Chapter 6
AFFECTED ENVIRONMENT, ENVIRONMENTAL IMPACTS, AND MITIGATION MEASURES

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6.1 Introduction

This chapter contains an analysis of identified environmental issues related to the proposed Montezuma Wetlands Project and the project alternatives. The existing environment is first described, followed by the environmental impacts that could occur as a result of the Project or project alternatives. Adverse as well as beneficial impacts are identified. Mitigation measures to reduce the level of impact are identified for all significant, adverse impacts, as well as a number of adverse but less-than-significant impacts.

6.1.1 Determination of Significance

The California Environmental Quality Act (CEQA), the CEQA Guidelines, and the National Environmental Policy Act (NEPA) were used as guidance in determining the level of impact significance. CEQA Section 15065 includes a list of factors which define a significant effect. CEQA Guidelines Appendix G includes a list of factors which would normally result in a significant effect on the environment. Under CEQA, a significant effect is defined as a substantial, or potentially substantial, adverse change in the environment (Public Resources Code 21068). The Guidelines implementing CEQA direct that this determination be based, to the extent possible, on scientific and factual data.

Under NEPA, the discussion of environmental consequences must include the environmental effects of the alternatives, any adverse environmental effects which cannot be avoided, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved if the proposal is implemented. Environmental effects include ecological, aesthetic, historical, cultural, economic, social and health (40 C.F.R. 1502.16, 1508.8). Whether a proposed action "significantly" affects the quality of the human environment is determined by considering the context in which it would occur and the intensity of the action (40 C.F.R. 1508.27). Consistent with these regulations, the Corps' determinations of significance also depend on whether the impact would be sufficient to trigger the need for an EIS, given the scope of federal regulatory control and authority. As a result, several impacts and issues that have local significance are considered less than significant from a federal perspective.

6.1.2 Environmental Factors Addressed in the EIR/EIS

The following environmental issues, or resource areas, are addressed in this chapter:

1. Land Use
2. Policy
3. Geology and Seismicity
4. Sediment Quality
5. Hydrology and Water Quality
6. Biological Resources
7. Cultural Resources
8. Traffic, Access, and Circulation
9. Air Quality
10. Noise
11. Recreation
12. Population, Housing, and Employment
13. Visual Resources
14. Utilities and Public Services
15. Economic and Fiscal Factors.

The affected environment, environmental impacts, and mitigation measures for the off-site alternatives — Bel Marin Keys and Hamilton (Alternatives 3 and 4) — are based entirely on existing environmental documentation. These analyses are more qualitative and less detailed than those for the Montezuma site, but they are sufficient for the EIR/EIS to draw meaningful comparisons between these alternatives and the Proposed Project.

6.1.3 Format for Impacts and Mitigation Measures

For the Proposed Project, impacts and corresponding mitigation measures are numbered consecutively for each resource area (e.g., Land Use; Policy). The mitigation measure for an impact has the same number as the impact. The first part of the impact/mitigation number reflects the Project or the alternative being considered ("P" for Project; "1," "2," "3," or "4" for Alternative 1, 2, 3, or 4, respectively). The second part of the impact/mitigation number reflects the resource area, such as "LU" for Land Use or "AIR" for Air Quality. Impacts and corresponding mitigations are then numbered sequentially within each resource. Not all impacts have mitigation measures: beneficial impacts do not warrant mitigation measures, and some adverse but less-than-significant impacts do not require mitigation.

The analysis of the Proposed Project is presented first in each resource section. Most of the impacts and mitigation measures identified for the Proposed Project are applicable to the alternatives. To reduce unnecessary duplication and facilitate more meaningful comparisons between the Proposed Project and alternatives, the impact and mitigation sections for each alternative identify which impacts and mitigations previously described for the Proposed Project are directly applicable and, as a result, need not be repeated. Subsequent discussion for each alternative is focused on the substantive differences between it and the Proposed Project. Where an alternative's impact differs substantively but has essentially the same cause and types of consequences, the impact (and any associated mitigation) is given the same number as for the Proposed Project. As a result, the reader is able to quickly discern the similarities and differences between the Proposed Project and alternatives.

For each impact, a summary description is written in bold, followed parenthetically by a determination of significance from the perspective of the County and Corps, respectively (S = significant, LS = less than significant, NA = not applicable). The impact summary description is followed by supporting analysis, followed by the recommended mitigation measures, followed by the significance of the residual impact after mitigation.

6.2 Summary of Project Benefits

A project can have both significant beneficial effects as well as significant environmental impacts.

NEPA requires the identification of beneficial impacts as well as adverse impacts. CEQA, however, defines impacts more narrowly as those which could have an adverse effect on the environment. The benefits of the Proposed Project and the project alternatives are briefly described below. These benefits are discussed further in the resource-specific sections of Chapter 6 (e.g., section 6.3 [Land Use], section 6.4 [Policy], etc.). The benefits of the Project and the alternatives are compared in Chapter 7 (Comparison of Alternatives). The summary tables in Chapter 3 (Tables 3-1 through 3-5) also reflect the beneficial impacts of the Project and alternatives (as well as the adverse impacts).

6.2.1 Benefits of Proposed Project

To the degree that the Proposed Project is successful, its primary benefits would be the restoration of 1,720 acres of historical tidal wetlands, and the creation of 109 acres of managed wetlands, in an area of diked, non-tidal lowlands. Relative to existing conditions, wetland functions and values would be improved in most respects, and there would be a net gain of approximately 200 acres of wetland and aquatic habitats.

Within the Suisun Bay system there are abundant seasonal wetlands, whereas tidal marsh wetlands have become relatively scarce, due to diking and filling over the last century. Tidal marsh is generally recognized as a highly productive biological system. The replacement of some existing seasonal wetlands and grasslands with tidal marsh in the Suisun Marsh is generally considered to be a net ecological benefit in the long term, although during the period of restoration there would be a significant loss of biological productivity due to the removal of habitats provided by seasonal wetlands and grasslands.

For the Proposed Project, assuming mitigation measures identified herein are incorporated, there is a high probability that typical low marsh vegetation (tules) of the Suisun Marsh will successfully establish in the low marsh and along channel banks, leading to successful restoration of this habitat and associated benefits, especially for estuarine fishes and waterfowl. There is also a high probability of the successful creation of managed wetlands to benefit the endangered salt marsh harvest mouse and other types of wildlife. Other landscape elements (including high marsh and others described in section 4.4) are also likely to provide important habitat functions and values for wildlife, although the composition of the vegetation and the direction of succession as the marsh develops are more difficult to predict.

In addition, the Project could provide the following specific benefits.

- Habitat could be restored for rare plant species (Mason's lilaeopsis, Suisun thistle, soft bird's beak) associated with tidal brackish marsh., Wildlife species, especially migratory waterfowl and shorebirds, plus one endangered fish species (the winter-run chinook salmon), one threatened species (the Delta smelt), and one proposed threatened species (the Sacramento splittail), are likely to benefit from tidal restoration.

- The need for upland sites suitable for beneficial reuse of dredged material from the Bay has been established by the LTMS. The Project would provide a non-aquatic site for disposal of 17 million cubic yards (mcy) of cover and non-cover dredged material from the San Francisco Bay.

- The Project would improve existing public access facilities and add new public access at controlled points that would avoid the disturbance of wildlife, satisfying BCDC's public access requirements. Increased public access to the Suisun Marsh and shoreline would be a public benefit.

- If tipping fees are provided to Solano County, as required mitigation for fiscal impacts on the County, the net revenues to the County from the Project would benefit the public.

- The Project would provide the opportunity to monitor the success of effects on tidal wetlands restoration using dredged materials. Data from monitoring activities would benefit other efforts for wetland restoration, and would set standards for sediment quality.

6.2.2 Alternative 1: Managed Wetlands

This alternative would have less benefits overall than the Proposed Project. Diked managed wetlands at Montezuma would primarily benefit wintering and migratory waterfowl and other marsh birds, but the habitat created would be of a type that is relatively common in the Suisun Marsh. The site would benefit no endangered species other than SMHM, for which the probability of success is high. Greater seasonal wetlands habitat would be restored to the site following placement of dredged materials and restoration.

6.2.3 Alternative 2: Combined Wetlands

The major difference in benefits between Alternative 2 and the Proposed Project is that this alternative would restore both tidal marsh and managed wetlands to the site. Alternative 2 would thus provide benefits of both the Proposed Project and Alternative 1. The total acreage of tidal marsh, the most productive habitat, would be 966 acres, compared with the 1,720 acres of tidal wetlands of a variety of types in the Proposed Project. In terms of the value of the habitat restored, Alternative 2 would be more beneficial than Alternative 1 but less than the Proposed Project, due to the relative scarcity of tidal marsh wetlands in the Suisun Marsh system.

6.2.4 Alternative 3: The Bel Marin Keys Site

The following specific benefits would result from the Bel Marin Keys alternative:

- The primary benefit of this alternative would be the restoration of about 1,500 acres of historic tidal salt marsh. Marsh restoration has a high probability of success.

- A major benefit of this alternative, if successful, would be the likelihood of restoring the habitat for the endangered California clapper rail, SMHM, and the state-listed threatened black rail populations, and a significant contribution to the recovery of these species. This benefit would also have a high probability of success.

- The salinity levels are higher at this Bay site than at the Montezuma site, and would result in greater predictability of vegetation type and, in turn, greater predictability of habitats for the endangered California clapper rail and SMHM.

- This alternative has less potential to impact existing wetland resources compared to the Proposed Project; no rare, threatened, or endangered species have been documented within the boundary levees. This alternative would not result in loss of known SMHM habitat.

- The need for upland sites suitable for beneficial reuse of dredged material from the Bay has been established by the LTMS Program. Alternative 3 would provide an upland site for disposal of about 17 mcy of cover and non-cover dredged material from the San Francisco Bay.

- This alternative would have the advantage of being closer to dredging sites in the San Francisco Bay and, assuming most dredging sites are in the Bay, would reduce the distance traveled by tug boats transporting dredged materials.

- This alternative would add new public access at controlled points that would avoid the disturbance of wildlife, satisfying BCDC's public access requirements. Increased public access to the San Pablo Bay and shoreline would be a public benefit. (The Project would also increase public access.)

- If tipping fees were charged by Marin County, as required mitigation for fiscal impacts on the County, the net revenues to the County from this alternative would benefit the public. (Similar benefits to Solano County could occur with the Project.)

6.2.5 Alternative 4: The Hamilton Site

The Hamilton site would have benefits similar to those of the Bel Marin Keys site, with a similar probability of success. This site differs from Bel Marin Keys with respect to acreage (it would restore roughly 800 acres of tidal habitats) and jurisdiction (City of Novato).

6.2.6 No-Project Alternative

The No-Project Alternative would allow the continuance of existing uses of the project site, including hunting, which provides recreational benefits, and livestock grazing, which may be considered a beneficial land use.

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6.3 Land Use

6.3.1 Affected Environment

6.3.1.1 The Montezuma Site

Existing Land Uses. The 2,394-acre Project site includes approximately 1,822 acres of land used for cattle and sheep grazing. About 360 acres at the northern end of the site are leased to a private hunting club and used for hunting ducks and pheasant. A small area at the southeast end of the site adjacent to the McDougal Cut is leased to Jerico Towing Company, which brings oyster shells and sand to the site. The material is processed and sold for construction purposes. The California Department of Water Resources (DWR) has a Day Use Area for fishing, boating and picnicking on the site at the Montezuma Slough, accessible via Fire Truck Road. A Sacramento Northern railroad right-of-way and tracks extend through the middle of the site from north to south. Existing land use is shown in Figure 6.3-1.

Surrounding Land Uses. Uses in the surrounding area include sheep and cattle grazing in the Montezuma Hills east of the site and to the north of the site, several residences on Collinsville Road, eight to ten residences at the intersection of Collinsville Road and Fire Truck Road, and the small settlements of the Town of Collinsville at the south end of Collinsville Road, and Birds Landing to the northeast of the site. The Suisun Marsh lies west of the site, where hunting is a major recreational activity.

6.3.1.2 The Bel Marin Keys Site

Existing Land Uses. Current land uses on site are limited to oat hay farming. Five residences and two temporary residential structures are located on Headquarters Hill in the northwest corner of the site.

Surrounding Land Uses. Surrounding land uses include residences in Bel Marin Keys west of the site, the former Hamilton Air Force Base to the south, lands of the Marin County Flood Control and Water Conservation District to the west and north, and San Pablo Bay to the east. Beyond the Flood Control District lands to the west is the Ignacio industrial district, Los Robles Mobile Home Park, a PG&E substation, and the Novato Sanitary District office.

6.3.1.3 The Hamilton Site

Existing Land Uses. The Hamilton site includes the former airfield, which is currently being abandoned for disposal and reuse (see section 5.2.4.1), and the antenna field, which is used for agricultural grazing and as a pistol range by the Novato Police Department.

Over 400 acres adjacent to the restoration site include approximately 1,500 residential units. Although current plans call for the housing to be vacated in 1997, the U.S. Coast Guard, Merchant Marine Academy, and Department of Veterans Affairs have requested housing through the real estate screening process. Additionally, the proposed City of Novato General Plan Update is recommending no net loss of housing in this area.[1]

1 USACE 1996

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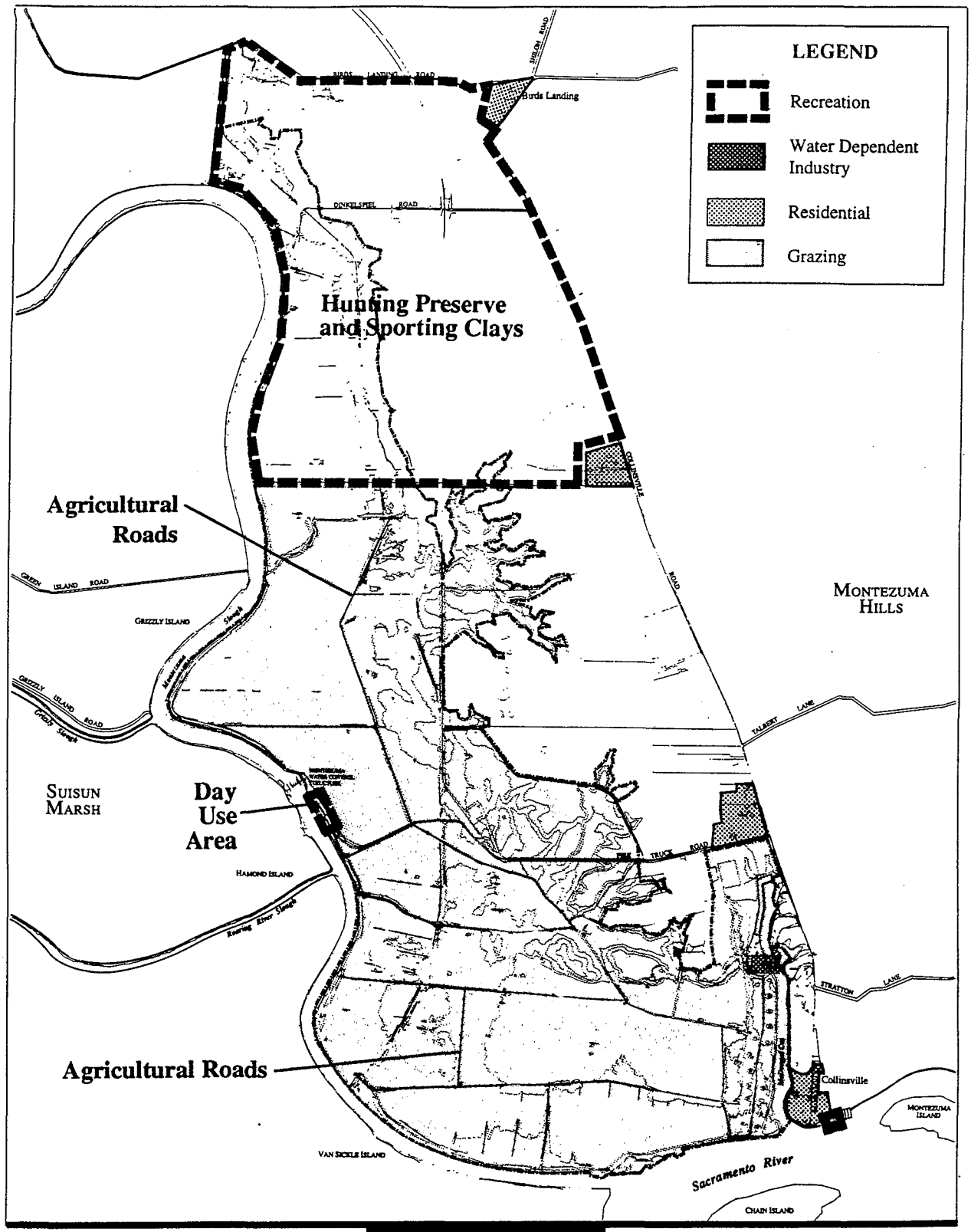

Source: Brady and Associates (1994)

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Figure 6.3-1

Montezuma Site: Existing Land Use

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Surrounding Land Uses. Surrounding land uses include the Bel Marin Keys site to the north, the Los Robles Mobile Home Park on the northwest, San Pablo Bay to the east, and Pacheco Hill to the south, which separates the site from 1,500 acres of undeveloped land now used for grazing and hay production. St. Vincent's Boys School, planned for mixed-use development, occupies a portion of this property. The remainder of the former Air Base to the southwest is the subject of a proposal for a 402-acre mixed use development.

