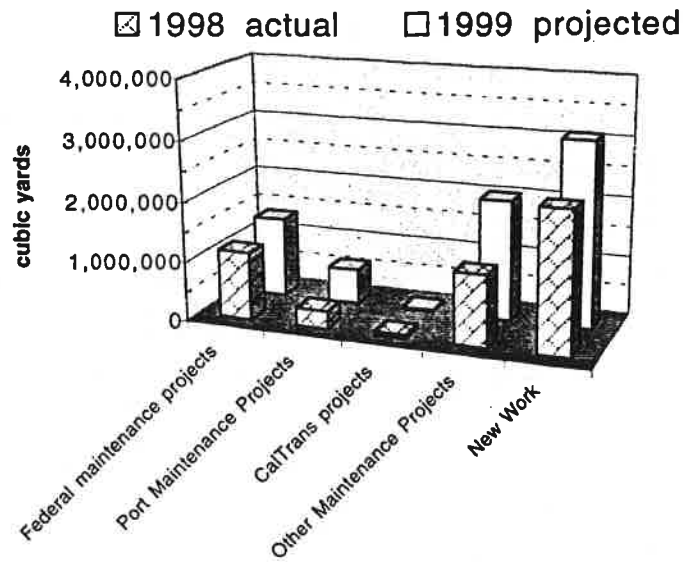


Chart 5. Comparison of 1998 actual and 1999 projected dredging by project type.

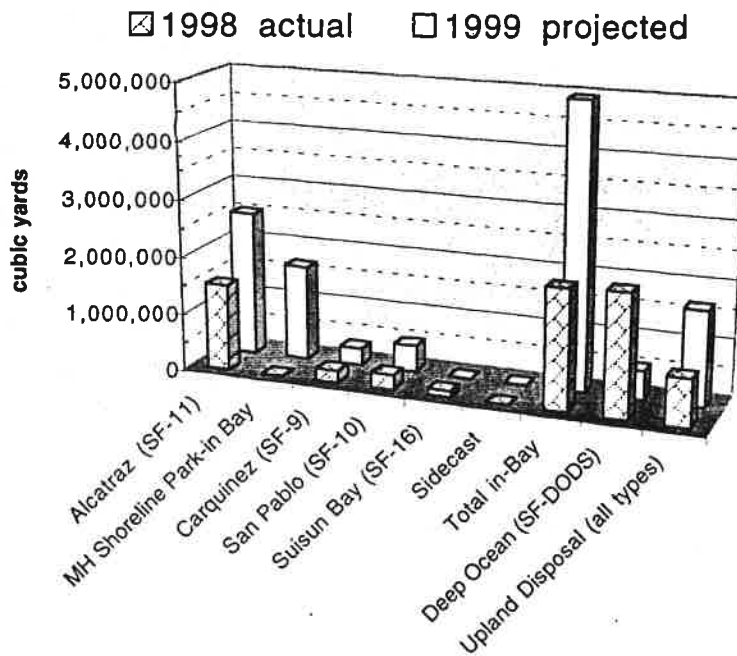


Chart 6. Comparison of 1998 actual and 1999 projected dredging disposal volumes.

TABLE 2

Dredged Material Disposal Options

(Provided for planning purposes. Figures contained herein are preliminary estimates from best available data.)

Disposal Site ¹	Site Status / Feasibility ²	Implementation Costs (million dollars)	Disposal Cost ³ (dollars per cubic yard)	Site Capacity	Comments
Authorized In-Bay Sites					
1) Alcatraz (SF-11)	Existing	0	4	4,000,000 cy (4.0 mcy)/yr	Long-term use constraints: capacity & volume limits; seasonal restrictions.
2) Carquinez Strait (SF-9)	Existing	0	5-6	2-3.0 mcy/yr	Long-term use constraints: capacity & volume limits; seasonal restrictions.
3) San Pablo Bay (SF-10)	Existing	0	4-5	500,000 cy/yr	Long-term use constraints: capacity & volume limits; seasonal restrictions.
4) Suisun Bay (SF-16)	Existing	0	5.5	200,000cy/yr	Exclusive use for Suisun Bay Channel material.
Proposed In-Bay Sites					
5) Bay Farm Island Borrow Pit	Not currently available/Low	80.2 (excluding costs for further studies, etc.)	2-3	10-15.0 mcy	Considered for Oakland Harbor -42' deepening project. No use currently proposed.
6) Middle Harbor Enhancement Project	Not currently available	Not available	2.5	7.0 mcy	Proposed for Oakland Harbor 50' deepening project. Existing site depth would be decreased on average from -38 feet to -4 feet. Issues include: desirability of fill in bay and design feasibility.
Ocean					
7) S.F. Bar Channel (SF-8)	Existing	0	Not available	Not available	Exclusive use for material from the San Francisco Bay Bar Channel.
8) S.F. Deep Ocean Disposal Site (SF-DODS)	Existing	5.0	6-8	4.8 mcy/yr	Permanent site designation and disposal volume limit pending.
Reuse/Non-tidal					
9) Airport Borrow Pits (Solano)	Not currently available/High	1.2 ⁴	6.4 ⁵	2.0 mcy/re-handling cycle ⁶ 15.2 mcy for confined disposal ⁷	LTMS identified as highly feasible for rehandling and confined disposal, and prepared conceptual plans (12/94). Project requires sponsor and funding.

