Within the Planning Area, several special status species are very wide ranging and occur in many habitat types. These species include the golden eagle, ferruginous hawk, northern harrier, black-shouldered kite, osprey, merlin, Cooper's hawk, prairie falcon, burrowing owl, loggerhead shrike, Townsend's western big-eared bat, California mastiff bat, and San Joaquin pocket mouse (Williams 1986; Remsen 1978). Alternatively, other species occur in specific habitats, including intertidal, mudflat, and rocky shore; tidal marshes; seasonal wetlands; salt ponds; and riverine and riparian habitats. Each of these habitats and unique species are discussed, in turn, in the following.

Intertidal Mudflat and Rocky Shore. Intertidal mudflats occur throughout the Bay and provide valuable foraging habitat for several special status species, including the long-billed curlew, California gull, and elegant tern. Rocky shores also occur throughout the Bay Area and provide important resting and roosting habitat for the following special status bird species: the California gull, elegant tern, American white pelican, and double-crested cormorant.

Tidal Marshes. Several types of tidal marshes have been identified in the Planning Area, including tidal salt marsh, tidal brackish marsh, and tidal freshwater marsh. These habitats are described in detail in the vegetation and wildlife section of the Policy EIS/EIR.

Within the Planning Area tidal salt and brackish marshes provide habitat for a diverse array of special status species, including the salt marsh common yellowthroat, Suisun song sparrow, Alameda song sparrow, San Pablo song sparrow, yellow rail, short-eared owl, salt marsh-vagrant shrew, Suisun ornate shrew, and San Pablo vole (CNDDB 1995; SFEP 1991b; Williams 1986).

Within the Delta portion of the Planning Area, freshwater tidal wetlands may provide suitable nesting and foraging habitat for the tricolored blackbird, double-crested cormorant, western least bittern, and white-faced ibis. These species may also occur in freshwater habitats at other locations within the Planning Area, in conjunction with the yellow rail, short-eared owl, salt marsh common yellowthroat, and western pond turtle (SFEP 1991b, 1992c).

Seasonal Wetlands. As described above, within the Planning Area several types of seasonal wetlands have been identified, including freshwater non-tidal marsh, diked wetlands, seasonal ponds, and farmed wetlands. The following is a brief description of the special status species associated with these habitats.

Freshwater non-tidal marshes are known to provide foraging habitat and nesting sites for the following birds: the tricolored blackbird, double-crested cormorant, western least bittern, white-faced ibis, and yellow rail. In addition, western pond turtles are common residents of these habitats. Seasonal ponds may also support the western pond turtle and California tiger salamander (SFEP 1992c).

Diked wetlands and seasonal ponds provide nesting and/or foraging habitat for several special status bird species, including the California gull, American white pelican, elegant tern, and double-crested cormorants that use these habitats for roosting and foraging during the fall (SFEP 1992c).

Farmed wetlands provide foraging habitat for several special status species that nest and roost in adjacent habitats. These species include the tricolored blackbird, California gull, long-billed curlew, and short-eared owl (SFEP 1991b, 1992c).

Salt Ponds. Salt ponds support a variety of special status wildlife, including resident and migratory species. Species observed at salt ponds in the Planning Area include the California brackish water snail, Barrow's goldeneye, western least bittern, long-billed curlew, salt marsh common yellowthroat, tricolored blackbird, and Alameda song sparrow (Wetlands Research Associates, Inc. 1995). Other species known to occur at these sites include the California gull, American white pelican, elegant tern, and the double-crested cormorant (SFEP 1992c).

Riverine and Riparian Habitats. Riparian habitats within the Planning Area are known to support rookery sites for several heron species and double-crested cormorants, nesting cover for colonies of tricolored blackbirds, basking sites for western pond turtles, and den habitat for ringtails. These species all forage in or adjacent to riverine habitat. Other special status species may use this habitat for migration corridors and/or perch sites, but are not generally dependent on riparian habitat.

Threatened and Endangered Plants

Evaluation of the proposed policy and regional biological resources indicate that five threatened and endangered plant species may potentially be affected by policy implementation. These include the following species: soft-bird's beak, Mason's lilaeopsis, delta button celery, swamp sandwort, and California seablite. Each of these species is discussed below.

Soft Bird's-beak. Soft bird's-beak is a semi-parasitic annual plant that occurs in salt and brackish marshes in the North Bay and Suisun Bay areas. The plant is named after the soft hairs that cover the stems. Several historical populations are known from the Planning Area, but only four surviving populations are known (Skinner and Pavlik 1994).

Mason's Lilaeopsis. Mason's lilaeopsis is a small mat-forming perennial that is limited to the intertidal zone of brackish and freshwater marshes of the North Bay, Suisun Bay, Suisun Marsh, and Delta. Mason's lilaeopsis generally occurs on eroding substrates, but may also colonize pilings and riprapped levees. While the trend for this species has been designated as one of decline due to several factors, recent survey efforts have increased the number of the known populations from 39 in 1991 to over 100 in 1995 (Golden and Fiedler 1991; CNDDB 1995).

Delta Button Celery. Delta button celery is a slender perennial species that occurs on clay substrates in riparian floodplains. The historic distribution of this species included Calaveras, Merced, Stanislaus, and San Joaquin counties. All known populations from the Delta have been removed by agricultural development and levee reinforcement projects (CNDDB 1995). For these reasons, it is likely that policy implementation will have no effect on Delta button celery.

Swamp Sandwort. Swamp sandwort is a perennial species that was historically known from freshwater marshes in coastal regions. There is discrepant information on the current distribution of this species within the Planning Area as various sources conflict as to whether the only known population from the Presidio is extant or extirpated (CNDDB 1995).

California Seablite. California seablite is an evergreen shrub species that occurs in coastal salt marshes. Within the Planning Area, historical populations were known from Sonoma, Solano, and Alameda counties (Skinner and Pavlik 1994). Because California seablite is generally believed to be extirpated from the Planning Area, it is unlikely that policy implementation will affect this species.