6.3.2 Environmental Impacts and Mitigation Measures

6.3.2.1 Proposed Project

Existing Land Uses

GRAZING AND HUNTING: Existing uses on about 1,650 acres of grazing land and 245 acres of land leased by the hunting club would change. Wetlands restoration would eliminate grazing and hunting use.

Impact P-LU-1: The Proposed Project would remove 1,650 acres of grazing land from agricultural use, and would change 245 acres of uplands leased by the hunting club to tidal marsh. (County-LS, Corps-LS)

The loss of grazing and upland hunting land is a less-than-significant impact and no mitigation is required. The impact of removal of agricultural land is diminished by the large amounts of grazing land in the surrounding Montezuma Hills area, the marginal quality of the existing grazing land, and its natural tendency to deteriorate under current conditions. The conclusion that the project would not have a significant impact on agricultural land use is reinforced by the fact that the affected grazing lands are designated in the Solano County General Plan as Marsh and Water-Dependent Industry, respectively, signifying their relatively low agricultural value in comparison with lands designated Extensive Agriculture (see section 6.4 for additional discussion).

The loss of existing hunting land is considered less-than-significant because hunting on the adjacent uplands east of the project boundary would be unaffected, and because there are sufficient hunting opportunities elsewhere in the region.

DWR DAY-USE AREA: Access to the DWR day use recreation area would pass through Phase I and II Project areas, and would be directly adjacent to the proposed holding pond where the dredged materials would be dewatered. The nature of the public access experience would be modified during the construction phases of the Project. Construction traffic and activity could interfere with visitors going to the Day Use Area as both types of traffic would use Fire Truck Road. These potential impacts are discussed further in section 6.13 (Recreation).

RAILROAD RIGHT-OF-WAY: Dredged materials would cover a portion of the railroad right-of-way and defunct trackage, in Phase II of the Project. The Applicant would obtain permission as necessary from easement holders. This long-abandoned rail corridor is not recognized as viable for future rail use in the Solano County General Plan. Instead, the General Plan identifies a future rail spur eastward to Talbert Lane, a route that coincides approximately with the project boundary. The project has no effect, either positive or negative, on the feasibility of this alignment.

JERICO TOWING COMPANY FACILITY: Access to the Proposed Montezuma Wetlands Project office would cross land leased by the Jerico Towing Company within the Project boundary. Given limited Project-

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related traffic and the small size of the Jerico operation (three permanent employees), potential conflicts are insignificant (section 6.10).

Surrounding Land Uses. Construction of the rehandling facility and activity associated with rehandling dredged materials near McDougal Cut and the off-loading of dredged materials at the Sacramento River would increase activity in the area, slightly increase traffic to the site, and generate noise and dust from construction activity upon the residents in the area. The operation of these uses would increase airborne dust and noise levels generated from barges, traffic, earthmoving equipment, and tugs. The off-loading and rehandling facility would be lighted for safety and security purposes and would be a 24-hour operation. The potential long-term impacts on residents associated with noise, traffic, lighting, and dust are discussed further in subsequent noise, traffic, visual, and air quality sections of this EIR/EIS.

6.3.2.2 Alternative 1: Managed Wetlands

Alternative 1 would have the same land use impacts as the Proposed Project. The type of wetlands being restored would not change the on-site or adjacent land use effects.

6.3.2.3 Alternative 2: Combined Wetlands

Alternative 2 would have the same land use impacts as the Proposed Project. The type of wetlands being restored would not change the on-site or adjacent land use effects.

6.3.2.4 Alternative 3: The Bel Marin Keys Site

AGRICULTURAL LAND: Development of the Bel Marin Keys site as a wetlands restoration project would lead to the phased elimination of the oat hay farming that currently occurs on the site.

Impact 3-LU-1: Removal of 1,500 acres of agricultural land could be a significant impact on the County's agricultural resources. (County-S, Corps-LS)

> Mitigation Measure 3-LU-1: If this impact were to prove significant upon further review by Marin County, a transfer of development rights could be implemented through coordination with the Marin Agricultural Land Trust. (LS)

ADJACENT RESIDENCES: Construction and operations phases of the project would impact residences on Headquarters Hill and nearby residences in Bel Marin Keys Units 1-4 with increased noise, dust, and changes in visual quality over the lifetime of the project These impacts are discussed in the noise, air quality and visual resources sections of this chapter.

6.3.2.5 Alternative 4: The Hamilton Site

The project would remove the potential for urban or other uses of development on the site. Construction and operations phases of the project would impact residences in Los Robles Mobile Home Park and existing residential uses on Hamilton Air Force Base with increased noise and dust over lifetime of the project. These impacts are discussed in the noise and air quality sections of this chapter.

6.3.2.6 The No-Project Alternative

Current uses of the Montezuma project site would continue into the foreseeable future. The No-Project Alternative would have no significant land use impacts on the Montezuma site.

The No-Project Alternative could have regional land use impacts. Ports, as well as recreational facilities such as marinas, depend upon in-Bay disposal sites. The ability to find dredged material disposal sites which do not significantly increase Port operating costs is essential to continued operation. Existing and future water-related industrial and recreational land uses would be constrained if disposal opportunities are not provided. In addition, the sites where tidal wetlands can be restored in the Bay Area are limited. If the Montezuma site is not restored as wetlands, the opportunity to enhance a diminishing regional resource would not occur.

6.3.2.7 Cumulative Impacts

Restoration of wetlands in shoreline areas would cumulatively increase and enhance the existing wildlife and wetland habitat areas of the San Francisco Bay, which is a beneficial impact. The restoration would not affect existing water-related industries. Although other areas along the Contra Costa shoreline (including the diked marshes at the U.S. Navy Port Chicago site on Pacheco Creek) are also designated for port and water-related industrial uses, the Proposed Project would not contribute to "past, present, or reasonably foreseeable" conversion of these activities. Cumulative land use impacts on port and water-related industrial uses would be insignificant. Considerations of policies encouraging the development of port and water-related industrial uses are discussed in section 6.4.

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6.4 Policy

6.4.1 Affected Environment

This section describes the existing land use policies applicable to the Montezuma Wetlands Project site and the sites of the Project alternatives. Policies that relate to specific environmental factors, such as air quality and recreation, are discussed in those respective issue area sections.

In addition, state and federal agencies have applicable laws and regulations that would apply to the Project. These laws and regulations are discussed in Chapter 1, Introduction, and the relevant sections of this chapter. Appendix H contains a discussion of federal and state laws pertaining to wetlands and restoration projects.

6.4.1.1 The Montezuma Site

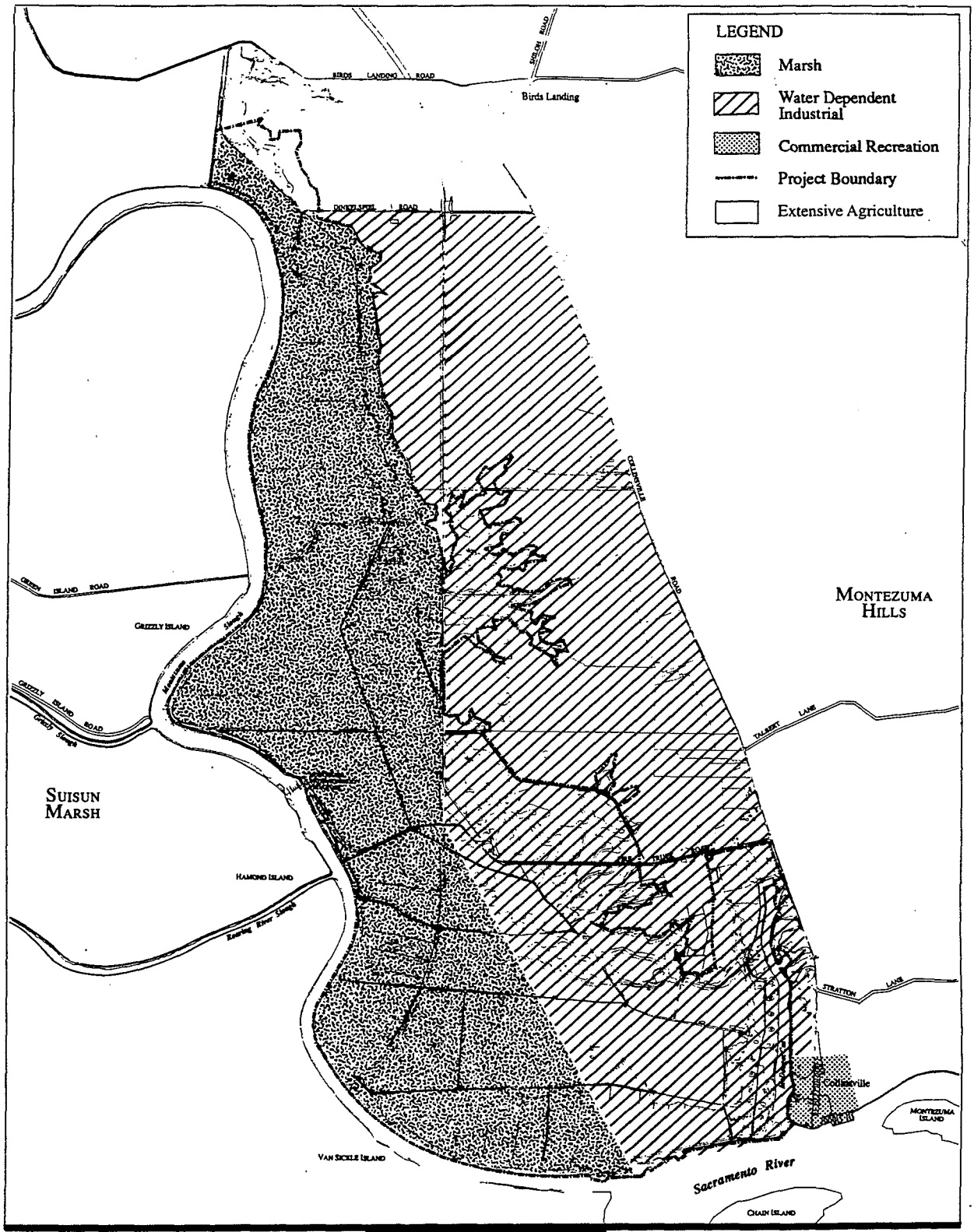
Local Land Use Policy

Land use and policy regulations which apply to the site include those found in the Solano County General Plan, and the Solano County Zoning Ordinance. The Land Use and Circulation Element (LUCE), the Resource Conservation and Open Space Element (RCOSE), and the Collinsville-Montezuma Hills Area Plan and Program, all elements of the Solano County General Plan, have policies applicable to the site which provide for marsh and wetlands protection, cultural resource protection, wildlife habitat preservation, and provision of public access. The Solano County Local Protection Plan (LPP) is a compilation of the General Plan and zoning requirements in Solano County and the Suisun Marsh area. The LPP requires preservation of wildlife habitat, protection of wetlands and lowland grasslands and water quality on the areas designated to Marsh.

SOLANO COUNTY GENERAL PLAN. As shown in Figure 6.4-1, the Solano County General Plan designates the western part of the site as Marsh, the eastern portion for Water-Dependent Industry, and a small area at the northern end as Extensive Agriculture. The LUCE contains the following policies which apply to these designations.[1]

> **Marsh.** General Plan policies which apply to marshes encourage protection, preservation and enhancement of wildlife habitat. The LUCE policies of the General Plan state:
>
> - *The County shall preserve and enhance wherever possible the diversity of wildlife and aquatic habitats found in the Suisun Marsh and surrounding upland areas to maintain these unique wildlife resources.*
> - The County shall protect its marsh waterways, managed and natural wetlands, tidal marshes, seasonal marshes and lowland grasslands which are critical habitats for marsh-related wildlife.
> - Existing uses should continue in the upland grasslands and cultivated areas surrounding the critical habitats of the Suisun Marsh in order to protect the marsh and preserve

1 Solano County Planning Department 1980a



Source: Brady and Associates (1994)

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0' 1500' 3000' 6000'

Figure 6.4-1

Montezuma Site: General Plan Land Use Designations

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valuable marsh-related wildlife habitats. Where feasible, the value of the upland grasslands and cultivated lands as habitat for marsh-related wildlife should be enhanced.

- *In marsh areas, the County shall encourage the formation and retention of parcels of sufficient size to preserve valuable tidal marshes, seasonal marshes, managed wetlands, and contiguous grassland areas for the protection of aquatic and wildlife habitat.*
- *The County shall ensure that development in the County occurs in a manner which minimizes impacts of earth disturbance, erosion, and water pollution.*
- *The County shall preserve the riparian vegetation along significant County waterways in order to maintain water quality and wildlife habitat values.*
- *The County shall ensure that public access at appropriate locations is provided and protected along the County's significant waterways within the Suisun Marsh and the Napa Marsh.*[2]

Water-Dependent Industry. The overall General Plan goal for industrial development in the County is to establish a strong diversified economic base and provide for a wide choice of employment opportunities in a pleasant working environment. An objective is to ensure that development is located in a manner which provides for the needs of industry while protecting surrounding uses and activities from adverse impacts.[3]

The following LUCE policies apply to the land designated as Water-Dependent Industry:

- *Industrial development shall be located and developed in a manner which protects significant marshlands and wetland habitats and the water quality of the area.*[4]
- *The policies on port facilities also apply to the site and call for the maintenance and improvement of deep water port facilities to provide better access for industrial and commercial development.*[5]

Policies of the RCOSE address wildlife habitat, agriculture, water quality, utilities and transportation, diking, filling and dredging, and recreation and access.[6] Policies of particular relevance to the Project are identified below.

Wildlife habitat policies are essentially similar to those of the LUCE/Marsh policies, with one important addition:

- *Where feasible, historic tidal marshes should be returned to wetland status, either as tidal marshes or managed wetlands. If in the future, some of the managed wetlands are no longer needed for waterfowl hunting, they should also be restored as tidal marshes.*

2 Land Use and Circulation Element, Solano County General Plan, pages 43-44.
3 Land Use and Circulation Element, Solano County General Plan, page 91.
4 Land Use and Circulation Element, Solano County General Plan, page 101.
5 Land Use and Circulation Element, Solano County General Plan, page 132.
6 Resource Conservation and Open Space Element, pages 39, 40, 42, 46, 51, and 54, respectively.