¹ Disposal site shown on Map 2.

² Feasibility, if listed, is from LTMS technical studies

³ Disposal cost estimates based on Central Bay dredging projects (unless otherwise noted), and do not include implementation costs.

⁴ Includes costs for construction, engineering, administrative, and other improvements; cost of site acquisition, mitigation, and operation and maintenance are not included.

⁵ Includes costs for mobilization, dredging (\$16/cy based on small dredging projects, about 50,000 cy), transport, and placement at reuse site.

⁶ In the Bay and Delta regions, rehandling or drying cycle typically lasts from 18 to 24 months.

⁷ Confined disposal assumes multiple disposal events and an average 40-60% compaction of dry material.

TABLE 2 (cont'd.)

Disposal Site	Site Status / Feasibility	Implementation Costs (million dollars)	Disposal Cost (dollars per cubic yard)	Site Capacity	Comments
10) Alameda Naval Air Station (Alameda)	Not currently available	Not currently available	Not currently available	750,000 cy	City of Alameda possibly interested in using clean dredged material from Oakland Harbor 50' deepening project for construction of golf course. Feasibility study for golf course currently underway.
11) Bel Marin Keys Unit 5 (Marin)	Not currently available/High	Not available	Not available	20.0 mcy	LTMS identified as highly feasible for habitat restoration. Privately-owned but under consideration for acquisition by Coastal Conservancy. If acquired, may be incorporated into Hamilton wetland restoration project.
12) Cargill Salt evaporator ponds (now owned by CA Dept of Fish & Game) (Solano & Napa)	Not currently available/High but site owner opposed to use	38 ⁸	5 ⁹	7-11.0 mcy	LTMS identified as highly feasible for habitat restoration. California Department of Fish & Game does not believe dredged material is needed for restoration.
13) Cargill Salt crystallizer ponds (east of Napa River) (Napa)	Not currently available/High	3.4 (rehandling) ⁸ 14-65 (confined disposal) ¹⁰	7-16 (rehandling) ⁵ (confined disposal) ⁹	Up to 1.9 mcy/drying cycle ⁶ 5.5 mcy for confined disposal ⁷	LTMS identified as highly feasible for rehandling and confined disposal projects, and prepared conceptual plans (1993). However, site privately-owned, mitigation likely required, and funding needed. Further studies currently under preparation by the Dredged Material Reuse Project (DMRP).
14) Cullinan Ranch (Napa & Solano)	Not currently available/High but site owner opposed to use	To be determined	9	16.0 mcy	LTMS identified as highly feasible for habitat creation. However, USFWS, site manager, not interested in restoring site using dredged material.
15) Galbraith Golf Course (Alameda)	Not currently available/capacity reached	21	9	1.2 mcy	Site filled with material from Port of Oakland - 42' deepening project.
16) Hamilton Army Airfield & State Lands Commission Antenna Field (Marin)	Not currently available/High Potentially available to use material for habitat restoration in 2001.	55	7.4-11.3	10.2 mcy	LTMS identified as highly feasible for habitat restoration. CEQA/NEPA process initiated in March, 1998. Draft conceptual restoration plan issued April, 1998. Final EIS/R issued late 1998. Proceeding to final design phase.

⁸ Includes costs for site acquisition, engineering, utility relocation, construction, and administration; mitigation and monitoring are not included.

⁹ Includes costs for transport, pump-out, and placement at reuse site; dredging costs not included. Add \$2.20/cy for small projects.

¹⁰ \$65 million cost to establish operations comparable to hazardous waste facility.