Other Special Status Plants

The following describes those species within the Planning Area that are not designated as rare, threatened, or endangered, but are considered federal candidates for listing or are listed in the *Inventory of Rare and Endangered Vascular Plants of California* (Skinner and Pavlik 1994). Within the Planning Area, these species may be locally designated by local jurisdictions.

The varied geology, topography and climate of the 11-county Planning Area provides optimal conditions for a variety of special status plant species. The habitats of the Planning Area that will be affected by policy implementation support a unique subset of these species. Those special status plant species that are known from or are expected to occur in the habitats that would be affected by policy implementation are discussed below.

Tidal Marshes. The various tidal marshes of the Planning Area include salt, brackish, and freshwater types. These habitats support several special status species, including Marin knotweed, Suisun Marsh aster, Point Reyes bird's-beak, hispid bird's-beak, San Francisco gumplant, rose-mallow, delta tule-pea, marsh gumplant, delta mudwort, mad-dog skullcap, small spikerush, hairless popcorn flower, Petaluma popcorn flower, Sanford's arrowhead, slough thistle, slender-leaved pondweed, and eel-grass pondweed.

Seasonal Wetlands. Within the Planning Area, farmed wetlands and diked wetlands are not associated with special status plant species, because of the high levels of disturbance associated with these areas. Naturally occurring seasonal wetlands in the area, however, may support a variety of species, including Contra Costa goldfields, heart-leaf saltbush, San Joaquin spearscale, alkali milk-vetch, brittlescale, dwarf downingia, fragrant fritillary, and Carquinez goldenbush.

Salt Ponds. Because of the high salinity and disturbed nature of salt pond habitats, no special status plant species are associated with these environments. Although, some special status species may occur in less disturbed adjacent habitats.

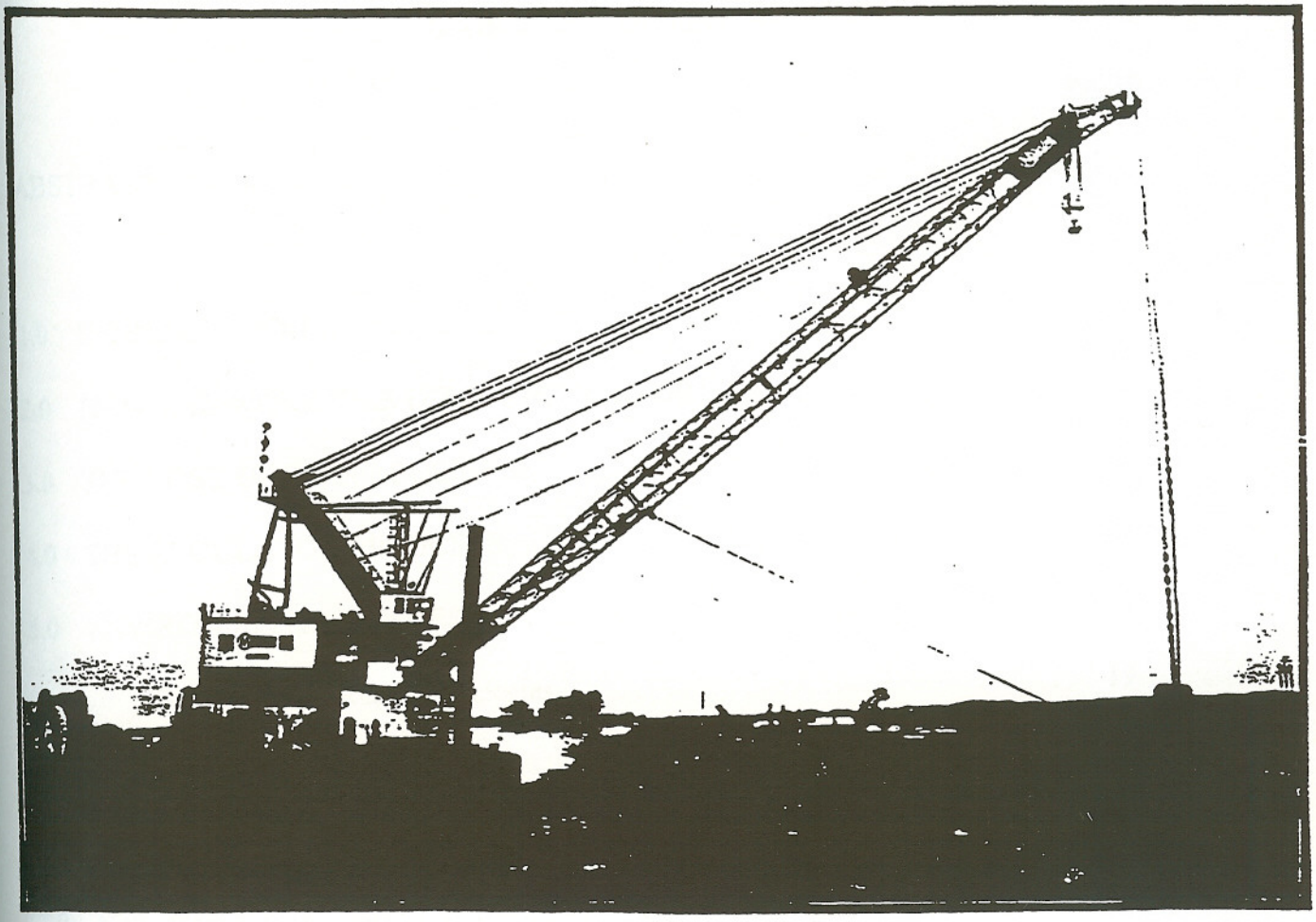
Riverine and Riparian Habitats. Riparian habitats within the Planning Area may support populations of rose-mallow and delta tule pea.

APPENDIX K

Lessons Learned from the Jersey Island Levee Maintenance Demonstration Project (Draft)

Note: This report was being finalized as the Draft LTMS Policy EIS/Programmatic EIR was being printed. The comment period for the Jersey Island draft report has closed; only editorial and clarifying changes to that draft report are expected. The final Jersey Island report will be included with the Final LTMS EIS/EIR.