Agricultural policies include (but are not limited to) the following:

- *Agriculture within the primary management area of the Suisun Marsh should be limited to activities compatible with, or intended for, the maintenance or improvement of wildlife habitat....*
- *Agricultural uses consistent with protection of the Marsh, such as grazing and grain production, should be maintained in the secondary management area...*
- *Existing non-agricultural uses...should be allowed to continue if they are conducted so that they will not cause adverse impacts upon the marsh.*

Water Quality policies include (but are not limited to) the following:

- *To prevent crop damage in some areas, the withdrawal of groundwater from the underground aquifer surrounding the Marsh may be desirable. Withdrawal should not be so extensive as to allow the salt water of the marsh to intrude into fresh water aquifers, or to disrupt the natural surface flow of groundwater into the Marsh.*

Utilities, Facilities, and Transportation policies include (but are not limited to) the following:

- *New electric power transmission utility corridors should be located at least one-half mile from the edge of the Marsh. New transmission lines, whether adjacent to the Marsh or within existing utility corridors, should be constructed so that all wires are at least six feet apart.*
- *Within the Marsh, new electric lines for local distribution should be installed underground unless undergrounding would have a greater adverse environmental effect on the Marsh than above-ground construction, or the cost of underground installation would be so expensive so as to preclude service. Any distribution line necessary to be constructed above ground should have all wires at least six feet apart.*
- *In general, soil disturbance shall be limited to the period between April 1 and October 1.*

Policies require native vegetation and wildlife to be protected, exposure of soils to erosion to be limited, slopes to be limited to 2:1, and prohibit cuts and fills in watercourses from affecting the carrying capacity of watercourses. The RCOSE has specific policies which address dredging, filling or diking in managed wetlands and marshes. Policy 9(c) states that dredged materials should be placed on dry land, in approved fill or levee projects, or in federally designated in-Bay disposal sites. Policies do not provide for placement of dredged materials on diked baylands for wetland restoration.[7]

SOLANO COUNTY GRADING AND EROSION CONTROL ORDINANCE. Article 3, Design Principles and Standards, addresses construction activity and minimizing soil erosion. Graded areas are to be limited and the duration of exposure is to be limited to the extent practical. Revegetation of the graded areas is required in advance of the rainy season, which is between mid-October and mid-April. Extensions allowing grading outside these time frames require the approval of the Solano County Building Official. The Proposed Project's

7 Resource Conservation and Open Space Element, page 53.

year-round construction schedule would require erosion control measures and approval of the Solano County Building Official.

THE COLLINSVILLE-MONTEZUMA HILLS AREA PLAN AND PROGRAM. The Collinsville Montezuma Hills Area Plan provides specific guidance for land use for the Project site. The policies in the Area Plan encourage the placement of water-dependent industrial uses on land above the 10-foot contour line. As shown in Figures 6.4-1 and 6.4-2, land below the 10-foot contour line is generally designated as marsh, and marsh preservation is encouraged. The project site ranges in elevation from approximately 9 feet below the National Geodetic Vertical Datum (NGVD) to approximately +10 feet NGVD.[8]

> **Western Industrial Subarea.** The primary intent of the water dependent industrial designation and policies is to provide for industrial facilities requiring large areas of level land, such as facilities for the processing of raw materials, fabrication and assembly, which require ship to shore or shore to ship transfer of materials which cannot be accommodated by pipeline or conveyor.

The transportation policies of the Area Plan emphasize the need to have rail access and road access through a site to assure that industrial uses on the site or in the vicinity can have adequate and convenient access. The policies also contain criteria about dock construction for deep draft commercial vessels.[9]

There are also some specific requirements for the development of industrial uses. The flat lowlands can be filled to make the site usable for industrial purposes. Dredged materials may be used for fill only if they are properly engineered. An impervious dike should be constructed around the entire industrial area and around any fill area to protect adjacent habitats in the adjacent marsh from contamination. All surface runoff should be retained and treated prior to discharge into the surrounding marshes and water. Landscaped screening of industrial areas is also recommended. There is no provision for placement of dredged materials for wetland restoration or enhancement.[10] A specific requirement for noise control in this subarea is as follows:

- *The introduction of a noise-emitting industrial land use shall include noise mitigation measures which result in the following noise emissions maximums:*
  - 60 dBA (A-weighted) as measured at the western boundary of the industrial property.
  - 60 dBA (A-weighted) as measured at the boundary of the nearby Collinsville commercial recreation area.

> **Wetlands Protection Subarea.** The majority of the Project site is in the area shown for wetlands protection. The wetlands protection section of the Area Plan which addresses marsh, seasonal marsh and lowland grasslands below the 10-foot contour states such areas may be restorable to a marsh condition. Allowable uses within the wetlands area are limited to existing activities which are consistent with protection of the marsh, as described below:

8 Levine-Fricke 1992a
9 Collinsville-Montezuma Hills Area Plan and Program, Page 60.
10 Collinsville-Montezuma Hills Area Plan and Program, Page 62.

- Where feasible, historic marshlands below the current 10-foot contour which in the past have been diked off from tidal action for agricultural purposes should either be returned to their original wetland status or converted to managed wetlands by removing portions of levees and reintroducing tidal action.[11]

Area Plan policies do not provide for the disposal of dredged materials in wetlands to restore or enhance wetlands.

Agricultural Subarea. A small part of the Project site, comprising uplands at the extreme north end of the property that are above the 10-foot contour and outside of any wetland restoration activity, is within the Agricultural subarea. Area Plan policies stipulate that the "extensive" agricultural uses (i.e., non-intensive uses such as grazing) should be continued, protected, and fostered to ensure their long-term retention. The Project does not conflict with these policies.

SOLANO COUNTY ZONING ORDINANCE. The three zoning designations that apply on the site are Water-Dependent Industrial (I-WD), Marsh Preservation Zone (MP), and Limited Agricultural (A-L—160) as shown in Figure 6.4-2. These County zoning districts correspond with the General Plan designations.

Water-Dependent Industrial. The southeastern boundary of the site and inland areas extending northward are zoned Water-Dependent Industrial District (I-WD). Water-dependent industries are generally those that require a waterfront location to receive raw materials or distribute finished products by ship, thereby gaining a significant transportation cost advantage. Other uses may be allowed in the interim that would not preempt future use of a site for water-related industry or port facilities. Dredged materials disposal and reuse is permitted in this district to create backland for industry or as a temporary use subject to use permit approval. Neither the use of dredged material for wetland enhancement or the rehandling of dredged sediments for on-site of off-site use are addressed.

Marsh Preservation District. The western portion of the site is zoned MP, Marsh Preservation District. This zoning description is intended to provide long-term preservation and protection of the marsh. Uses allowed include management of wetlands and growing of plants for wildlife habitat. Although the zoning mentions enhancement of wetlands, it does not include the placement of fill or dredged materials to restore wetlands as an allowable or conditional use.[12]

Limited Agricultural District. A small area in the northern portion of the site is zoned A-L—160, Limited Agricultural District (minimum parcel area 160 acres). This zoning description is intended to assure the retention of upland and lowland grasslands adjacent to the Suisun Marsh in uses compatible with marsh protection. Encouraged uses include grain and hay crop production, and grazing operations harmonious with adjoining marshes. As shown in Figure 4.2-2, this portion of the Project site will not be converted to marsh, but will be part of the upland transition and buffer zone.

11 Collinsville-Montezuma Hills Area Plan and Program, page 56.
12 Solano County Zoning Ordinance, pages 20-29.

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San Francisco Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC) has jurisdiction over and the tidal areas of the San Francisco Bay and the Sacramento River, including projects within 100 feet of the shoreline. These jurisdictions are shown in Figure 6.4-3. BCDC has two fundamental objectives:

- To protect the Bay as a natural resource for the benefit of present and future generations.
- To develop the Bay and its shoreline to their highest potential with a minimum of Bay filling.

BCDC's permit decisions are controlled by the McAteer-Petris Act, the State legislation which established the agency and defines its authority. BCDC and the McAteer-Petris Act allows the placement of fill in the Bay if such fill is for a water-oriented use, such as a dock. However, the public benefits of the fill must outweigh its public detriment. The amount of the fill must be the minimum amount necessary, must not be harmful to fish and wildlife resources or water quality, must be seismically safe, and the Project Applicant must have title to the area it wishes to fill.

The following BCDC Plans apply to the site:

SUISUN MARSH PROTECTION PLAN. In 1977, the state legislature enacted the Suisun Marsh Preservation Act.[13] Pursuant to the Act, BCDC adopted the Suisun Marsh Protection Plan in 1979. The Act gave BCDC jurisdiction over the marsh itself (primary management area) and areas with a designated buffer zone (secondary management area). The primary and secondary management areas for the site are shown in Figure 6.4-3. The Act required each affected County to adopt a Local Protection Plan (LPP) for the Marsh.

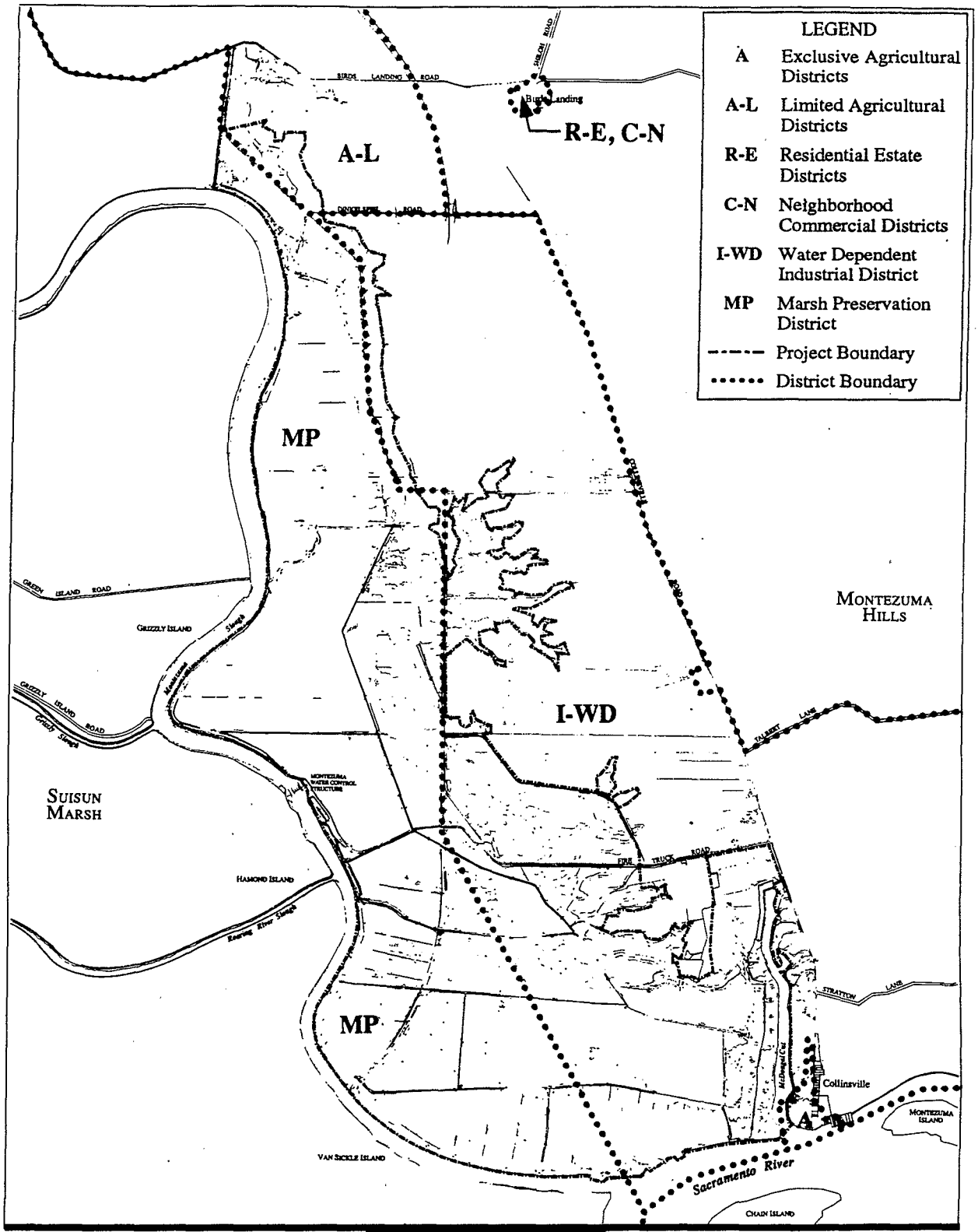
After BCDC approved Solano County's LPP in March 1980, the County was given permit authority over the secondary management area, and the Suisun Marsh Protection Plan was superseded in these areas. However, the Suisun Marsh Protection Plan still applies in the primary management area. In addition, if the LPP does not include policies for a specific issue within the secondary management area, the Suisun Marsh Protection Plan will prevail. Additionally, in order for the County to amend the LPP, its amendment must be consistent with the Suisun Marsh Protection Plan.

Generally policies of the Suisun Marsh Protection Plan require preservation and enhancement of wildlife habitat, protection of wetlands and lowland grasslands, encouragement of agricultural uses in the upland grassland buffer zones, provision of public access to waterways so long as access does not disturb habitat, and development of the Water-Related Industrial Area.

The Bay Plan also has policies on water-related industry, as summarized below:

- *Sites designated for both water-related industry and port uses in the Bay Plan should be reserved for those industries and port uses that require navigable, deep water for receiving materials or shipping products by water in order to gain a significant transportation cost advantage.*

13 Solano County Planning Department 1980b



Source: Brady and Associates (1994)

MONTEZUMA WETLANDS PROJECT EIR EIS

0' 1500' 3000' 6000'

Figure 6.4-2

Montezuma Site: Zoning Designations

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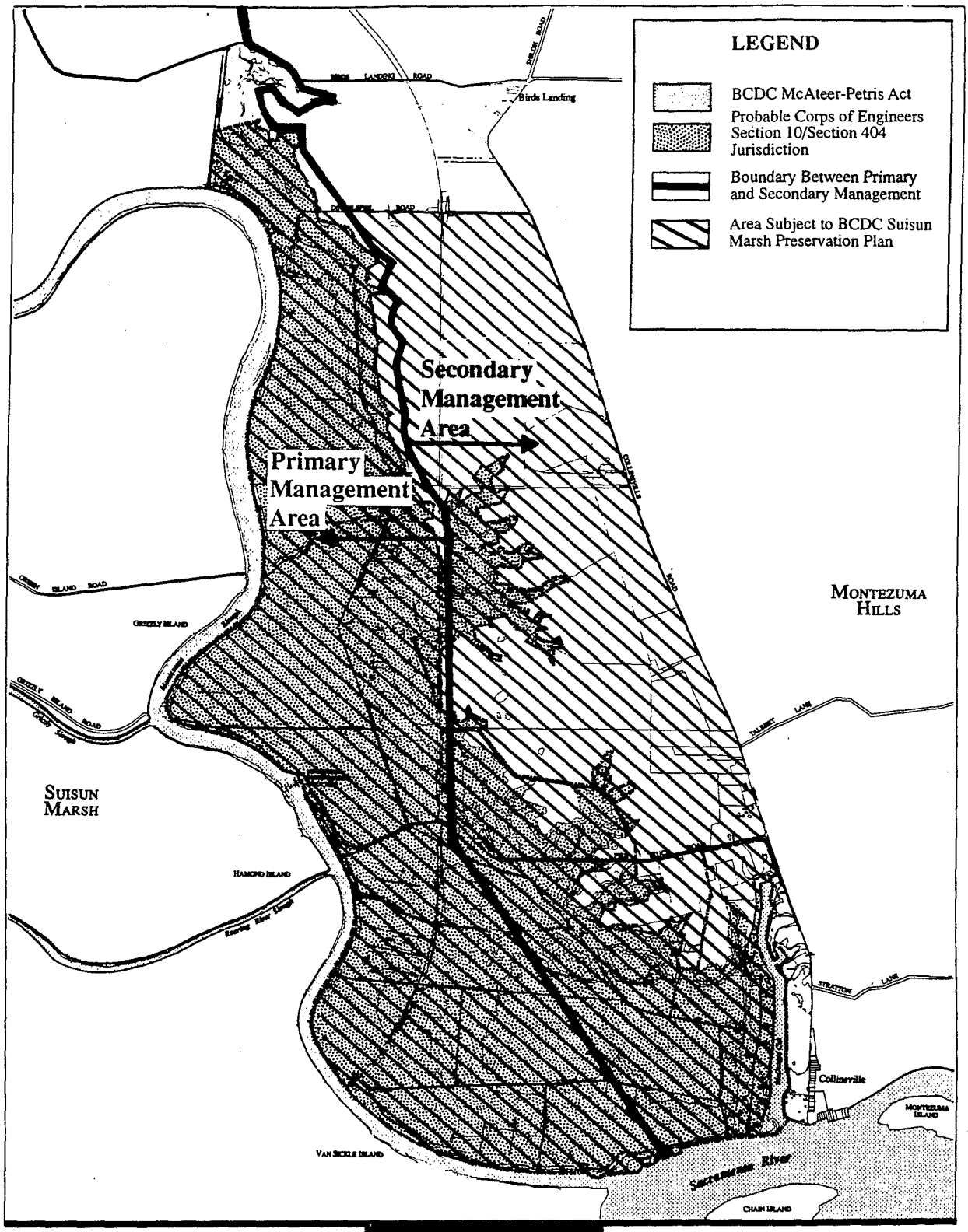

Source: Brady and Associates (1994)

MONTEZUMA WETLANDS PROJECT
EIR EIS

0' 1500' 3000' 6000'

Figure 6.4-3

Montezuma Site: BCDC and Corps Jurisdiction

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- *Land reserved for both water-related industry and port use would be developed over a period of years. Others uses may be allowed in the interim that, by their cost and duration, would not preempt future use of the site for water-related industry or port use.*

- *Water-related industry and port sites should be planned and managed so as to avoid wasteful use of the limited supply of waterfront land.*

- *Water-related industry and port uses should be planned so as to make the sites attractive (as well as economically important) uses of the shoreline.*[14]

The Bay Plan also has policies which relate to the disposal of dredged materials. The policies state the following:

- *To ensure adequate capacity for necessary Bay dredging projects and to protect Bay natural resources, acceptable non-tidal disposal sites should be secured. Further, disposal projects should maximize use of dredged material as a resource, such as creating, enhancing or restoring tidal and managed wetlands, creating and maintaining levees and dikes, providing cover and sealing material for sanitary landfills and filling at approved construction projects.*[15]

THE SEAPORT PLAN. The BCDC Seaport Plan establishes port priority uses in the Project area. The port priority use areas identified in the Seaport Plan are to be protected for marine terminals and directly related ancillary activities. Interim uses shall be permissible but must be readily displaceable when the area is needed for marine terminals or directly-related ancillary activities. Local governments are advised to protect these areas through land use controls. The area of the Montezuma site designated in the County's General Plan as Water Dependent Industrial District is designated in the Seaport Plan for port priority uses. However, the Seaport Plan policies state that, because of the site's extensive wetlands, lack of infrastructure, and isolation from other industrial areas, it offers no potential for future container terminal development. The policies further state that the site should not be developed as a marine terminal unless there is no other available site in the Bay Area and all other terminals have reached their maximum throughput capacity.[16]

As discussed in section 4.10.2, BCDC policies have been amended and now indicate the acceptability of using dredged materials to facilitate marsh restoration.