TABLE 2 (cont'd)

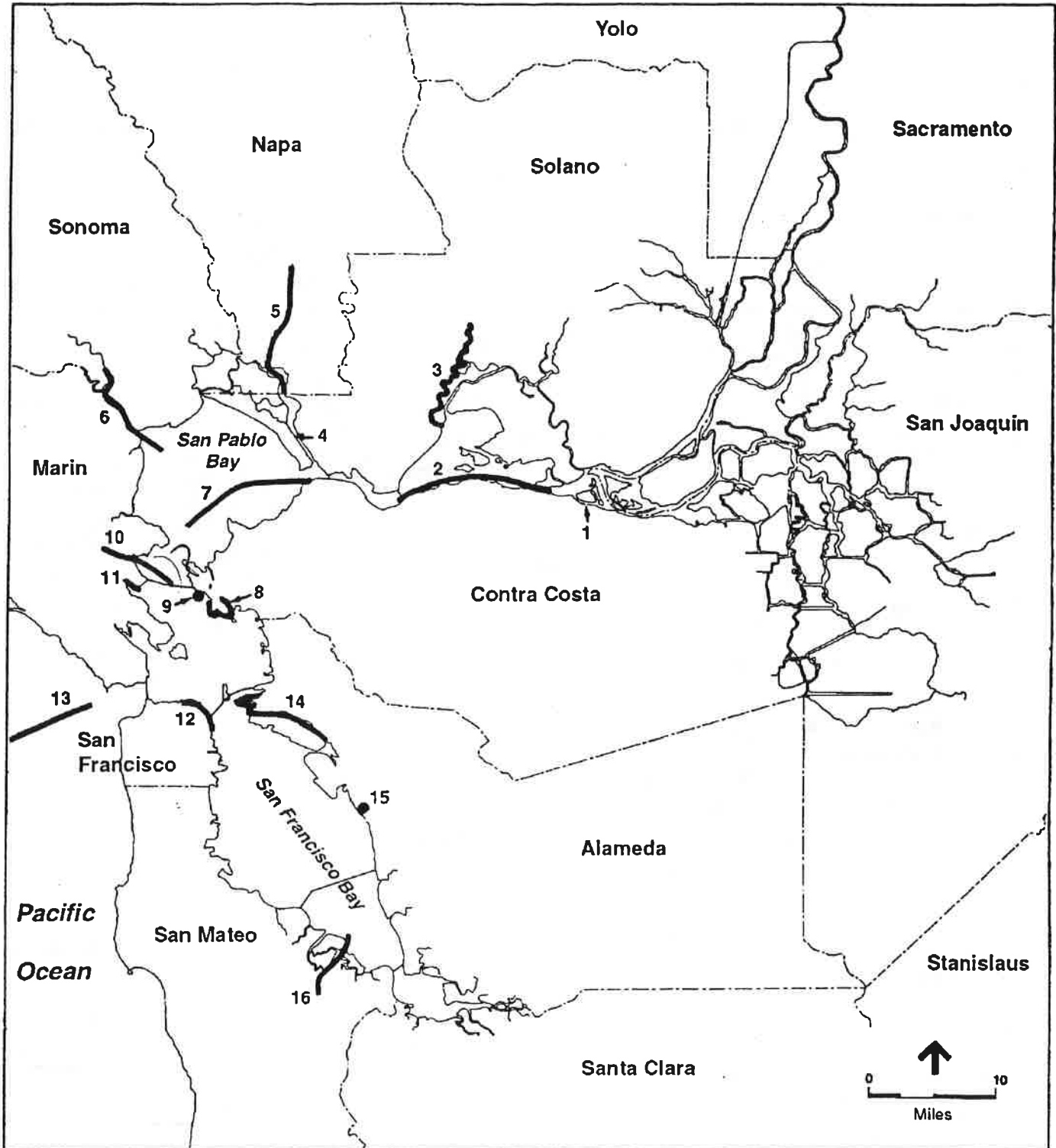
Disposal Site	Site Status / Feasibility	Implementation Costs (million dollars)	Disposal Cost (dollars per cubic yard)	Site Capacity	Comments
33) Sonoma Baylands (Sonoma)	No longer available/Capacity reached	7.6 (includes 39-acre project costs) ⁸	5	Completed	LTMS identified as highly feasible for habitat restoration. Site capacity reached with Port of Oakland -42' deepening and Petaluma River maintenance project.
34) West Contra Costa Sanitary Landfill (Contra Costa)	No longer available/Capacity reached	Not available	Not available	Not available	LTMS originally identified as highly feasible for material as part of site closure, but capacity reached.
35) Winter Island (Contra Costa)	Existing/High	1.7	15	100,000 cy/year	Currently permitted to take Suisun Bay federal channel material. Material used on-site in 1998 for levee restoration; proposed again for 1999.
36) Wickland-Selby	Not currently available/High	Not available	Not available	Not available	LTMS identified as highly feasible for regional rehandling facility and currently under investigation by DMRP. However, site's long-term use identified as liquid bulk cargo in Seaport Plan.