DRAFT
LESSONS LEARNED
FROM THE JERSEY ISLAND
DEMONSTRATION PROJECT



February 1996

Prepared For:

The San Francisco Bay Regional Water Quality Control Board

Prepared By:

The United States Army Corps of Engineers
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DRAFT
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FROM THE JERSEY ISLAND
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ABSTRACT

This "Lessons Learned" report has been prepared by the United States Army Corps of Engineers, San Francisco District (COE), pursuant to the Special Studies and Monitoring condition outlined within the San Francisco Bay Regional Water Quality Control Board's Waste Discharge Order Number 95-040 for the Corp's 1995-96 Maintenance Dredging Program. This report outlines the challenges of implementing a levee rehabilitation project with sandy dredged-material from the Federal navigation channel at the Suisun Bay Channel and New York Slough. One of the COE's missions is to routinely maintain these channels for safe navigation of deep draft vessels.

The demonstration (or pilot) project discussed in this paper examines in detail a wide array of issues: the environmental impacts to sensitive habitats and water quality; an analysis of the costs related to the dredging, transport and the final placement of the dredge-material upon Jersey Island levees and what entity would bear those costs; and the regulatory requirements which must be achieved in order to successfully implement such a project.

Another purpose of this report is to identify the feasibility of long-term beneficial reuse of dredged material from future Operations and Maintenance dredging projects specifically located within the Suisun Bay portion of the San Francisco Bay/Delta Estuary. Since some of the regulatory agencies have typically viewed this sandy dredged material as a valuable resource for levee rehabilitation/commercial sand mining, their desire is to have the material reused for one of these beneficial purposes rather than continuing to dispose of the dredged material back into the aquatic environment at the Suisun Bay. Furthering of this ideal envisions a "turn key" operation that would be cooperatively implemented by the various agencies having regulatory oversight. Perhaps within the context of a Memorandum of Understanding, the plethora of responsible agencies could act within a reasonable time frame (less than one year) to achieve this goal.

However, as outlined within this report, the time constraint is not the only obstacle to be overcome. Significant issues arise with the source(s) of future project funding, environmental concerns and regulatory demands. The findings and conclusions presented are intended to be useful for formulating policies designed to facilitate/expedite future beneficial reuse of dredged material for the purpose of levee rehabilitation.

1.O INTRODUCTION

The Jersey Island Demonstration Project incorporated the use of sandy dredged-material obtained from the Federal navigation channels in Suisun Bay, Solono County, and New York Slough, Contra Costa County. Disposal of the dredged material occurred at the northern portion of Jersey Island, Contra Costa County (See Figure 1). The dredged material was used to reinforce the landward side of Jersey Island levees weakened from subsidence.

The Federal navigation project (which includes the Suisun Bay and New York Slough Channels) extends from the Benicia Bridge to the Port of Stockton and is authorized at a depth of minus 35 feet Mean Lower Low Water (MLLW).

Historically, the Suisun Bay Channel is maintenance dredged once every year and New York Slough every fourth year. Both channels contain medium to fine sand transported to Suisun Bay by the Sacramento and San Joaquin Rivers. In past practice this sandy material is dredged and disposed of aquatically at the COE's Suisun Bay Channel Disposal Site adjacent to the Suisun Bay Channel. However, the COE and other agencies are interested in identifying and studying the feasibility of beneficial uses for this sandy material, rather than to continue disposing the material into the aquatic environment.

Specifically; the COE, the San Francisco Bay Conservation and Development Commission (BCDC), the United States Environmental Protection Agency (EPA), and the California Regional Water Quality Control Board (RWQCB) have joined efforts to address and reduce dredging impacts within the San Francisco Estuary from a regional perspective for the next 50 years via the Long Term Management Strategy (LTMS).

One phase of the 5-year LTMS study was to outline the Beneficial Reuse/Non-Aquatic Disposal of dredged material. This study considered a full range of measures to reduce dredging requirements, manage existing disposal sites to extend their life; and various combinations of new disposal sites involving different disposal methods, locations and periods of use.

The Suisun Bay Channel and New York Slough were both identified as potentially feasible for beneficial reuse of dredged material by the above study. As such, the COE agreed to investigate alternative disposal methods for the Suisun Bay Channel material and to take the New York Slough material to an upland site, pursuant to the FY 1993-94 two-year water certification granted by the RWQCB and the two-year consistency determination as concurred by the BCDC. Subsequently, as required under the current FY 1995-96 two-year water certification, the COE agreed to analyze and report on the "Lessons Learned" resulting from implementation of the project.