LTMS (LONG-TERM MANAGEMENT STRATEGY). BCDC is cooperating with EPA, SFBRWQCB, the State Water Resources Control Board and the Corps on long-term disposal options for dredged materials and has a lead role in promoting "beneficial use" of dredged materials for wetland creation/restoration, levee maintenance, and other "upland" uses. The Proposed Project would satisfy the LTMS goals of maximizing the use of dredged material as a resource, minimizing in-Bay disposal, and ensuring adequate, suitable disposal capacity for projected volumes of dredged material.[17]

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14 The San Francisco Bay Plan, The Bay Conservation and Development Commission, page 16.
15 The San Francisco Bay Plan, The Bay Conservation and Development Commission, page 15.
16 The Seaport Plan, The Bay Conservation and Development Commission, page 59.
17 *Long Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region Draft EIR/EIS*, Volume I, pages. 2-4 through 2-13.

California State Lands Commission

The California State Lands Commission has jurisdiction over sovereign tidelands and submerged lands, and the beds of navigable lakes and streams that the state owns in a trustee capacity. The Commission maintains a multiple use management policy to ensure that the greatest possible public benefit is derived from these lands. The Commission considers numerous factors in determining whether a proposed use of the State's land is appropriate, including, but not limited to, consistency with the Public Trust under which the Commission holds the State's sovereign lands, protection of natural resources and other environmental values, and preservation or enhancement of public access to State lands.

The Commission's holds a public trust easement over an area in the southern tip of the site adjacent to the Sacramento River and Montezuma Slough. The Commission holds title to the beds of Montezuma Slough and the Sacramento River, from their centerlines to the perimeter levee. A detailed description of the subject parcels, including metes and bounds descriptions, can be found in the final Compromise Title Settlement Agreement, dated June 30, 1993, which can be obtained from the Commission.

6.4.1.2 The Bel Marin Keys Site

The site is in Marin County, within the area shown in the Countywide Plan as the City-Central Corridor. It is also within the City of Novato's planning area.

Local Land Use Policy

COUNTYWIDE PLAN. The Marin Countywide Plan[18] designates the Project area Bayfront Conservation District, with subzones of Diked Bay, Marshlands and Agricultural. The County's Environmental Quality Element contains policies calling for protection of environmental values and protection of marshlands and bayfront land uses. The relevant policies regarding Bayfront Conservation Area are as follows:

- Policy EQ-2.44: Tidelands Subzone. The purpose of this subzone is to define those areas which should be left in their natural state because of their biological importance to the estuarine ecosystem. The County shall prohibit diking, filling, or dredging in areas subject to tidal action (Tidelands Subzone) unless the area is already developed and currently being dredged. Current dredging operations for maintenance purposes may continue subject to environmental review, if necessary. In some cases, exceptions may be made for areas which are isolated or limited in productivity. In tidal areas, only land uses which are water-dependent, or consistent with federal, state, and regional policy, shall be permitted.

- Policy EQ-2.45: Diked Historic Marshlands Subzone. The County shall, through its land use and development regulations, foster the enhancement of the wildlife and aquatic habitat value of the diked historic marshlands subzone. Land uses which provide or protect wetland or wildlife habitat, and which do not require diking, filling, or dredging, shall be encouraged.

- Policy EQ-2.58: Protection of Existing Agricultural Lands. The County shall protect existing agricultural lands in the Bayfront Conservation Zone. Such agricultural activities could consist primarily of grazing operations and crop production harmonious with

18 Marin Countywide Plan (1994)

adjoining marshes, wetlands, grasslands, or other sensitive lands. Agricultural lands provide habitat for many wildlife species. These habitats may be important for migratory species during times of flood and after silage has been cut.

ZONING CODE. In the Marin County Zoning Code, most of the site is zoned Residential Single-Family Planned, 0.5 unit per acre (RSP 0.5). A small portion (8 acres) is zoned Agricultural Residential Planned, 2 acres per unit (ARP 2). All of the site has a combined zoning designation of Bayfront Conservation (BFC). This zone requires environmental review to determine environmental constraints and site capacity.

The northern levee on the site and seven adjacent acres are zoned Primary Floodway (F-1). This zone prohibits structures that would reduce flood water holding capacity. The rest of the site is zoned Secondary Floodway (F-2). This zone prohibits structures that would reduce the capacity of the floodway.

Approval of the adjacent Bel Marin Keys development was conditioned upon requirement on this site of a 300-acre pond area for flood control purposes; a disposal area ponding area for dredged materials from the recreational boating lagoon; and a Flood Control District access easement.

NOVATO GENERAL PLAN. The site is unincorporated and is outside the City of Novato's City limits, urban services area, and sphere of influence, however, the site is in Novato's planning area. The Novato General Plan designates the site for Conservation. This designation recommends maintaining the site in its natural state or in agricultural use. However, the Novato General Plan only applies in an advisory capacity.

San Francisco Bay Conservation and Development Commission

In addition to the Bay Plan and general planning policies as discussed previously, the BCDC conducted a study in 1982 of areas such as Bel Marin Keys, which were diked off from San Francisco Bay and used for agricultural purposes. The study included policies which the Commission uses when it comments on projects that are outside the Commission's jurisdiction but that are being considered for permit approval by the U.S. Army Corps of Engineers. The study, entitled the Diked Historic Baylands Study, concluded that diked areas adjacent to San Francisco Bay perform a critical function for migratory waterfowl and shorebirds. The study also found that agricultural lands in the North Bay were important contributors to the Bay area economy. The loss of a few parcels of agricultural land could affect the viability of agriculture in the entire area. The study recommended that conversion of agricultural parcels on a piecemeal basis should be considered only in conjunction with the economic viability of the entire north Baylands.

6.4.1.3 The Hamilton Site

The site is within the City of Novato, but controlled by the federal and State government. If the site is eventually sold to a private land owner, the property would be subject to regulations established by the City.

Local Land Use Policy

CITY OF NOVATO. The Novato General Plan includes a section that provides policies specifically for south Novato, including Hamilton Army Airfield (HAAF). The site is designated Planned Community by the City's General Plan. Development on the site would be governed by a community master plan and regulations of the Planned Community zoning district. In 1993, the City approved a tentative map for

Phase I and a master plan for Phase II of a mixed-use development on the former Air Base. The Master Plan recommends wetlands restoration on the airfield site.[19]

The site is presently zoned Planned Community (PC), which allows office/commercial, light industrial, research and development, residential, retail/commercial, transportation, recreation, education, hotel, open space/wetland, restoration/flood control, and agriculture/mariculture land uses.

COUNTY OF MARIN. The City of Novato, which includes the Hamilton site, is located within the County of Marin. The County's jurisdictional authority over the site is superseded by the authority of the federal government. If HAAF is eventually purchased by a private individual or group, it would fall under the authority of the City of Novato, with the county having an advisory role in development of the property.

The Marin Countywide Plan regulates development within unincorporated parts of Marin County. The plan also plays an advisory role for local jurisdictions that have their own general plans, as is the case for the City of Novato.

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Plan Map Number 12 designates the site as Wildlife Refuge Priority Use Area.

Regional Airport System Plan

The Regional Airport System Plan (RASP), a component of the San Francisco Metropolitan Transportation Commission (MTC)'s long-range Regional Transportation Plan (RTP) recommended deletion of the airport facility as a regional general reliever airport and redesignation as a wetlands restoration site. The RTP determined that the Hamilton airport was no longer needed.

California State Lands Commission

The California State Lands Commission has jurisdiction over sovereign tidelands and submerged lands, and the beds of navigable lakes and streams that the state owns in a trustee capacity. The California State Lands Commission has had a conflict with the Air Force over the ownership of tidelands at HAAF.[20] The state made a claim to approximately 1,200 acres of the Hamilton Air Base, claiming it to be tidelands. In 1981, a settlement granted the State Lands Commission title to approximately 400 acres of shoreline property, which includes the antenna field and tidal lands east of the airfield accounting for approximately 87 acres.[21]

6.4.2 Environmental Impacts and Mitigation Measures

6.4.2.1 Proposed Project

The proposed development of off-loading and dredged material disposal facilities is generally in conformance with Solano County plans and policies regarding construction of industrial facilities in water-dependent industrial areas. These facilities would be water-dependent and industrial in use and character.

19 The Martin Group, *Hamilton Field Master Plan,* December 23, 1991, January 10, 1992, October 12, 1992.
20 Turner, Collie & Braden, Inc. 1984.
21 Environmental Assessment for the Closure and Realignment of Hamilton Army Airfield (HAAF). CA. U.S. Army Corps of Engineers. Jones and Stokes. September 1991.

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However, the placement of dredged materials to restore wetlands in areas designated as Marsh and Water-Dependent Industry is not provided for in current County policies. In addition, the rehandling of dredged sediments for on-site or off-site use is not currently provided for in the I-WD zoning district. As part of the Montezuma Wetlands Project, the Applicant proposed amendments to land use and policy regulations which apply to the Montezuma site including those found in the Solano County General Plan, the Solano County Zoning Ordinance, the Local Protection Plan and the BCDC's Suisun Marsh Protection Plan and Bay Plan. The amendments were drafted by Solano County and BCDC staff in 1992/93. BCDC adopted the Bay Plan and Suisun Marsh Protection Plan amendments on April 20, 1995. The Solano County policy amendments are still in draft form, pending certification of this EIR/EIS.

Generally, these amendments would allow for marsh restoration projects utilizing dredged materials, in the MP and I-WD districts and would allow for rehandling of dredged materials for on-site and off-site use in the I-WD zoning district, as long as adverse environmental impacts are not caused by the Project. These amendments are described in more detail in section 4.10, Plan and Policy Amendments. Generally, these amendments would allow more flexibility for Project construction, and would allow for the placement of dredged materials on the site as long as activities do not adversely affect wildlife habitats or industrial or port activity.

Impact P-POL-1. The Proposed Project would be inconsistent with Solano County plans and policies for placement of dredged materials in marsh and water-dependent industrial-designated areas, and the rehandling of dredged materials for on-site and off-site use would be inconsistent with uses allowed in the I-WD zoning district. (County-S, Corps-LS)

The General Plan policies and zoning code reserve a portion of the Project site, as well as a large area east of the Project site, for water-dependent industrial use. While disposal of dredged materials to create uplands for adequate industrial backland (for container storage and truck circulation) is consistent with County policy, disposing of dredged materials to restore wetlands is not currently provided for. In addition, rehandling of dredged materials for on-site and off-site use is not currently provided for in the zoning code.

> Mitigation Measure P-POL-1. The Solano County General Plan, the LPP, and the zoning ordinance shall be amended to allow for placement of dredged materials for wetland enhancement prior to permit approval. In addition the zoning ordinance shall be amended to allow for rehandling of dredged materials for on-site and off-site use prior to permit approval. (LS)

The proposed amendments to the General Plan, LPP, and zoning ordinance would allow placement of dredged materials for restoration of wetlands, as a conditional use in the Water-Dependent Industry and the Marsh Preservation districts and rehandling of dredged materials for on-site and off-site use as a conditional use in the Water Dependent Industry district. Amendments to County polices would be required prior to use permit approval. These amendments are summarized in section 4.10, Plan and Policy Amendments.

Impact P-POL-2. Project implementation would involve marsh restoration on 541 acres of land designated for future water-dependent industrial use by the County. (County-LS, Corps-LS)

Implementation of the Project would eliminate 541 acres from future consideration for water-dependent industrial land use development. However, the Project is unlikely to adversely affect a possible future use of the site for port or water-related industry. According to the County and BCDC, it is considered a "long-

range" development site, most likely not required for water-related industrial use in the next 20 years. The site in its present state has a number of impediments which would make it difficult to be used for port or industrial use in the foreseeable future. The Seaport Plan policies state that, because of the site's extensive wetlands, lack of infrastructure, and isolation from other industrial areas, it offers no potential for future container terminal development. The policies further state that the site should not be developed as a marine terminal unless there is no other available site in the Bay Area and all other terminals have reached their maximum throughput capacity.[22] There is no infrastructure to support industry, and thus the site would be expensive to develop. The site does not include rail access, nor do County policies prescribe future rail access to the affected area. Instead, County policies (Collinsville-Montezuma Hills Area Plan and Program) direct future rail construction eastward across the Project Site to Talbert Lane. The parcel has endangered species habitat for salt marsh harvest mouse, and jurisdictional wetlands are located on the site designated for water-dependent industrial use. Development of the site would thus require extensive mitigation of wildlife and wetland impacts.

The completed tidal marsh would be completely below 10 feet in elevation (low marsh and intertidal channels equaling 1,520 acres at 0.5 feet below mean high water; high marsh equaling 145 acres at mean higher high water; and ponds, marsh, tidally-inundated hollows, and upland transition and buffer areas between these two elevations). Future water-related industrial development of areas designated as marsh (Figures 6.4-1 and 6.4-2), generally those under 10 feet in elevation, would conflict with the Collinsville-Montezuma Hills Area Plan and Program that encourages water-dependent industrial uses only above this elevation. Also, development on the marsh would conflict with LUCE policies on Water-Dependent Industry that require protection of significant marshlands and wetland habitats. Based on these policies, there is little potential for developing the Project area in the future as water-dependent industry without conflicting with these existing land use policies.

As proposed, the Project does not diminish the site's existing potential for accommodating water-related industrial development, as called for by the adopted amendments to BCDC's Suisun Marsh Protection Plan and Bay Plan; that is, the Project will not diminish the potential for using the remaining upland portion of the site for water-dependent industry. The adopted amendments to BCDC's Suisun Marsh Protection Plan and Bay Plan neither diminish nor enhance the potential for using the remaining upland portion of the site for water-dependent industry. Access to the shoreline at McDougal Cut and to Collinsville would remain as at present along existing roadways. Infrastructure related to the off-loading and rehandling facilities is intended to serve only the Project and would not be growth-inducing. The Project would not amend the current water-dependent industrial use designations at McDougal Cut and within a 1,000-foot strip along the shoreline. Future water-dependent or port uses at the shoreline would not be precluded by the Project.

Changing the General Plan and zoning ordinance to allow wetlands to be restored under the current land use designations would not substantially change the potential for future water-dependent industrial use of the site. Proposed project impacts are considered less than significant, and no mitigation is required.