- 1 New York Slough
- 2 Suisun Bay Channel
- 3 Suisun Slough Channel
- 4 Mare Island Strait

- 5 Napa River
- 6 Petaluma River
- 7 Pinole Shoal
- 8 Richmond Harbor

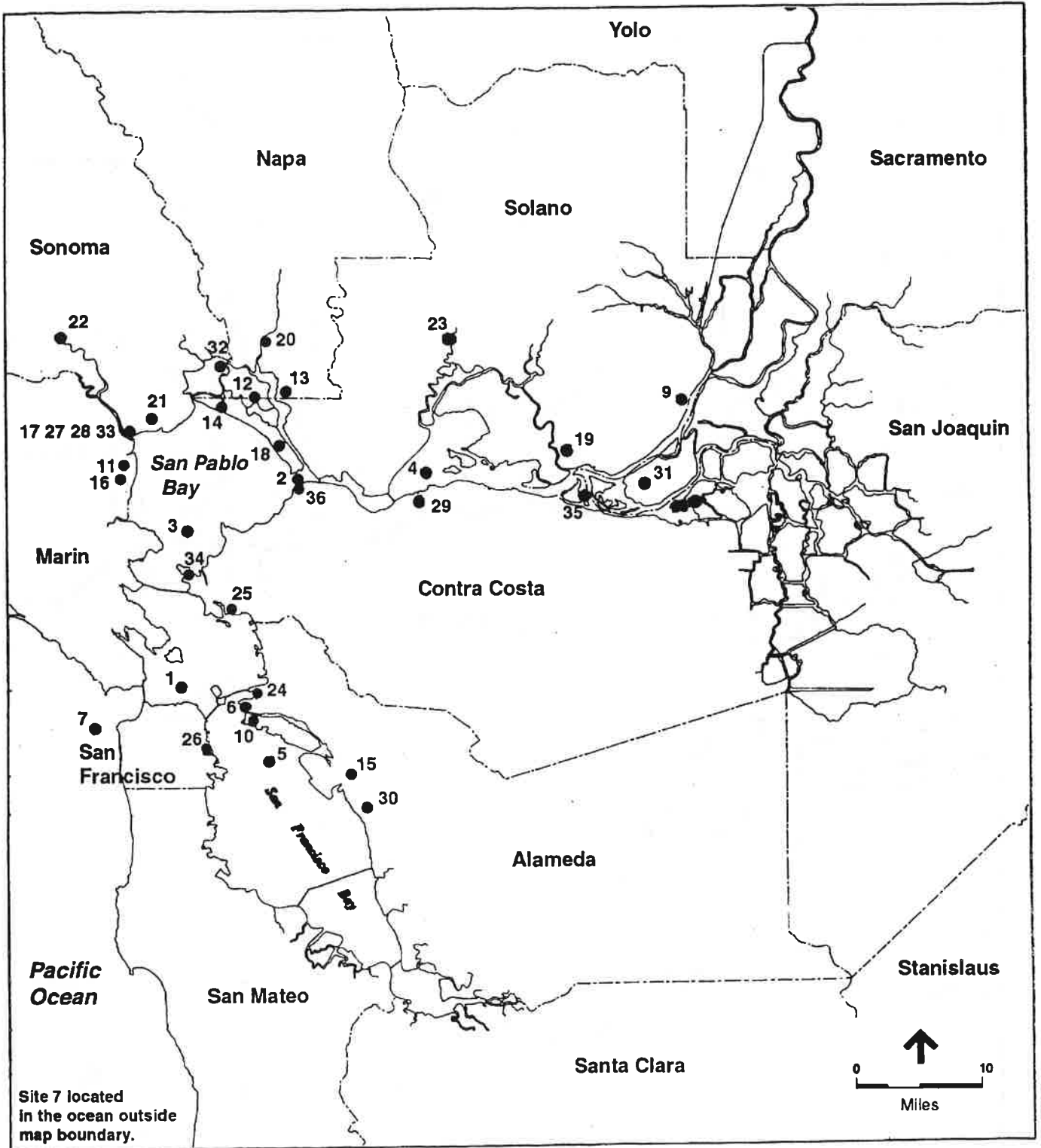
- 9 Chevron
- 10 San Rafael Creek
- 11 Larkspur Ferry Channel
- 12 Port of San Francisco

- 13 San Francisco Bar
- 14 Port of Oakland
- 15 San Leandro Marina
- 16 Redwood City



Map 1. Major dredging areas in the San Francisco Bay region.

NOTE: Site names identified in Table 2.



Map 2. Existing and potential disposal sites.