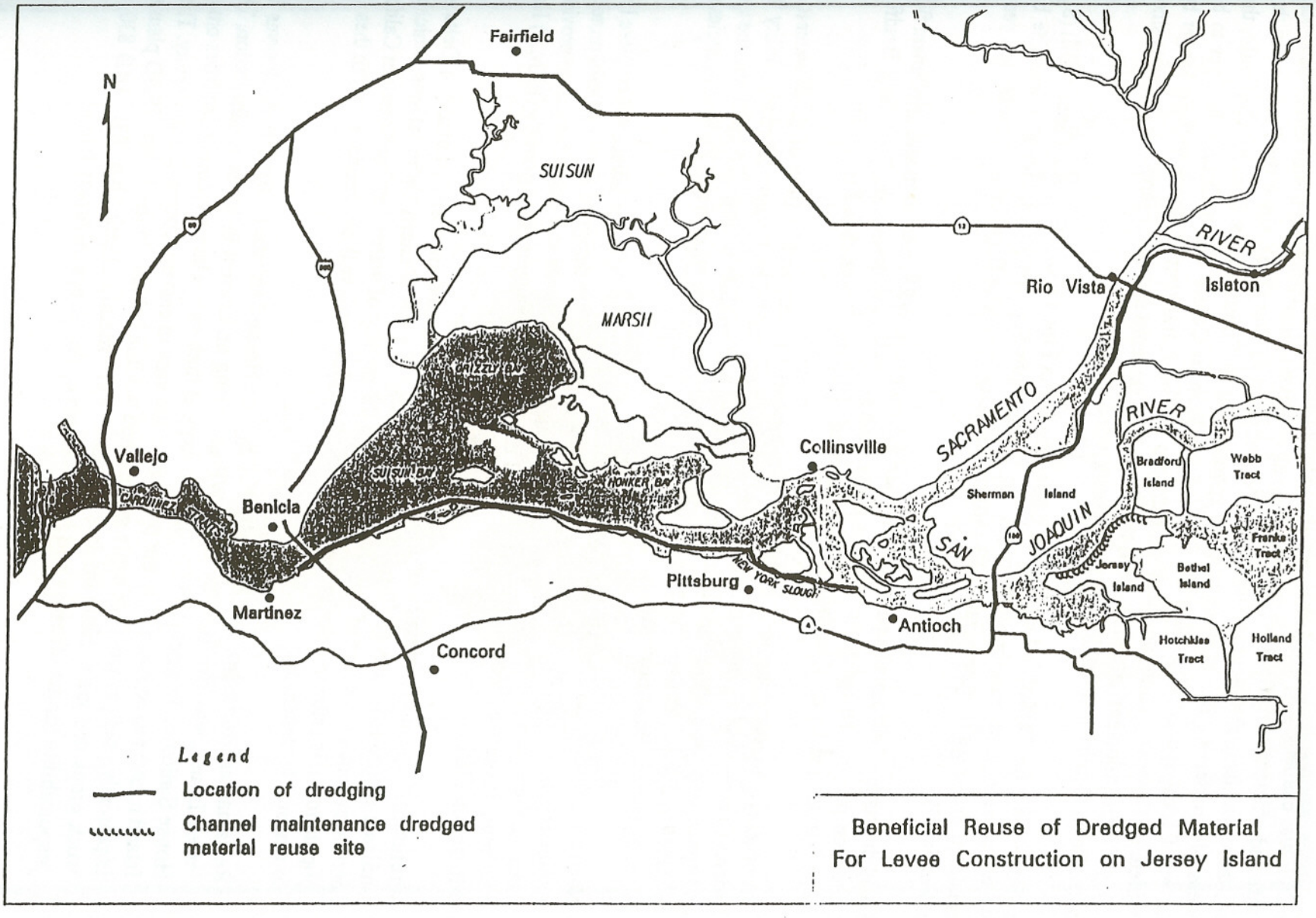

Fairfield
N
SUISUN
MARSH
RIVER
Rio Vista
Isleton
Vallejo
Benicia
Martinez
Pittsburg
Collinsville
SACRAMENTO
RIVER
SAN JOAQUIN
Sherman Island
Bradford Island
Webb Tract
Jersey Island
Bethel Island
Franks Tract
Antioch
Concord
Hotchkiss Tract
Holland Tract
Legend
Location of dredging
Channel maintenance dredged material reuse site
Beneficial Reuse of Dredged Material
For Levee Construction on Jersey Island

FIGURE 1

The COE was challenged by the following: the federal navigation channels needed to be maintained for safe and efficient navigation yet there was no alternative upland dredged material disposal site. Also, there was lack of a participating local sponsor (Port of Stockton), since the Port was in the process of transferring that portion of their sponsorship to Contra Costa County. Currently, the transfer of local sponsorship from the Port of Stockton to Contra Costa County has yet to be completed. However, once the local sponsorship has been transferred, there will no longer be oversight duplication performed by both the Corps' Sacramento and San Francisco Districts since Contra Costa County lies within San Francisco's jurisdiction.

In March 1988, the California Legislature passed the Delta Flood Protection Act (Senate Bill (SB) 34) which recognized the importance of the Sacramento-San Joaquin Delta Region. The bill legislated the intent to appropriate $12 million annually for Delta flood protection for ten years, ending in 1998.

SB 34 directs the California Department of Water Resources (DWR) to develop and implement flood protection projects on the eight western Delta islands. They are: Sherman, Twitchell, Bradford, Webb, Bethel and Jersey Islands; and Hotchkiss and Holland Tracts (See Figure 2).

The primary purpose of the projects is to protect: the Delta system and its flow of fresh water to the Federal Central Valley Project and the State Water Project; public highways and roads; utility lines and conduits; private and public land uses; recreation; and wildlife habitat. To complete the work, the DWR is directed to seek cost-sharing opportunities with public entities and Federal agencies who have interests in flood protection.

Nearly 700,000 acres of land in the Delta are protected by 1,100 miles of levee. All of these levees require regular maintenance if they are to continue to provide the designed level of flood protection. Many of these same levees are in need of substantial improvements and upgrades just to provide the minimum protection required by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Plan.

Preliminary quantity estimates of material needed for maintenance and upgrade of Delta levees indicate a need in excess of 50 million cubic yards. For the Western Delta Islands, which are of particular concern because of their importance to the quality of water serving Southern California's population, it is estimated that at least eight million cubic yards will be needed to return these levees to reasonable standards.

Reclamation District No. 830, comprised of the Iron House Sanitation District which owns most of Jersey Island, was identified by the DWR as having an interest in levee rehabilitation. The Iron House Sanitation District (IHSD) plans to expand their secondary treatment facilities onto Jersey Island in order to accommodate the population increase in eastern Contra Costa County. The Island is presently used primarily for cattle grazing and wildlife habitat. In the future, IHSD plans to grow truck crops and graze cattle on Jersey Island. Reclamation District No. 830 (RD 830) has the responsibility for maintenance and improvement of the levees on Jersey Island.