<u>Impact P-POL-3.</u> Amendment of the Marsh and Wetland Habitat Land Use Proposals of the Land Use & Circulation Element (LUCE), the Resource and Conservation Element (RCOSE), the Subarea Land Use and Transportation Policies for the Wetland Protection and Western Industrial Subareas of the Collinsville Montezuma Hills Area Plan (CMHP), and the Marsh Preservation (MP) District in the Solano County Zoning Ordinance could have indirect impacts on the Suisun Marsh by setting a precedent for allowing disposal of dredged materials in existing wetlands. (County-LS, Corps-LS)

22 BCDC (MTC) 1996.

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The Project Applicant has proposed amendments to policies contained in the LUCE, the RCOSE, the CHMP, the Zoning Ordinance, the Suisun Marsh Protection Plan and Bay Plan to allow restoration of tidal wetlands through placement of dredged materials in the primary management area of the Suisun Marsh. The Suisun Marsh Protection Plan and Bay Plan were amended on April 20, 1995.

These policies apply to all of the primary management area of the Suisun Marsh, an area that covers approximately 57,000 acres and is primarily managed for waterfowl habitat. With the proposed changes to these policies, dredged materials could be placed in wetlands throughout the Suisun Marsh for wetland restoration projects, subject to individual use permit and environmental review. The indirect impact is less than significant because Use Permits would be required in all cases prior to similar projects being initiated.

The primary management area of the Suisun Marsh is one of the most valuable marsh environments in the State and within the Pacific Flyway. The marsh supports habitat for rare and endangered species. With the proposed amendments to policies in the General Plan placement of dredged material would require a Solano County Use Permit, and would occur only after a particular project could demonstrate that it was consistent with preserving the marsh habitat's integrity. This would require the incorporation of adequate mitigation for impacts on significant resources, and monitoring to confirm the success of mitigation and the attainment of marsh restoration goals. The dredged disposal sites would also provide for biological benefits, such as have been achieved in areas of the Suisun Marsh to raise pond bottoms and improve water circulation, as well as throughout the United States to improve marsh fertility.

Impacts resulting from the proposed policy change are considered insignificant; no mitigation is required.

Impact P-POL-4. Proposed year-round construction would be inconsistent with Solano County Grading and Erosion Control Ordinance Article 3, Design Principles and Standards, requiring revegetation of the graded areas in advance of the rainy season, between mid-October and mid-April. It would also be inconsistent with the RCOSE requiring that soil disturbance be limited to the period between April 1 and October 1. (County-LS, Corps-LS)

These restrictions on year-round construction are intended to address projects where exposed soils can cause sedimentation of storm water runoff, which can have adverse impacts on receiving waters. In the case of the Proposed Project, storm water runoff will be contained by on-site structures: the perimeter levee isolates the site from adjacent surface waters, and any runoff from the interior of the site will be routed through channels to the makeup water pond, where suspended sediments can settle out. The quality of water discharged from the makeup water pond will be regulated by the Project's NPDES permit. Water quality measurements, including turbidity and total suspended solids, will be monitored in the sediment placement cells and the makeup water pond as part of ongoing monitoring required by the permit.

The Project will require a major grading permit from the Solano County Building Division. The permit application requires an erosion, sediment and runoff control plan, through which the Project Applicant would address the issue of adequate erosion and sedimentation controls to allow year-round construction. The interpretation of the zoning regulations and the terms of the permit are up to the discretion of the County Building Official.

This impact is considered insignificant, and no mitigation is required.

Impact P-POL-5. The Project would contribute significantly to the regional goals for the long-term management of dredged materials in the San Francisco Bay estuary. (County-NA, Corps-S)

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Since the Project would promote the beneficial use of dredged materials for wetland restoration, it would be consistent with the LTMS and would satisfy the LTMS goals of maximizing the use of dredged material as a resource, minimizing in-Bay disposal, and ensuring adequate, suitable disposal capacity for projected volumes of dredged material. There is no mitigation required for this beneficial impact.

Impact P-POL-6. Proposed improvements including additions to the DWR Day Use Area and the Phase IV public access facility would be consistent with Solano County General Plan and BCDC Suisun Marsh Protection Plan and Bay Plan policies and would provide beneficial impacts. (County-NA, Corps-S)

No mitigation is required for this beneficial impact.

Impact P-POL-7. The proposed placement of relocated utility lines on poles, above ground, is potentially inconsistent with County policies directing that utility lines should be located at least one-half mile from the edge of the Marsh and installed below-ground within the Suisun Marsh unless such installation is more environmentally damaging than above-ground installation, or is economically infeasible (County LS, Corps LS).

The Project proposes to relocate existing powerlines onto aboveground poles as depicted in Figure 4.2-3. This apparent inconsistency is considered less than significant, as follows. The Project would relocate aboveground lines that currently traverse the Marsh Preservation. Lines would be placed on aboveground poles along an existing road (Fire Truck Road) and along the levee road adjacent to McDougal Cut which will be constructed to the sediment offloading/rehandling facility. As discussed elsewhere in this document (section 6.16, P-UTIL-1), installing utilities underground would increase maintenance requirements and be prohibitively expensive for the Applicant. Consistent with County policy, the Applicant would incorporate a six foot separation between lines.

6.4.2.2 Alternative 1: Managed Wetlands

Alternative 1 would have the same policy impacts as the Proposed Project. The type of wetlands being restored would not change the policy effects. Please refer to the discussion for the Proposed Project.

6.4.2.3 Alternative 2: Combined Wetlands

Alternative 2 would have the same policy impacts as the Proposed Project. Please refer to the discussion for the Proposed Project.

6.4.2.4 Alternative 3: The Bel Marin Keys Site

Impact 3-POL-1. Filling and diking would be inconsistent with Marin County Policies EQ-2.44 and EQ-2.45, which encourage the protection of wetland habitats without diking or filling. (County-S, Corps-LS)

Using fill to convert diked historic marshlands to any other use would be inconsistent with Marin Countywide Plan Policies EQ-2.44 and 2.45.

> Mitigation Measure 3-POL-1. Amendments of Policies EQ-2.44 and EQ-2.45 to allow diking and filling for wetlands restoration shall be required. (LS)

Impact 3-POL-2. Filling the site would be inconsistent with the F-1 and F-2 zones, which are designed to provide storage for Novato Creek flood waters on the site. (County-S, Corps-LS)

The proposed Alternative 3 site presently is used to store both floodwaters from Novato Creek and dredged materials. The northern levee and seven adjacent acres are zoned Primary Floodway (F-1). This zone prohibits structures that would reduce flood water holding capacity. The rest of the site is zoned Secondary Floodway (F-2). This zone prohibits structures that would reduce the capacity of the floodway.

> Mitigation Measure 3-POL-2. The wetland restoration project shall be designed so that adequate flood water storage capacity is available. (LS)

Impact 3-POL-3. Alternative 3 would eliminate oat hay farming on the portion of the site that is converted to wetlands. The BCDC policies on diked historic baylands and the San Francisco Bay Plan policies require agricultural land to be protected unless an agricultural use is no longer economically viable. In addition, the Marin County Comprehensive Plan encourages the retention of agriculture on this site. (County-S, Corps-LS)

The BCDC Policies on Diked Historic Baylands and San Francisco Bay Plan policies require agricultural land to be protected unless an agricultural use is no longer economically viable. In addition, the Marin County Comprehensive Plan and the Novato General Plan encourage the retention of agriculture on this site. Alternative 3 would not be consistent with the RSP and ARP zones since it would preclude agricultural use. In addition, the Project would conflict with the Marin Countywide Plan BFC Policy EQ-2.58 which encourages protection of existing agriculture lands. Mitigation Measure 3-LU-1 would be required to mitigate this significant impact to a less-than-significant level.

The 3.6-mile transport pipeline from the off-loading facility to the site, as a component of the overall project, would be considered "fill" in the Bay. The BCDC would require a permit for the pipeline. Mitigation for fill impacts resulting from the Project would be developed in coordination with BCDC at the time of permitting.

Impact 3-POL-4. This alternative would contribute significantly to the regional goals for the long-term management of dredged materials in the San Francisco Bay estuary. (County-NA, Corps-S)

There is no mitigation required for this beneficial impact.

6.4.2.5 Alternative 4: The Hamilton Site

Wetlands restoration in this alternative would be compatible with City of Novato's site designation of Planned Community, and could be incorporated into a community master plan for mixed use development. No policy impacts are anticipated.

The 3.6-mile transport pipeline from the off-loading facility to the site, as a component of the overall project, would be considered "fill" in the Bay. The BCDC would require a permit for the pipeline. Mitigation for fill impacts resulting from the Project would be developed in coordination with BCDC at the time of permitting.

Impact 4-POL-1. This alternative would contribute significantly to the regional goals for the long-term management of dredged materials in the San Francisco Bay estuary. (County-NA, Corps-S)

There is no mitigation required for this beneficial impact.

6.4.2.6 No-Project Alternative

The No-Project Alternative would maintain water-dependent industrial use and marsh land use and zoning designations on the Montezuma site, consistent with the Solano County General Plan. It would not require plan or zoning amendments.

The No-Project Alternative would not contribute to achieving the regional objectives of the LTMS to find alternative sites for upland disposal of dredged materials.

6.4.2.7 Cumulative Impacts

The cumulative impacts of the Proposed Project and the alternatives are generally the same. The two fundamental objectives of the Bay Conservation and Development Commission are to protect the Bay and Suisun Marsh as natural resources and to develop the Bay and its shoreline to their highest potential with a minimum of Bay filling. These objectives include the protection of water-related industrial uses and the enhancement of wildlife habitat. Cumulative wetland restoration projects could have significant beneficial wildlife habitat enhancement effects. The Project would not appreciably reduce the amount of land designated for and feasible for water-related industrial development. Cumulative impacts on agricultural land are insignificant because of the abundance of agricultural land in the region and the fact that tidal wetland restoration projects like Montezuma generally affect land that has limited agricultural capabilities.

6.5 Geology and Seismicity

6.5.1 Affected Environment

The affected soils, geology, and seismic environment at the Montezuma, Bel Marin Keys, and Hamilton sites is discussed below. This section includes a general discussion of the regional geology, identification of the seismic environment, and a summary of site-specific geologic and seismic hazards for each of the three project sites.

Soils at the Montezuma site and alternative sites would be covered by dredged materials imported from other locations in the Bay and estuary. The specific characteristics of covered soils would not affect the Proposed Project.

6.5.1.1 The Montezuma Site

Site Geology and Soils

GEOLOGY. The Montezuma site consists of approximately 1,850 acres of generally flat lowland (including slightly elevated areas along roads and levees) and about 550 acres of "upland" along the eastern margin of Suisun Marsh. It is located in the Coast Range Geomorphic Province[1] in an area with local relief of almost 90 meters in the Montezuma Hills to the east of the site.[2] Suisun Marsh, bordering the site on the west, includes more than 88,100 acres of brackish marshland including seasonal and managed wetlands (52,300 acres), channels, sloughs, bays, and mudflats (29,500 acres), and vegetated levees and tidal marshes (6,300 acres).

The oldest geologic formation exposed in the area is the Pleistocene Montezuma Formation that underlies the Montezuma Hills. The Montezuma Formation consists of poorly consolidated clayey sands. Most of the site is covered by surface deposits consisting of Holocene sediments of two types: peaty mud deposited in tidal marshes, and coarser materials deposited by streamflow.[3] These deposits are up to 90 feet thick beneath the site.

The Sacramento-San Joaquin Delta and Suisun Bay formed since the end of the last ice age in response to rising sea level. Eastward progradation of the Delta produced a stratigraphic sequence of coarser-grained sand and gravel deposits at depths overlain by finer-grained deposits. Lithologic data from Levine Fricke's October 1990 drilling investigation and May 1991 cone penetrometer test (CPT) program, as well as a drilling investigation completed by DWR for construction of the Montezuma Salinity Control Structure, indicated that the soils across the site consist of interbedded layers of varying thickness comprised primarily of peat, clay, silt, and sand sediments. A layer of silty clay was found across the entire site surface. The majority of shallow sediments at the site consist of fine-grained silts, clays, and organic soil, which generally have low hydraulic conductivities (e.g., approximately 0.00001 cm/sec). Hydraulic conductivity is generally a measure of the permeability of the soil. Vertical permeabilities are expected to be even lower. The western part of the site contains peat beds up to 30 feet thick. These

1 Helley et al., 1979.
2 USGS, 1970.
3 Wagner et al., 1981.

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deposits thin in an eastward direction. In the southern part of the site, clay and silt deposits are interbedded with silty sand, sand, and clayey sand.[4]

The site consisted of tidal wetlands of Suisun Marsh until it was diked and drained in the 1880s.[5] Some patterns of channels and site geomorphology prior to human intervention can be inferred from archival aerial photographs. Since that time, levees have been maintained and shallow groundwater has been pumped continually to prevent inundation of the diked area by waters from Suisun Bay. The site currently ranges in elevation from nine feet below the National Geodetic Vertical Datum (NGVD, similar to mean sea level) in the central areas to 10 feet above NGVD at the perimeter levee and at the inland boundary of the Proposed Project. The ground subsides as interior peat soils dry and oxidize.[6] The Delta has subsided up to 21 feet (6.5 meters) in the Project region, and the site is subsiding at a rate of approximately 1.5 inches (3.8 cm) per year.

SOILS. The characteristics of the soils at the Montezuma site were sampled by the Project Applicant at seven sites and at several depths at each site, as shown in Figure 6.5-1. Sampling depths were variable, ranging from a depth of 0.5 feet to 11.5 feet.

In general, the pH values in site soils were variable, but tended to be lower (more acidic) in the surface sediments and neutral or less acidic in the deeper sediments. Soil organic matter (SOM) values on site were variable and related to the occurrence of peat or root material at the sampling locations. Cation exchange capacity of soils is generally positively correlated with soil organic matter content.[7] This pattern is present in soils at the Montezuma site, with the higher cation exchange capacity values generally being found at those stations with higher organic matter content.

The mean concentration of the metals from the sites measured at Montezuma was less than background levels in all cases except for antimony and nickel. The mean concentration of cadmium, lead, silver, copper, and mercury from the Montezuma site is less than the mean values for San Francisco Bay. Additionally, the highest value from individual samples from the Montezuma site is less than (cadmium, lead, and silver) or equal to (copper and mercury) the mean values reported in studies on San Francisco Bay.[8]

The concentration of organic and inorganic nitrogen, inorganic phosphorus and total phosphorus, potassium, calcium, and magnesium was measured in surface sediment samples. Higher organic and inorganic nitrogen levels were observed in samples from the northern half of the Project site. These values are within the range reported by several authors for tidal freshwater marsh systems on the James River in Virginia and Baratarea Basin in Louisiana.[9] No comparison to local tidal and freshwater marsh systems has been made at this time. Phosphorus levels were generally low in all the samples. Calcium and magnesium levels generally exceeded 1100 mg/kg, but potassium levels were relatively low (less than 700 mg/kg).

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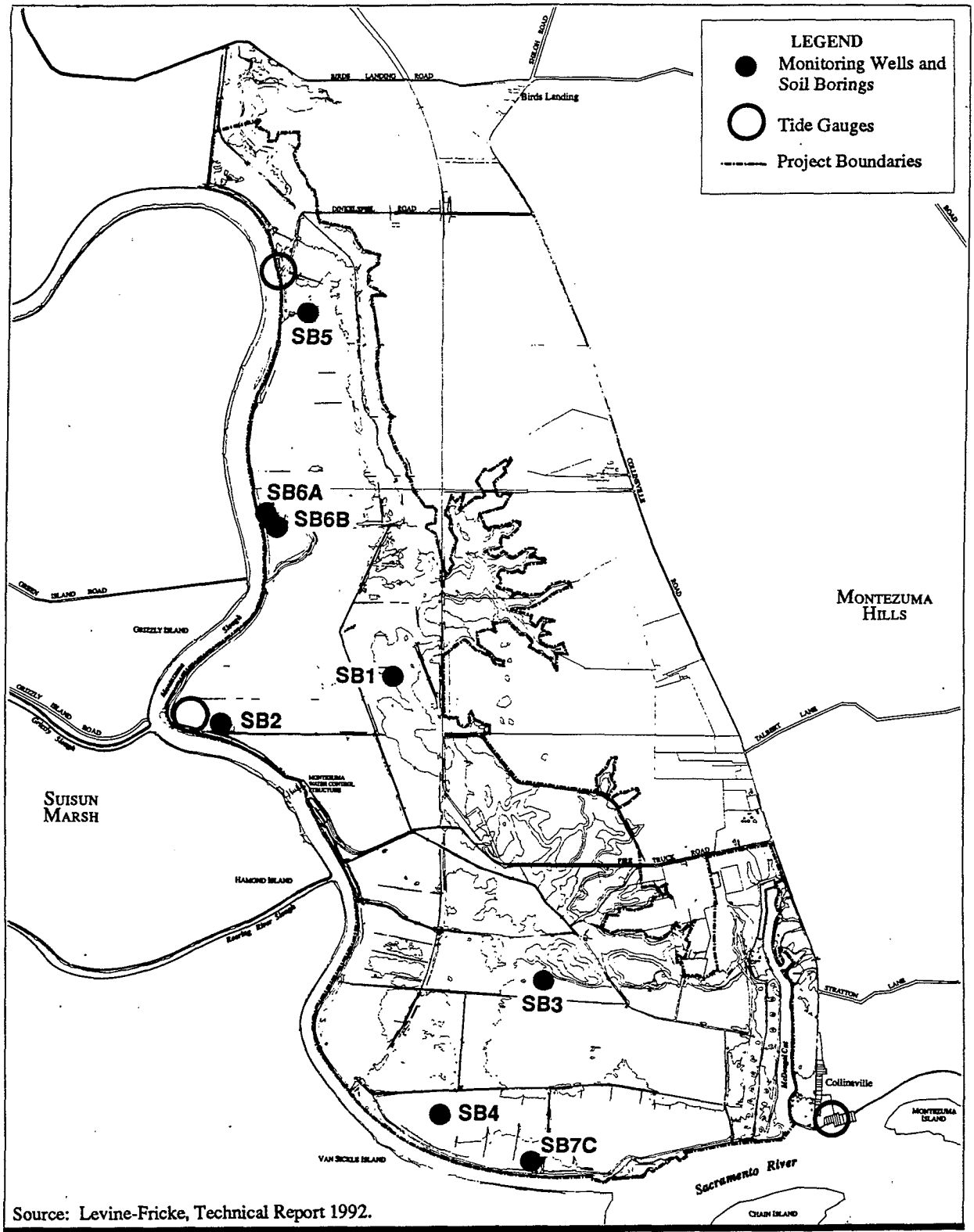
4 Levine Fricke 1992
5 Levine-Fricke 1992, p. 1-2.
6 Helley et al. 1979
7 Sposito, 1989.
8 Long et al., 1988.
9 Mitsch and Gosselink, 1986.



Source: Levine-Fricke, Technical Report 1992.

Source: Brady and Associates (1994)

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0' 1500' 3000' 6000'

Figure 6.5-1

Approximate Locations of Soil Sampling Stations and Tide Gauges

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Seismic Hazards

Although no major faults are currently mapped on the site, the region is one of active seismicity and numerous active faults are present in the San Francisco Bay Area, as shown in Figure 6.5-2. Ground shaking intensity is predicted to be up to "Strong" from earthquakes along the Healdsburg-Rodgers Creek, Hayward, Calaveras, San Gregorio, or Mayacama faults, and up to "Very Strong" for earthquakes along the San Andreas and Concord-Green Valley faults.[10] The Antioch fault zone, approximately 4 miles southeast of the site, is the closest fault identified by the state as a Holocene-active fault under the Alquist-Priolo Special Studies Zone Act. The site is located directly on the northwestward extension of this fault zone, which is mapped[11] only as far as the southern shore of the San Joaquin River. Recent investigations by Wills[12] show that there is no evidence for an active surface fault in Antioch, who recommends that the fault be removed from the special studies zone. Other nearby fault study zones include the Concord (11 miles southwest), Green Valley (11 miles northwest) and Greenville (16 miles south) faults.

In addition to these documented faults in the site vicinity, there are other potential or postulated active faults on or near the site. For example, Williams and Anima[13] show the proposed Montezuma Fault along the western margin of the site, as shown in Figure 6.5-2. The fault zone is identified via seismic reflection profiles in Suisun Bay and aligns with a zone of earthquake epicenters. In addition, the site lies within a zone of fault slip transfer between the Antioch and Green Valley faults. Any offset on these faults would produce landscape features such as thrust faults and overlying folds. The Montezuma and Potrero Hills, both located within 6 miles of the Project, are typical landscape features indicative of this type of deformation. Faults in the site vicinity could produce earthquakes. The faults are thus potentially significant sources of both strong ground shaking and surface fault rupture at the site.

The susceptibility to shaking for local geologic units ranges from moderately high in the Montezuma Hills to very high in the marshlands of the site. The cumulative damage potential from earthquake ground shaking is low to moderate for wood frame buildings, and up to extremely high for tilt-up concrete buildings.

- **Liquefaction.** Liquefaction probabilities range from 0.01 to 0.276 percent per year. Liquefiable sediments are identified in the southern part of the Project area. Liquefaction of deposited dredged materials would be likely if they consist of greater than 85 percent sand or coarse silt or both, are present in layers of 6 inches or greater in thickness, and are laterally continuous over an area of greater than 100 square yards. These conditions are not expected in the majority of the Project site because the material would primarily consist of Bay mud (fine silt and clay). However, due to their soil make-up, levees of unconsolidated material may fail due to shaking and/or liquefaction during an earthquake.

The proximity of the site to known and postulated faults indicates that there is a significant potential for earthquake-related hazards. The seismic hazards at the Project site include liquefaction, ground rupture,

10 ABAG, 1983
11 CDMG, 1976
12 Wills, 1992
13 Williams and Anima, 1992

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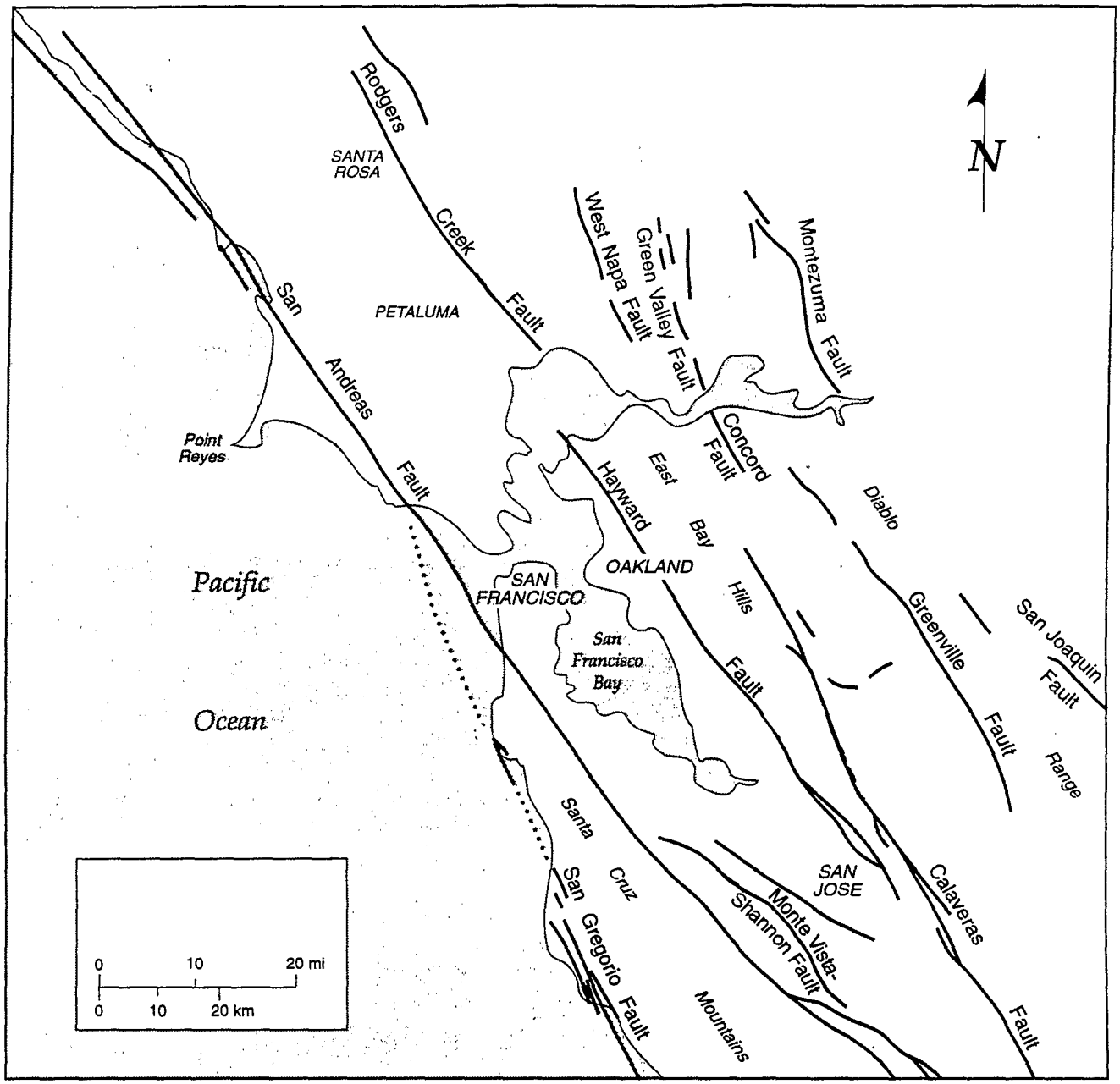

Source: William Lettis & Associates

Source: Brady and Associates (1994)

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Figure 6.5-2

Regional Fault Map

tsunamis (seismically-induced waves in oceans and bays), seiches (change in water level due to oscillations caused by earthquakes), and lurching, as discussed below.

- **Lurching.** Lurching, or lurch cracking, is the cracking of the ground surface in soft, saturated material as a result of earthquake-induced ground shaking. The Bay mud that underlies the site is susceptible to lurching, particularly where bordered by steep channel banks or adjacent hard ground.

- **Ground Rupture.** The potential for ground rupture is considered to be low because no faults are mapped on the site. The low relief of the site makes landslides on the ground surface unlikely.

- **Tsunamis.** Tsunamis are sea waves produced by large-scale seismic disturbances of the ocean floor. Tsunamis can be generated by local offshore seismic events, as well by events thousands of miles away. Tsunamis are considered to be unlikely and, if present, less than 5 feet high at the site for a 20-foot tsunami at the Golden Gate.[14]

- **Seiche.** Seiches are rare oscillations of the water in an enclosed bay or lake, which can be caused by earthquakes. The potential for seiche damage in Suisun Bay is unlikely. The 1906 earthquake caused a rise in water level of only 1 to 2 inches.

Mudwaves

Mudwaves are boils of earth materials that surface as a result of placement of heavy material in an adjacent location. Because a part of the site is underlain by poorly consolidated mud and peat, there is a potential to create mudwaves. Addition of new materials on existing mud could cause mud in adjacent areas to deform to create "waves" in the surface around the new pile of material.

Settlement

Settlement of the ground surface could occur as a result of placement of new material over the existing surface, which adds weight and compresses the underlying material. Settlement can occur both uniformly and differentially. Uniform settlement results in equal amounts of settlement over an area. Differential settlement occurs when parts of an area settle more than others.

Peat soils are particularly porous and thus prone to compaction when heavy materials or objects are placed on top of them. Levees placed over peat soils settle at fast rates and must have new material added at a frequent rate. Because peat soils settle more rapidly than adjacent non-peat soils when loaded, the surface of the material undulates. It is difficult to create a level surface over a large area of fill and to maintain that level surface over a long period if peat and non-peat soils are present under the fill. Existing levees would subside (sink) if they are underlain by peat soils and are used by heavy equipment, or new materials are placed on them to raise their elevation. New levees would also subside for a similar reason. The proposed new marsh surface would also be subject to subsidence where underlain by peat soil. Thus, careful engineering is necessary to ensure the integrity of structures placed on peat soils and the success of the

14 Ritter and Dupre, 1972.

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marsh restoration. The Project Applicant has proposed a system of subdrains to control settlement and subsidence.

The subdrain system is designed to pre-settle the subsurface as needed in those areas underlain by peaty soils prior to placement of dredged sediment on the site. Draining the soils above the peat by pumping shallow groundwater would cause surface soils to act as a non-buoyant load, thereby increasing the rate of consolidation of the underlying peat. Additionally, pumping from the subdrains would continue to a limited extent after sediment placement to utilize the additional sediment load in the consolidation of the peat. Use of the subdrains would require a balance between lowering the groundwater (for consolidation of the peat) and keeping the dredged sediments in a saturated or flooded condition (to prevent potential oxidation of metals in the sediments). It is anticipated that the surface soil layer between the deposited sediments and the underlying peat will allow for this separation of surface and groundwater zones to occur. Modeling of anticipated site settlement has been conducted by the Applicant, taking into account peat thickness, estimated sediment loads, and groundwater pumping from the subdrain system. The anticipated duration of pumping from the subdrain system is 2 years. Results from the modeling indicate a range of settlement up to approximately 4 feet (during the 2-year pumping period) in the areas underlain by the deepest peat layer (30 feet).

Settlement is anticipated until pumping from the subdrain system stops. Once the water table equilibrates to near surface elevations, further settlement of the peat would be limited to secondary compression of the sediments. Modeling results indicate that the maximum settlement that should occur after pumping of the subdrain system ceases is on the order of 0.5 feet in the area underlain by the deepest peat layer.

The Project Applicant proposes to monitor settlement and levee performance at the Project site. Before construction begins, monitoring points would be established on existing facilities such as roads and levees. As construction progresses, additional monitoring points would be established on phase/cell boundary levees, decant structures within cells, and other constructed facilities, to help evaluate overall site performance. These points would be permanent and would be maintained until the wetlands are fully developed to monitor settlement of existing roads and levees.

Monitoring points would be surveyed weekly to monthly while active filling is occurring in areas adjacent to a monitoring point. During nonfilling periods, surveys would be performed monthly or quarterly. Once a predictable settlement pattern is established, settlement monitoring could be performed on a reduced schedule if approved by the agencies until wetland restoration in the area is complete.

Levee Failure

In the revised design, the Project includes four types of levees, each of which has a distinct role and design life, and also has an associated risk in case of failure. Failure of the perimeter levee at any time can lead to the uncontrolled flooding of the Project area. Uncontrolled flooding would convert the site to a sheltered tidal embayment which would act as a sediment basin or trap. Failure of phase levee could cause uncontrolled drainage of one phase's water and slurried cover sediment into the adjacent phase area (this would only affect an adjacent phase area that has not been filled). In the revised design, failure of a phase or cell levee is unlikely to release non-cover material because this sediment type is isolated behind non-cover separation cell levees located at least 200 feet from constructed channels, as well as 200 feet from the Montezuma Slough and Sacramento River. Because the interphase and cell levees are critical structures only during the construction phase, and because they would be buried following construction of the marsh plain, the latter two failure scenarios should be treated as construction problems with known

engineering solutions that will be addressed in final design documents and would not result in a significant impact.

As part of the Project, monitoring would be performed for levees. Visual observation of each of the four types of levees associated with the project would be performed weekly throughout the construction period to assess levee integrity. Newly constructed non-cover separation, cell, and phase levees would be maintained and reinforced or recompacted as necessary to ensure that they continue to effectively contain deposited sediment. Slope inclinometers would be installed in the existing perimeter levee to monitor lateral movements. The inclinometers would be installed through the levee crown and compressible soils into underlying competent soil. The inclinometers would be read shortly after installation and every other week during active filling, unless repeated readings show no movement, and quarterly during the first two quarters after the end of construction. After two quarters following the end of construction, the frequency of reading may be reduced, depending on the readings to date. The inclinometers would be surveyed and also used in the settlement monitoring program.

STATIC FAILURE. The conventional static failure analysis[15] of the existing perimeter levee and proposed phase boundary levees provide indications that these structures are not prone to deform or fail.[16] However, additional stability analyses to be completed by the Applicant in support of final design would consider both short- and long-term conditions, including seepage and rapid draw-down. These analyses are essential because significant deformation and failures can occur in levees constructed over soils containing peat, even when conventional static failure analysis indicates stability.[17]

A DWR levee constructed for the Montezuma Salinity Control Structure in 1988 developed a longitudinal crack which required that a 200-foot-long section be reconstructed.[18]

Liquefaction of the materials beneath the levees could cause sections of the levees to subside, making them vulnerable to erosion.[19] Regular monitoring and maintenance as proposed makes an uncontrolled breach of any of the project levees highly unlikely. The consequences of such events are different for the different types of levees. A breach in non-cover separation or cell levees during construction would result in a discharge of the contents (i.e. the sediment slurry) into adjoining parts of the site, within site boundaries. Failure of a phase levee could allow sediment within cells of one phase to spill into another phase, but again, the consequences would be internal to the site. A breach in the perimeter levee during project construction would flood the site, but the site would then tend to function as a sediment trap rather than a source of contamination to the surrounding waters. Liquefaction of non-cover materials may lead to their local eruption onto the surface of the constructed marsh. The liquefaction susceptibility of the dredged materials, with a probable range of grain sizes between clay and fine gravel, would be variable. Contiguous deposits of medium silt to coarse sand would be the most susceptible to liquefy during a future earthquake.