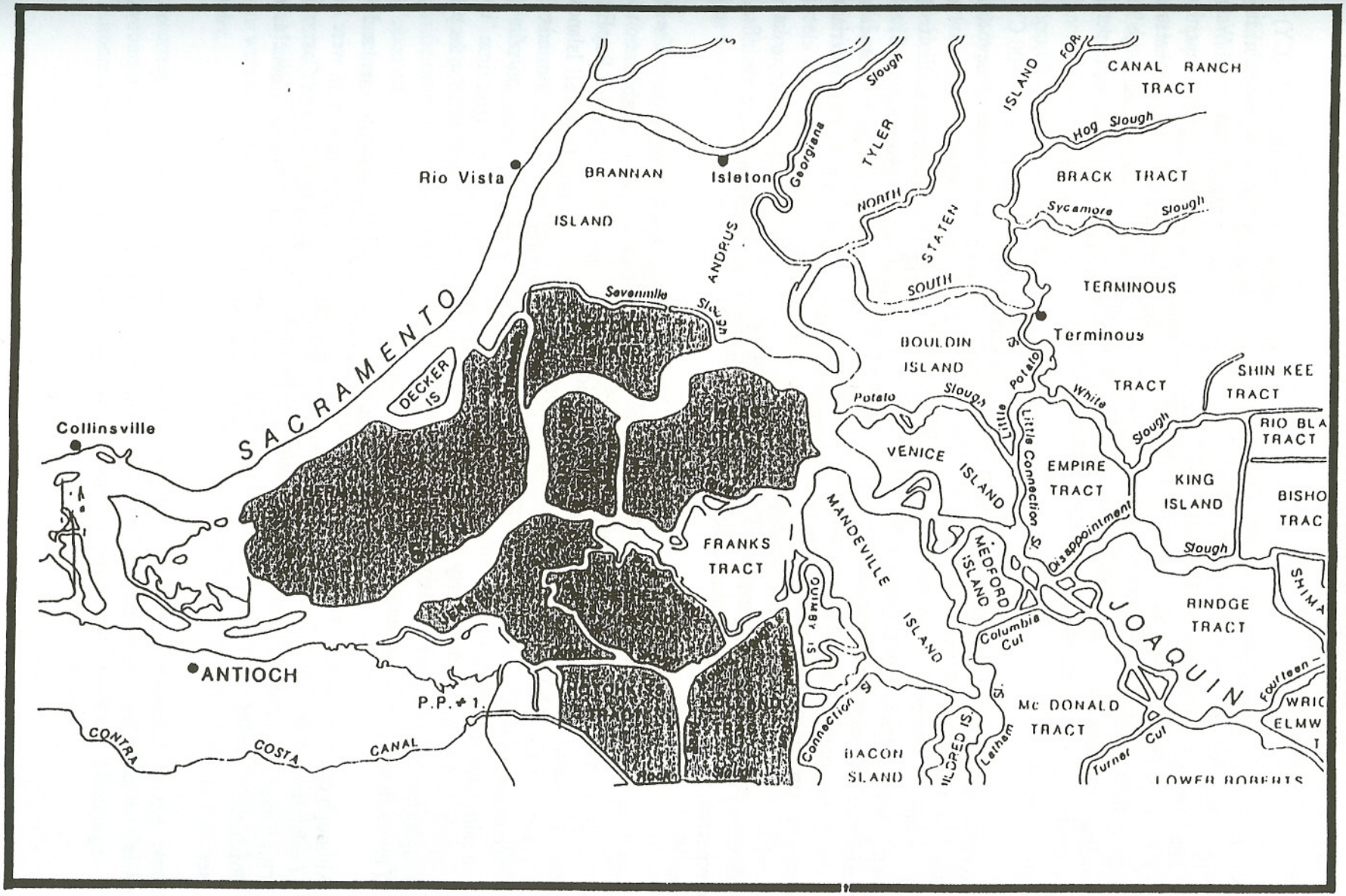

Rio Vista
BRANNAN
ISLAND
Isleton
Georgiana Slough
TYLER
NORTH
STATEN
SOUTH
ISLAND
FOR
CANAL RANCH
TRACT
Hog Slough
BRACK TRACT
Sycamore Slough
TERMINOUS
Terminous
BOULDIN
ISLAND
Potato Slough
Little Connection Slough
White Slough
SHIN KEE
TRACT
RIO BLA
TRACT
VENICE ISLAND
EMPIRE
TRACT
KING
ISLAND
BISHO
TRAC
Disappointment Slough
MEDFORD ISLAND
MANDEVILLE ISLAND
FRANKS
TRACT
Columbia Cut
JOAQUIN
RINDGE
TRACT
SHIMT
Fourteen
WRIC
ELMW
Mc DONALD
TRACT
Turner Cut
LOWER ROBERTS
BACON
SLAND
Connection Slough
Latham
ILORED IS.
Collinsville
SACRAMENTO
DECKER
IS
Sevenmile Slough
ANDRUS
ANTIOCH
P.P.# 1
CONTRA COSTA CANAL

FIGURE 2

As of this date, the DWR has conducted two other demonstration projects on Sherman and Twitchell Islands utilizing dredged material.

The Sherman Island Demonstration Project began in late 1990 when 1,600 cubic yards (CY) of fine-grained material dredged from Suisun Slough was placed as part of a 2,500 cy levee-stabilizing berm. The dredged material was placed under permit from the Central Valley Regional Water Quality Control Board (CVRWQCB) which required an extensive monitoring and reporting program, including soil and water sampling and testing, and quarterly reporting of analytical results. Monitoring continued into late 1992. The monitoring program was discontinued, with the CVRWQCB's approval, after the monitoring results indicated little to no impact from the imported dredged material.

The second demonstration project was implemented on Twitchell Island where over 500,000 CY of dredged material was placed as a stabilizing berm along nearly 5 miles of levee. Most of the material used for this project came from the fresh water environment of Clifton Court Forebay which is located in the southwesterly region of the Delta, but 50,000 CY originated from the COE dredged material stockpile area on Simmons Island. This material had been dredged from Suisun Channel and stored on Simmons Island for several years. However, unlike the material used at Jersey Island, the salts within this material were able to leach out prior to placing it at Twitchell. This material was moved to Twitchell Island with the approval of the CVRWQCB, who required an electrical conductivity (EC) monitoring program. The monitoring of this site continues. However, to date and as expected, no specific effects attributable to the Simmons Island material have been identified and quantified.

Jersey Island is the third demonstration project undertaken and is the focus of this report. The Jersey Island Demonstration Project was designed to assess the feasibility of levee rehabilitation using dredged material taken directly from Federal navigation projects in the San Francisco Bay Estuary on a larger scale. Unlike the two demonstration projects at Sherman and Twitchell Islands, the dredged material utilized at Jersey came entirely from a saline environment; was not allowed to leach with rainwater prior to its placement; and was not combined (or "cut") with clean non-saline soils. Keeping this in mind, the Jersey Island Demonstration project is really the first time "in-situ" dredged material from a brackish environment has been studied at this magnitude for the purpose of rehabilitating levees in the California Delta.

Although one of this study's main purposes was to monitor and analyze the movement and impact of salts through the dredged material into its environs, several other important lessons were learned. This study will also examine: How the Work Was Done and Who Did It; The Cost of Doing Business; The Regulatory Process; and Environmental Issues. Finally, this study concludes with sections entitled: Findings and Conclusions and Recommendations.

2.0 HOW THE WORK WAS DONE AND WHO DID IT

The first step in proceeding with a project of this scope involved identification of the necessary tasks and who would perform each function. In this case, the involved agencies and the local sponsor were proactive and wanted the project to succeed. If this were not the case, this project would have never been possible. The second, and probably most important, step is to identify the source(s) of funding. Had the agencies and local sponsor been unwilling to finance such an ambitious project, the plan would have remained on the "shelf." At their first meeting, held in March 1994, the agencies decided what would be done and who would do it. The following is a chronologic compendium of what occurred:

Initially, the San Francisco District Engineer promised to deliver approximately 65,000 CYS of sandy dredged material from both the Suisun Bay Channel and New York Slough navigation projects based on the pre-condition hydrographic survey of 40,000 CYS and 25,000 CU, respectively. However, by the time the dredging actually took place in December 1994, the quantity had increased and the COE dredged approximately 40,000 cubic yards from Suisun Bay Channel and 32,719 cubic yards from New York Slough.

Prior to the actual dredging, sediment testing was necessary to determine the suitability of the material for upland disposal. Grain size analysis, chemical characterization and Waste Extraction Tests were conducted by the COE.

The sediment samples were composited and analyzed for constituent concentrations to determine whether the proposed sediments could be classified as "inert waste" as defined in Section 2524 of Chapter 15, Title 23 of the California Code of Regulations.

The sediments were analyzed for the following constituents: Trace Metals, Pesticides, PCBs, Semi-Volatile Organic Constituents, Tributyl Tin, and Total Recoverable Petroleum Hydrocarbons.

Predredge sediment sampling and analyses demonstrated that the sediments would meet the classification of "inert waste" in all aspects except for salinity. The COE's sediment testing indicated that the salinity of the dredge materials was between 10,000 to 17,000 mg/l in Suisun Bay Channel and between 3,000 and 4,000 mg/l in New York Slough.

The next step in the process entailed preparation of the project description. DWR and BCDC assisted RD 830 in preparation of a project description and monitoring plans for the project. Both plans were submitted to the CVRWQCB with the request to approve and grant a Waste Discharge Order.

Concurrently, the COE prepared the Environmental Assessment pursuant to the National Environmental Policy Act and DWR prepared the Negative Declaration required under the California Environmental Quality Act. With the environmental permits and the Waste Discharge Order

completed by mid-September 1994, the cost sharing arrangement was left to be negotiated prior to letting the construction contract. Funding came from the COE's Operations and Maintenance funds, DWR Subvention Funds and RD 830. The cost sharing agreement between DWR and RD 830 was 75% and 25%, respectively.

The COE, Port of Stockton, and the DWR entered into a cost sharing arrangement under the 1982 Local Cooperative Agreement (LCA) between the Government and the Port of Stockton (technically the local sponsor). The financial arrangement was based on the amount of yardage shown on the pre-condition survey initially conducted in March 1994, which at that time was 40,000 cubic yards in the Suisun Bay Channel and 25,000 cubic yards in the New York Slough Channel.

Under the LCA, the Government was completely responsible for dredging, transporting, and off-loading the material for the New York Slough portion of the project; and only responsible for dredging the material for the Suisun Bay Channel portion of the project. Historical in-bay disposal is the responsibility of the Government, while the transportation and off-loading of the Suisun Bay Channel material onto Jersey Island was the responsibility of the Port of Stockton. DWR agreed to provide the monitoring and assessment of the project during the pre-project, dredging, material placement, and post-project periods; they also agreed to take lead responsibility for initiating and completing corrective actions to mitigate unreasonable impacts to waters of the State pursuant to the Waste Discharge Order, if required. Prior to the delivery of the dredged material to the Island, DWR sampled the baseline background water quality levels (See Environmental Issues Section for results). Once this task was finished a qualified contractor was sought to perform the work.

Nine firms were issued solicitations for bid, however, only one responded with a proposal. On September 30, 1994 a contract between the United States of America and Manson Construction Company was awarded in the amount of $1.153 million (See The Cost for Doing Business Section for further discussion). The Notice to Proceed was received and acknowledged on October 20, 1994 by Manson Construction.

For the Suisun Bay Channel material the Contractor worked 7 days a week, with 1 barge load per day in up to 12 hours of operation. At New York Slough they worked up to 24 hours in two shifts. The contract specifications required clamshell dredging with the material to be transported by barge. Two each, 2,100-2,500 ton flat barges (approximate draft for theses barges fully loaded is about 10 feet) were used with a 5 cubic yard bucket attached to a 190 foot long floating boom (the draft for this boom was approximately 6.5 feet deep).

Dredged material was barged to Jersey Island on flat barges with open sides where it was unloaded by clamshell to the land side of the levee. Excess water generated during dredging was discharged back into the Bay at the dredge sites prior to transportation; however, a staff member from the CVRWQCB reported that the material at the delivery site appeared to be wetter than the water content specifications outlined within the Waste Discharge Order.

The dredged material was "windrowed" at the northern perimeter of Jersey Island adjacent to the San Joaquin and False Rivers (See Figure 3). RD 830 provided access to the levee. The material from Suisun Bay was placed west of Jersey Island Road and continued to the east, a distance of approximately 2 ½ miles. The material from the New York Slough was placed east of Jersey Island Road in segments covering a distance of approximately 1 mile.