15 Modified Bishop's method, a limited equilibrium approach that cannot be regarded as a truly accurate analysis of the stability of an embankment.
16 Table A-1, May 1, 1992 Technical Report (Levine-Fricke 1992a).
17 ASCE Geotechnical Special Publication No. 31, 1992.
18 Levine-Fricke 1992a, p. 2-14.
19 Already presumed to be occurring; see Levine-Fricke 1992a, p. 2-14.

SEISMIC FAILURE. An evaluation of the seismic risk in the Northern Sacramento-San Joaquin Delta Area[20] suggests that 10 percent of the total levee area would fail by ground motions during the 100-year exposure period. The range of accelerations determined ranged from 0.05g to 0.25g, with accelerations generally decreasing to the northeast.

An evaluation of the stability of the levees under pseudostatic earthquake loading indicates that the levees may deform during earthquakes that produce a horizontal acceleration of 0.15 gravity (g) or greater.[21] At this force, deformation analyses[22] indicate that the earthquake would cause an estimated 2 to 10 inches of deformation at the levee crest. The results of these analyses should be considered a minimum because greater horizontal accelerations could potentially occur at the site. Both the Concord and Green Valley faults are capable of producing horizontal accelerations in excess of 0.15 g.[23] However, deformation of a levee during an earthquake does not mean that the levee has failed, or will fail. Whether or not deformation results in levee failure will depend on the Montezuma Slough and Sacramento River levels and on whether the levee is repaired before breaching occurs.

6.5.1.2 The Bel Marin Keys Site

Site Geology and Soils

The Bel Marin Keys site is located within California's geologically complex and seismically active Coast Ranges Geomorphic Province. This province is characterized by a series of northwest-trending faults, mountain ranges, and valleys.

The site has been separated from tidal action by dikes and levees since the early 1900s. Adjacent to the Bay outside the levee, the site consists of former mudflats and marshlands. As the site dried out after being removed from tidal inundation, it began to settle below its original elevation. Most of the site is nearly level and lies between elevations -3 feet National Geodetic Vertical Datum (NGVD) and -6 feet NGVD.

Headquarters Hill, a small hill that rises to about 40 feet NGVD, is located near the northwestern corner of the site. Three shallow borrow pits in the north-central portion of the site were used as sources of fill in the 1960s during the construction of Bel Marin Keys Unit III. These pits fill with water during the rainy season.

With the exception of Headquarters Hill, the entire site is underlain by Bay mud. The Bay mud consists of clays and silty clays with occasional locations of sand and sandy clays, and organic and shell remains. Because the site has been separated from tidal action for many years, the surface of the Bay mud consists of a partly dried, somewhat firm crust about 3 to 5 feet thick. Below that depth, the Bay mud is soft, weak, and compressible. The thickness of the Bay mud at the site varies considerably from zero at Headquarters Hill to about 100 feet near the Bay margin.

Prior to the formation of San Francisco Bay, erosion of the adjacent hills resulted in the deposition of alluvium (unconsolidated materials deposited by water) and colluvium (unconsolidated materials deposited by downslope movement due to gravity) in valleys and low-lying areas. A thin layer of alluvium and/or

20 Ake, Wilson & Ostenaa, 1992.
21 Levine-Fricke, March 11, 1993, letter report.
22 Makdisi-Seed Method.
23 Table 2-2 of Levine-Fricke 1992a.

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colluvium underlies the Bay mud at the site. Sandstone and shale bedrock of the Franciscan Formation underlies these deposits.

The Saurin-Bonnydoon complex found on site is an upland soil, classified by the U.S. Soil Conservation Service as having moderate limitations due to low strength, moderate shrink-swell potential and slope. Permeability is moderate, runoff is medium, and the hazard of water erosion is moderate.

Three soil types are found within the Saurin-Bonnydoon complex — the Novato clay series, the Reyes clay series, and fill material. The Novato clay series is found on the Bay side of the shoreline levee and in a small area in the northeast part of the site The Reyes clay series, which is a new series formed when the former Novato soils were drained, is found inland of the shoreline levee where subsidence occurs. Fill material is located where local upland soil has been placed over extensive areas of Reyes soil.

The U.S. Soil Conservation Service classifies the Reyes clay soils, which cover most of the site, as having severe limitations for dwellings, commercial buildings, and roads and streets due to its low strength and high shrink-swell and subsidence potential. Permeability of the Reyes clay is slow, runoff is very slow, and the hazard of water erosion is slight. Novato clay soils have similar engineering properties.

Seismic Hazards

The Bel Marin Keys site, like the rest of the San Francisco Bay Area, is in one of the most seismically active regions in the United States. The site's seismic setting is dominated by the Hayward fault, about 8 miles southeast of the site, and the San Andreas fault, about 14 miles southwest of the site. The Healdsburg-Rodgers Creek fault (which may be an extension of the Hayward fault), about 6 miles northeast of the site, is the closest known active fault. The maximum credible earthquakes for the Hayward, San Andreas, and Healdsburg-Rodgers Creek faults are 7.5, 8.3, and 7.2 (Richter Magnitude), respectively.

The site could be affected by strong ground shaking due to movement along one of these or any one of a number of other active faults in the region.

A possible trace of the Burdell Mountain fault is mapped as extending toward and terminating about 4,000 feet north and west of the site.[24] There are various estimates of the date of the last displacement on the Burdell Mountain fault. It is generally thought to have been active in Quaternary time (the last 2.5 million years), and there is some evidence suggesting that it may have been active in Holocene time (the last 11,000 years). However, the fault is not designated as an "active" fault by the state and is not included within an Alquist-Priolo Special Studies Zone.

The U.S. Geological Survey has estimated that there is a 67 percent probability that there would be one or more earthquakes of magnitude 7.0 or greater in the Bay Area in the next 30 years.[25]

The seismic hazards at the Bel Marin Keys site include lurching, liquefaction, ground rupture, tsunamis and lurching. These conditions are described below.

24 Rice, 1974.
25 USGS, 1990.

- **Liquefaction.** Liquefaction typically occurs in areas where groundwater is shallow, and materials consist of clean, poorly consolidated, fine sand. Since Bay mud does not contain substantial amounts of granular materials, liquefaction hazards at the Bel Marin Keys site are minimal.

- **Lurching.** The Bay mud that underlies the site is susceptible to lurching, particularly where bordered by steep channel banks or adjacent hard ground.

- **Ground Rupture.** There are no active or potentially active faults which are known to cross the Project site. Therefore, the potential for ground rupture is minimal.

- **Tsunamis.** A tsunami with a 100-year recurrence interval has an estimated runup of about 4 feet in the vicinity of the Bel Marin Keys. At current elevations, the Bel Marin Keys site could be flooded due to such a tsunami.[26]

- **Seiche.** The 1906 San Francisco earthquake caused a seiche in the San Francisco Bay with several oscillations of only 1 to 2 inches.[27] Based on the lack of significant historic seiches within San Francisco Bay, the likelihood of a destructive seiche affecting the Bel Marin Keys area is extremely remote.

Mudwaves

Because a portion of the site is underlain by Bay mud there is a potential to create mudwaves.

Settlement

Settlement of the Bel Marin Keys site could occur with the placement of new material over the existing surface, causing a compression of the underlying material.

Levee Failure

In contrast to the Proposed Project, the outboard side of the perimeter levee is flanked by salt marsh that is rarely overtopped by high tides, making the levee somewhat more resistant to erosion and catastrophic failure, although the likelihood that such failures would occur and cause uncontrolled flooding at any of the sites is low. Failure of phase levees could cause uncontrolled drainage of one phase's water and slurried cover sediment into the adjacent phase area (this would only affect an adjacent phase area that has not been filled). Failure of a cell levee could only release non-cover material into adjacent cells if their internal non-cover separation levees fail. In the revised project design, no non-cover subcells are adjacent to perimeter levees. Thus all cell levee failures would be internal to the site. Stability analyses for levees should consider both short- and long-term conditions, including seepage and rapid draw-down. These analyses are essential because significant deformation and failures can occur in levees constructed over soils containing peat, even when conventional static failure analysis indicates stability.[28]

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26 Garcia, 1975.
27 Lawson, 1908.
28 ASCE Geotechnical Special Publication No. 31, 1992.

6.5.1.3 The Hamilton Site

Hamilton differs from Bel Marin Keys in that the perimeter levee is constructed of imported fill, and the extent of tidal marsh on the outboard side is less. In addition, the airfield portion of the site includes an abandoned concrete runway, an area of contamination, and a subsurface jet fuel pipeline. In other respects, the underlying geology, topography, and seismic conditions at the Hamilton site are similar to those at the Bel Marin Keys site. Please refer to the previous discussion for a summary of these conditions.

6.5.2 Environmental Impacts and Mitigation Measures

6.5.2.1 Proposed Project

This section discusses the environmental impacts associated with soils, geology, site settlement, seismicity and mudwaves and recommends mitigation measures to offset impacts associated with these factors.

Soils

The organic soils in the area have a high cation exchange value and soils in the northern area of the site have organic and inorganic nitrogen levels suitable for tidal marsh plant growth. The soils are high in organic matter with very finely textured mineral components. The fertility of these soils is low, but adequate for wetland plant growth. There should be no restrictions on the establishment of wetland plant communities as a result of fertility problems with these soils. There would be no resulting significant impacts related to soils.

Seismic Hazards

Impact P-GEO-1: Facilities, especially temporary structures, are subject to damage during a future earthquake by strong ground shaking and liquefaction. (County-S, Corps-S)

The constructed off-loading facilities for on-site operations, facilities for access, dewatering and water storage, and levees, are all subject to damage during earthquakes by strong ground shaking and liquefaction. Project employees could be injured or die if facilities collapse or are damaged.

> Mitigation Measure P-GEO-1: Structures shall be sited, anchored and designed to withstand strong ground shaking and deformation resulting from an earthquake on any identified, potentially seismogenic fault at or near the site. (LS)

Impact P-GEO-2: Critical Project structures, such as cell and perimeter levees, and holding pond levees could fail or be damaged during an earthquake, increasing potential for release of contaminants to the environment and delaying marsh restoration. (County-S, Corps-S)

The revised project design minimizes the likelihood that contaminants could be released beyond the site boundaries. Non-cover sediment is placed deeper (below mean sea level) in the revised design, and would be sequestered behind non-cover separation levees, more than 200 feet from constructed tidal channels. Levee failures during site construction involving non-cover separation, cell, or phase levees could result in a release of non-cover sediment, but this would be internal to the site. Any such failures would require levee repairs and the re-placement of sediment, potentially impacting the progress of marsh restoration, but without significant off-site consequences.

Catastrophic failure of the perimeter levee would flood the site, but because of its low elevation, the site would tend to be a "sink" for sedimentation rather than a source of sediment flowing out into the adjacent waters. In the (worst-case) event of catastrophic failure and subsequent exposure to tidal fluctuations before the breach could be repaired, turbulent flows and erosion would be concentrated along the major channels which, in the revised project design, have increased separation from non-cover sediment.

> Mitigation Measure P-GEO-2: Critical Project structures, such as levees, shall be designed to the current engineering standards of practice for levee construction, such as those of the Corps.[29] Records for the design and reconstruction of the distressed levee sections as well as maintenance records shall be maintained by the Applicant for future design and maintenance of Project levees. These records will be used to track on-going levee maintenance and to perform preventative inspection and maintenance of levees prior to the development of problems.
>
> Following repairs to any critical levees damaged during an earthquake event, the survey benchmarks that would be installed as part of the elevation control monitoring program shall be re-surveyed to evaluate deformation that may not be discernible by visual observation. This additional surveying is intended to identify levees weakened but not breached by seismic activity. (LS)

Mudwaves

Of greatest concern regarding the formation of mudwaves at the site is that these could cause instability of the containment levees. Additionally, loading of existing mud by filling with dredged materials adjacent to perimeter levees could lead to uplift and deformation of the levee, in addition to deformation of the mud outside of the levees. This deformation can produce "waves" in the surface of the normally flat mud deposits (e.g., Montezuma Slough).

Impact P-GEO-3: Because of underlying compressible materials, the Project has the potential to create mudwaves, which could lead to levee instability, increasing the potential for exposure of non-cover sediments to the environment. Secondarily, mud waves could form adjacent to the site, creating a potential navigation hazard in Montezuma Slough. (County-S, Corps-S)

As discussed above under P-GEO-2, the revised project design minimizes the possibility of off-site releases of contaminants.

The Applicant is proposing to conduct stability analyses during the final design of the Project (prior to issuance of permits for grading and sediment deposition) to determine threshold pore pressure limits for use in determining the rate of fill placement. Monitoring of levee construction and sediment placement will include weekly evaluation by a geotechnical engineer using visual inspections and pore pressure measurements through the use of piezometers to assess the potential for mudwave formation. The Applicant proposes to decrease the rate of sediment placement so that pore pressures are reduced below the limit threshold. Additional specific measures to mitigate the potential impact associated with mudwaves are listed below.

29 U.S. Army Corps of Engineers 1978, 1980

Mitigation Measure P-GEO-3: If mudwaves form, construction shall be stopped until excess pore water pressures dissipate, the mudwave stabilizes, and the extent of surface deformation to levees and to the adjacent slough channel are evaluated by a geotechnical engineer. Levees shall be reinforced or repaired as necessary, and any persistent navigation hazards shall be removed. The rate of sediment placement shall be reduced, based on the recommendations of the geotechnical engineer. Additional preventive measures are as follows:

Prior to the placement of any fill on the site, the Project Applicant shall fulfill the following requirements:

- A baseline hydrographic survey of the Montezuma Slough immediately adjacent to the site shall be conducted before construction begins in Phase I to provide the basis for identifying and correcting any deformation caused by mudwaves.
- For non-cover separation and cell levees: surcharge loads shall be kept significantly below foundation material shear strengths (thin lifts, slow rate of loading).
- For interphase levees: drainage of foundation shall be facilitated with sand/wick drains if the subdrain system proves ineffective in reducing pore-pressure buildup.
- For all types of project levees: settlement of levees shall be monitored in conjunction with the monitoring program proposed for assessing fill elevations in the sediment placement cells and repairs made, as necessary. The levee design will be modified if the results of the proposed geotechnical evaluations indicate that changes are required for levee stability. The rate of sediment placement operations will be reduced to allow for dissipation of pore water pressures. (LS)

The above mitigation provides a measure for each type of levee proposed for the Project. In general, these measures provide for a decrease in potential loads created by fill material, an increase in the strength of permanent levees, and the drainage of fill materials to prevent pressure build-up. Additionally, the Applicant has indicated that geotextile fabrics may be used, consistent with standard engineering practice, to enhance levee foundation stability and increase the bearing capacity of existing soils. The combination of these measures should prevent levee deformation and damage resulting from mudwaves by reducing and redistributing loads, and strengthening the foundation soils.

Impact P-GEO-4: If the proposed subdrain system fails, long-term settlement of the constructed marsh plain may lower it below project design elevations. (County-S, Corps-S)

Settlement of the constructed marsh plain after the completion of sediment deposition is likely to occur. The amount and rate of this settlement and the consequent impacts, however, are largely dependent upon the degree of success of the proposed subdrain system. Should the subdrain system perform as expected, an insignificant amount of settlement may occur. However, in the unlikely event the subdrain system fails, long-term settlement may result in the subsidence of some of the project's landscape elements to the point that they would not provide the desired ecological functions. Differential settlement of the peaty soils may reduce the effectiveness of the proposed subdrain system or cause failure of the system. Additionally, if the clay used to cap the subdrain trenches does not completely separate groundwater from the saturated sediments, the use of the subdrain system in promoting settlement may be limited by the requirement to keep deposited sediments in a flooded condition. Limitations on shallow groundwater pumping or failure of

the subdrain system would result in an initial reduction in the dredged sediment capacity since the consolidation would take longer to occur. There would also be a longer period of settlement after achieving the marsh plain elevation, since pre-consolidation of the peaty soils by draining would be reduced.

> Mitigation Measure P-GEO-4: A supplemental system consisting of either wick drains,[30] additional surcharge points, or well points, or a combination of these shall be developed for use should the proposed subdrain system prove ineffective. (LS)

6.5.2.2 Alternative 1: Managed Wetland

All impacts and mitigation measures previously described for the Proposed Project would apply to this alternative as well. Please refer to the previous discussions for details.