Once the material was placed on land, it was spread by a dozer in accordance with the recommendations of a geotechnical engineer (See Figure 4). The plan was to bring the landside of the levees to a minimum slope of 3:1 and construct a 40 foot-wide by 3-foot high berm along the landslide of the levee to stabilize the levee foundation.

The dredging construction contract duration was originally for sixty days but was extended due to inclement weather and a record rainy season. However, project construction started mid-December 1994 and was completed by the middle of January 1995.

Once the material was in place, the DWR began their monthly monitoring. The areas for placement of the Suisun Bay Channel and New York Slough dredged materials are served by separate field drains bisected by the Island's main drain which has a pump to discharge the Island's interior water back into the San Joaquin River. Thus, it was possible to independently monitor the rate of salt loss from each fill as well as the rate of movement through the drain system as a function of the concentration of salinity in the dredged material.

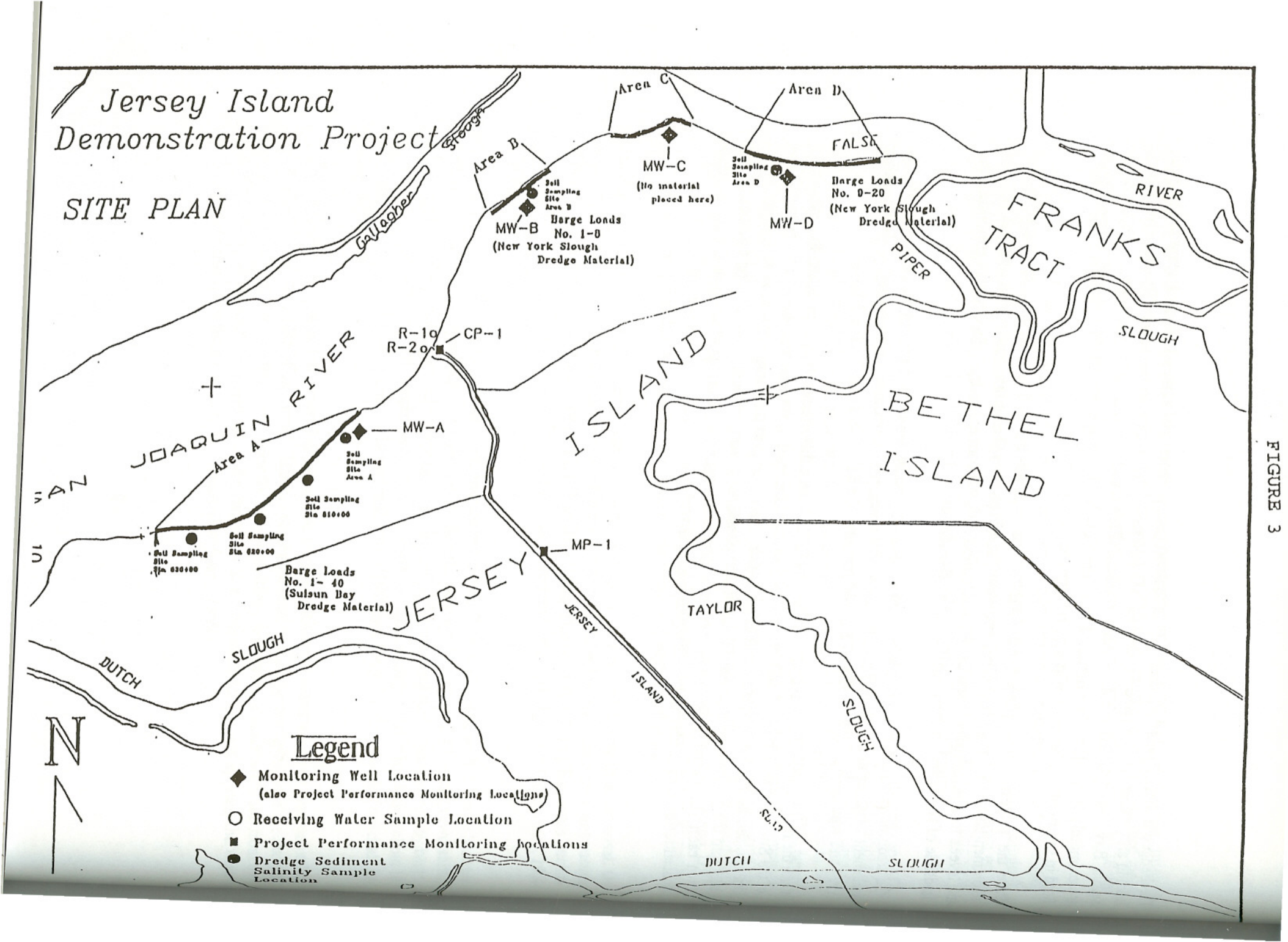
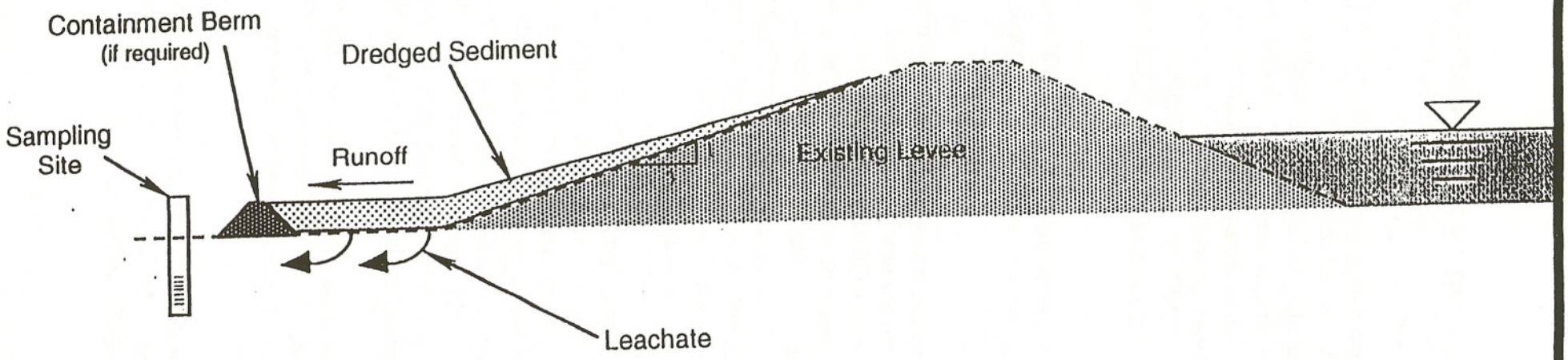

Jersey Island
Demonstration Project
SITE PLAN
Area C
Area D
Area B
FALSE
MW-C
(No material placed here)
MW-B
Barge Loads No. 1-8
(New York Slough Dredge Material)
MW-D
Barge Loads No. 9-20
(New York Slough Dredge Material)
RIVER
FRANKS TRACT
PIPER
SLOUGH
Gallagher
R-1o
R-2o
CP-1
ISLAND
BETHEL ISLAND
JOAQUIN RIVER
MW-A
Area A
Soil Sampling Site Area A
Soil Sampling Site Sta 810+00
Soil Sampling Site Sta 820+00
Soil Sampling Site Sta 830+00
MP-1
Barge Loads No. 1- 40
(Suisun Bay Dredge Material)
JERSEY
TAYLOR
DUTCH
SLOUGH
JERSEY ISLAND
SLOUGH
N
Legend
Monitoring Well Location
(also Project Performance Monitoring Locations)
Receiving Water Sample Location
Project Performance Monitoring Locations
Dredge Sediment Salinity Sample Location

FIGURE 3



LEGEND

- Existing Facilities
- Proposed facilities
- 'Native' Island Soil
- Dredged Sediment

FIGURE 4

3.0 THE COST OF DOING BUSINESS

One of the reasons for conducting the demonstration project was to determine the present cost of levee rehabilitation using localized dredged material. It has long been the desire of the BCDC, SFBRWQCB, and other environmental agencies to use the sand dredged from the Suisun Bay for some type of beneficial purpose rather than disposing of a potential resource back into the Bay. Other ideas for reuse of this material range from providing fill for development projects and/or for the local commercial sand miners presently operating in Suisun Bay. The latter idea is the subject of another study requested by the SFBRWQCB's Special Studies and Monitoring condition outlined within their Waste Discharge Order Number 95-040 for the COE's 1995-96 Maintenance Dredging Program.

Table A, the Historical Dredged Quantities and Costs on the following page illustrates what has been spent, and how many cubic yards have been dredged to maintain these navigation channels for the last eighteen years.

The 1994 cost for levee rehabilitation appears to be more than seven times greater than in past years. The reason for this higher cost is attributed to how the work was performed given the change in disposal site locations. In past years the COE has used a hopper dredge with aquatic disposal of the dredged material rather than the clamshell/barge used for the Jersey Island project. There is a greater cost due to the longer distance for transporting the dredge material for disposal and the less efficient clamshell/barge method of dredging. In addition, the 1994 amount indicates a total cost per cubic yard of $14.80. This amount reflects not only the cost for levee rehabilitation but also two separate emergency dredging episodes which were performed via a hopper dredge removing 42,515 CYS in May 1994 and 16,000 CYS in January 1995.

Table B, Suisun Bay Channel and New York Slough FY 1994 Cost Comparison, summarizes the costs for both dredging and transport of the materials to the upland and aquatic locations. Referencing this table, the cost for placing material at Jersey Island was $1,259,618.80. The Suisun material was the most expensive due to both its further distance from the delivery site and its irregular shoaling which required additional plant operation at a cost of $17 per CY. The New York Slough material cost somewhat less at $12 per CY (the overrun yardage was slightly cheaper since the dredging equipment was already mobilized) because of its closer proximity to Jersey Island. For comparative purposes, aquatic disposal at the historical site costs $3.50 per CY.

Of the $1,259,618.80 total, the COE's Operations and Maintenance funds contributed $719,618.80, DWR Subvention Funds paid $458,750 and RD 830 contributed $81,250. Due to both Federal and State subsidization, the Reclamation District received the levee reinforcement material for $1.12 per CY.

The above construction cost does not include other external costs such as sediment testing ($55,497), mitigation monitoring (estimated at $450,000), and the additional staff time required for plan coordination at the COE, CVRWQCB, and the RD 830.

Table A, Historical Dredged Quantities and Costs for Suisun Bay Channel and New York Slough

FISCAL YEAR	DREDGING DATES	AMOUNT DREDGED (CYS)	TOTAL COST ($)	CONTRACT COMPANY
1977	30 NOV - 04 DEC 76	85,000	60,257	GOV
1978	26 APR - 04 MAY 78	130,000	97,307	GOV
1979	02 JAN - 12 JAN 79	233,000	153,522	GOV
1980	15 FEB - 03 MAR 80	285,000	244,525	GOV
1981	17 FEB - 03 MAR 81	166,000	220,495	GOV
1983	29 SEP - 04 NOV 82	177,000	667,905	GOV
1984	10 SEP - 09 NOV 84	119,545	281,272	MANSON
1985	01 APR - 02 APR 85 25 APR - 27 APR 85	4,100 34,500	16,242 97,408	GOV
1987	24 MAR - 26 MAR 87	28,300	112,309	GOV
1988	03 OCT - 05 DEC 87	46,846	56,707	NORTH AMERICAN TRAILING
1990	17 AUG - 22 SEP 90	91,395	178,557	DUTRA
1991	18 SEP - 12 OCT 91	13,370	33,059	NATCO
1992	01 AUG - 28 AUG 92	54,418	291,336	MANSON
1993	19 JUL - 25 SEP 93	22,711	41,442	MANSON
1994	07 MAY - 08 MAY 94 20 OCT - 20 JAN 95	42,515 89,000	70,542 1,316,777	GOV MANSON