6.5.2.3 Alternative 2: Combined Wetland

All impacts and mitigation measures previously described for the Proposed Project would apply to this alternative as well. Please refer to the previous discussions for details.

6.5.2.4 Alternative 3: The Bel Marin Keys Site

Soils

On-site soils at the Bel Marin Keys site would be covered by sediment dredged from channels around the Bay. The specific characteristics of covered soils would not affect the Proposed Project, nor would the Proposed Project have an effect on these soils.

Geologic and seismic conditions at this site are similar to conditions at the Montezuma site. Because the area of the site is smaller, there is the potential that impacts would be smaller (i.e., fewer structures affected). However, the identified impacts for the Proposed Project would otherwise be similar for this site. It is assumed that all project design components would be similar to the Proposed Project (e.g., subdrains). As with the Proposed Project, addition analysis would be performed prior to development of final design.

Impacts P-GEO-1, P-GEO-2, and P-GEO-4, and corresponding mitigation measures discussed previously, would all apply to Alternative 3. Impacts associated with mudwaves (discussed above under P-GEO-3) differ for Alternative 3, and there is an additional impact related to the presence of transmission line towers on the site. These site-specific impacts and mitigations are discussed below.

Impact 3-GEO-3: Because of underlying compressible materials, the alternative has the potential to create mudwaves, which could lead to levee instability, increasing the potential for exposure of non-cover sediments to the environment. Secondarily, mudwaves could form adjacent to the site, creating a navigation hazard in Novato Creek or in the Bel Marin Keys lagoon (County-S, Corps-LS)

> Mitigation Measure 3-GEO-3: If mudwaves form, construction shall be stopped until excess pore water pressures dissipate, the mudwave stabilizes, and the extent of surface deformation

30 Wick drains are a geotextile membrane that can be installed in the ground that wicks (draws) water to the surface.

to levees and to adjacent waters are evaluated by a geotechnical engineer. Levees shall be reinforced or repaired as necessary, and any persistent navigation hazards shall be removed. The rate of sediment placement shall be reduced, based on the recommendations of the geotechnical engineer. Additional preventive measures are as follows:

Prior to the placement of any fill on the site, the Project Applicant shall fulfill the following requirements:

- A baseline hydrographic survey of Novato Creek and the Bel Marin Keys lagoon shall be conducted before construction begins in Phase I to provide the basis for identifying and correcting any deformation caused by mudwaves. Prior to the placement of any fill on the site, the Project Applicant shall fulfill the following requirements:

- For non-cover separation and cell levees: surcharge loads shall be kept significantly below foundation material shear strengths (thin lifts, slow rate of loading).

- For interphase levees: drainage of foundation shall be facilitated with sand/wick drains if the subdrain system proves ineffective in reducing pore-pressure buildup.

- For all types of project levees: settlement of levees shall be monitored in conjunction with the monitoring program proposed for assessing fill elevations in the sediment placement cells and repairs made, as necessary. The levee design will be modified if the results of the proposed geotechnical evaluations indicate that changes are required for levee stability. The rate of sediment placement operations will be reduced to allow for dissipation of pore water pressures. (LS)

Impact 3-GEO-5: Downdrag on the piles may occur due to loading of the clay crust, causing damage to existing transmission line towers on site. (County-S, Corps-S)

The placement of fill above the firm crust would result in settlement of the crust as the soft mud below consolidates. Pile foundations for the existing transmission line towers penetrate the crust and probably are bearing in firm clay.

Mitigation Measure 3-GEO-5: A soils engineer shall conduct design-level subsurface geotechnical investigation and incorporate recommendations into a comprehensive, detailed geotechnical design and engineering plan. A comprehensive monitoring program of settlement shall be performed. (LS)

6.5.2.5 Alternative 4: The Hamilton Site

As for Alternative 3, impacts P-GEO-1, P-GEO-2, and P-GEO-4, and corresponding mitigation measures discussed previously, also apply to Alternative 4. Impact and mitigation measure 3-GEO-5 would also apply to this alternative (see previous section for discussion). Impacts associated with mudwaves (P-GEO-3 and 3-GEO-3) differ for Alternative 3, which lacks potential navigation hazards, as described below.

Impact 4-GEO-3: Because of underlying compressible materials, the project has the potential to create mudwaves, which could lead to levee instability, increasing the potential for exposure of non-cover sediments to the environment. (County-S, Corps-S)

Mitigation Measure 4-GEO-3: If mudwaves form, construction shall be stopped until excess pore water pressures dissipate, the mudwave stabilizes, and the extent of surface deformation to levees is evaluated by a geotechnical engineer. Levees shall be reinforced or repaired as necessary. The rate of sediment placement reduced, based on the recommendations of the geotechnical engineer. Additional preventive measures are as follows:

Prior to the placement of any fill on the site, the Project Applicant shall fulfill the following requirements:

- For non-cover separation and cell levees: surcharge loads shall be kept significantly below foundation material shear strengths (thin lifts, slow rate of loading).
- For interphase levees: drainage of foundation shall be facilitated with sand/wick drains if the subdrain system proves ineffective in reducing pore-pressure buildup.
- For all types of project levees: settlement of levees shall be monitored in conjunction with the monitoring program proposed for assessing fill elevations in the sediment placement cells and repairs made, as necessary. The levee design will be modified if the results of the proposed geotechnical evaluations indicate that changes are required for levee stability. The rate of sediment placement operations will be reduced to allow for dissipation of pore water pressures. (LS)

6.5.2.6 No-Project Alternative

The No-Project Alternative would have no geological or seismic impacts. With the No-Project Alternative, no change would occur to soils on the site, beyond the natural processes now taking place. The proposed improvements to perimeter levees would not be implemented as part of the project, which could lead to possible failure of the levees in the future if allowed to deteriorate.

6.5.2.7 Cumulative Impacts

Since geology and seismicity impacts are generally related to site-specific hazards, no impacts would occur through the cumulative development of marsh restoration projects. Mitigation of site-specific geotechnical impacts would eliminate the potential for geotechnical impacts from cumulative development.

6.6 Sediment Quality

6.6.1 Affected Environment

This section addresses the issue of sediment quality of dredged materials that would be imported and placed on the sites. The quality of these sediments could have implications for release of contaminants to the environment. The impacts of release of contaminants are further described in Sections 6.7 (Hydrology and Water Quality) and 6.8 (Biological Resources). On-site soils are discussed in section 6.5 (Geology and Seismicity).

For the purposes of this EIR/EIS, a review was conducted of studies of San Francisco Bay sediment quality and the processes which affect contaminant mobility. This review is included in Appendix F, and summarized below.

An estimated 5,000 to 40,000 tons of at least 65 toxic contaminants are deposited in the San Francisco Bay estuary annually.[1] These contaminants include trace elements such as copper, nickel, silver, and zinc, and synthetic organic compounds such as organochlorine pesticides, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). The contaminants originate from numerous industrial, agricultural, natural, and domestic activities and reach the estuary through river flow, storm drains, and other runoff from urban and non-urban lands, wastewater treatment plants, industrial facilities, atmospheric deposition, discharges from maritime vessels, underground seepage, and disposal of dredged materials. Once in the estuary, the fate of these contaminants is determined by a combination of physical, chemical, and biological processes. Many of the persistent contaminants become bound to particulate matter and accumulate in areas of sediment deposition.

The concern over the presence of contaminants in sediments is related to the potential risk the contaminants pose to water quality and biological resources. (For a background discussion, see section 2.4, Release of Contaminants.) The processes of dredging and disposing of dredged materials in San Francisco Bay or in non-aquatic environments may re-distribute contaminants that have been buried in the sediments. These contaminants, although not new to the system, may become available to the biological environment and exert toxic effects upon biota which come in contact with the contaminants. The behavior of contaminants associated with sediments is difficult to assess since their behavior is influenced by temperature, amount of oxygen available, sulfides, acid generation potential, sediment organic carbon content, salinity, and biological activity. The effect of the contaminants on biological resources is strongly influenced by a combination of physical, chemical, and biological factors in the sediments.[2] Protection of biological resources is achieved primarily by avoiding direct contact with sediments containing elevated concentrations of contaminants. The isolation of the non-cover materials, thus preventing direct contact with biological resources, while maintaining them in an anaerobic environment (i.e., preventing contaminant mobility) is a basic concept of the Project's design.

Contaminated sediments are not an adverse impact in and of themselves, but they can adversely impact water quality and biological resources. Therefore, potential impacts that can result from contaminants in sediments are also identified in the water quality (section 6.7) and biological resources (section 6.8) discussions of this document.

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1 Davis et al., 1991.

2 Tessier and Campbell 1987, cited in Long and Morgan, 1990.

The quality of sediments to be used at the Montezuma site or either of its off-site alternatives would vary depending on the specific sources of the dredged materials, which are currently unknown. However, a reasonable range of potential sediment quality can be evaluated by reviewing dredging projects that are currently in the planning or design stages.

The Bay Monitoring Survey, part of the Pilot Regional Monitoring Program (RMP), sampled sediment at 27 potential dredging sites ranging from the south Bay to the Sacramento and San Joaquin rivers. The study also sampled sediments at 39 stations representing estuary marshes and creeks. Results of this sampling are included in Appendix F. These samples indicate background levels of contaminants throughout the estuary. The lowest levels of contaminants were found at the Suisun Bay-Carquinez Strait station, the closest sampling station to the Montezuma Project site. Higher levels are reached in San Pablo Bay, adjacent to the Bel Marin Keys and Hamilton sites, and in central and south San Francisco Bay. Some contaminants from sampling stations around the Bay estuary exceed interim screening criteria for cover material set forth by the SFBRWQCB. Contaminants sampled at the Suisun Bay-Carquinez Strait station do not exceed interim screening criteria. For a description of interim screening criteria, see section 2.3.

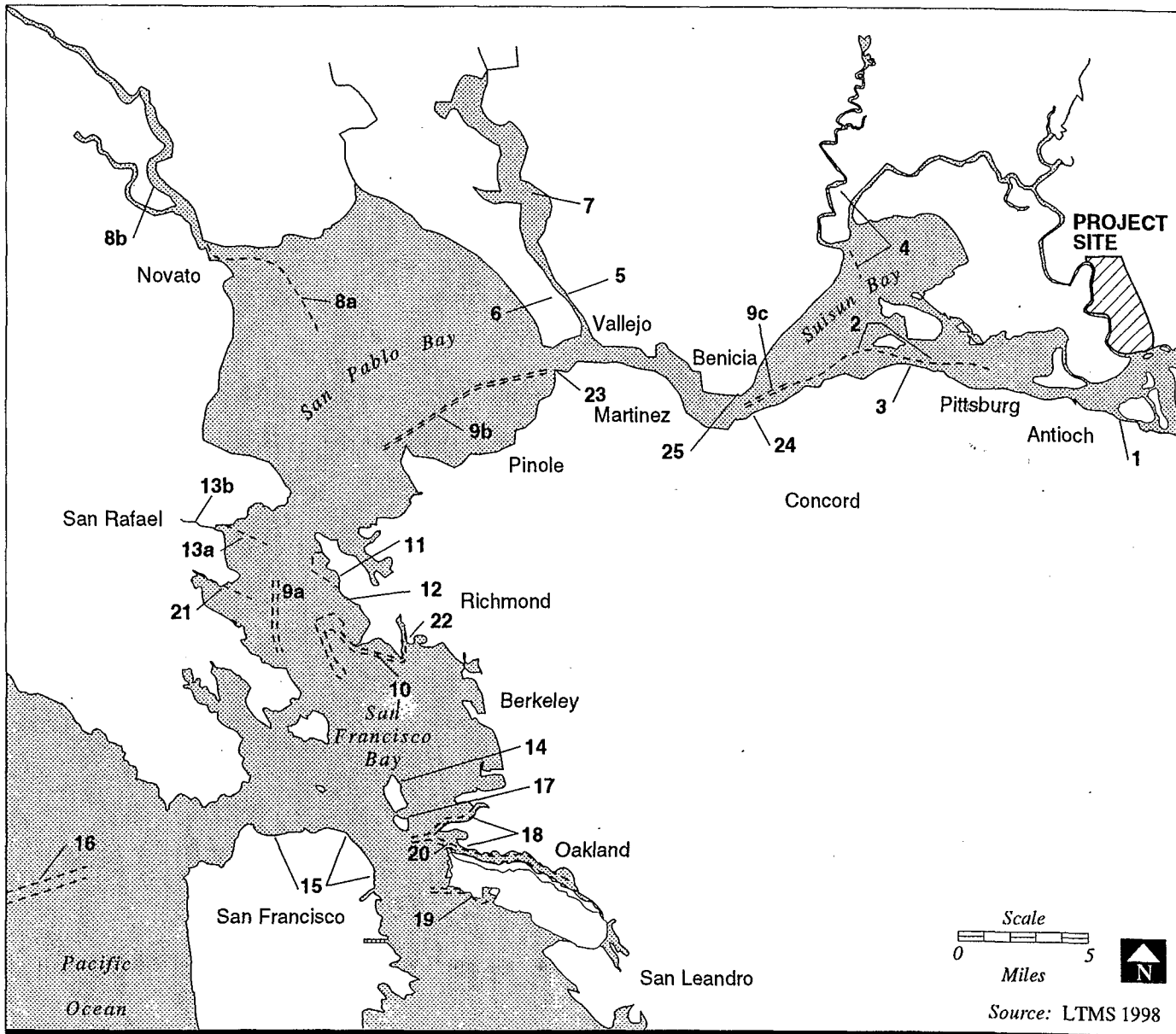
Dredging Volumes

As part of the environmental review process for the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region,[3] estimates were made of the total dredged material from the Bay region that will require disposal over the next 50 years. Factors considered included historic annual average dredging, regional changes over time (regulatory requirements, land use, hydrologic events, etc.), military base closures in the Bay Area, future new dredging projects, and the use of dedicated disposal sites for specific dredging projects. The resulting forecast of dredging and disposal requirements is between 3.47 mcy and 5.93 mcy annually.

Figure 6.6-1 shows the location of past, on-going, and foreseeable future dredging projects in the northern portion of the Bay. Not all of the projects shown in this figure would necessarily be viable sources of dredged material for the Montezuma site or its off-site alternatives due to various factors including distance from the site, availability of more feasible disposal sites, tipping fees, dedicated disposal sites, sediment quality considerations, and other factors. Evaluation of a few representative projects for which dredged sediment test data are available is also appropriate as representative examples of potential sediment sources and to illustrate potential environmental impacts when these sediments are used for wetlands creation projects.

During preparation of this FEIR/S, two major dredging projects were undergoing environmental review: the John F. Baldwin Navigation Channel Deepening (JFB) Project and the Richmond Harbor Navigation Improvements (Richmond) Project. Both of these projects have considered the Montezuma site as one of the disposal alternatives for the large volumes of dredged material that will be generated. These two projects were considered representative of the range of sediment quality that could come from dredging projects in the Bay region, with the JFB Project representing sediments that are relatively "clean" and the Richmond Project containing sediments that are more contaminated. These projects have been subject to the analytical and biological testing (described in Chapter 2) that is required to determine whether the material is suitable for use in wetlands creation. Therefore, the project proponent reviewed and summarized the available information for these two projects in a report entitled *Dredged Sediment Quality*

3 U.S. Environmental Protection Agency et al. 1996



LEGEND

1	New York Slough
2	Suisun Bay Channel
3	Concord NWS
4	Suisun (Slough) Channel
5	Mare Island Strait
6	Mare Island NSY
7	Napa River
8a	Petaluma River, Across the Flats
8b	Petaluma River, Mile 0.0 to Washington Street
	John F. Baldwin
9a	West Richmond Reach
9b	Pinole Shoal Reach
9c	Bulls Head Channel
10	Richmond Harbor
11	Point Molate NFD
12	Chevron (Richmond Long Wharf)
13a	San Rafael Creek, Across the Flats
13b	San Rafael Creek, Mile 0.0 to Grand Ave.
14	Treasure Island NS
15	Port of San Francisco
16	San Francisco Harbor (San Francisco Bar)
17	USCG, Yerba Buena Island
18	Oakland Harbor/Port of Oakland
19	Alameda NAS
20	Oakland NSC
21	Larkspur Ferry Channel
22	ARCO
23	Unocal
24	Shell Oil
25	Exxon

MONTEZUMA WETLANDS
PROJECT
EIR EIS

Figure 6.6-1

Past and Potential Future Dredging Projects

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Report.[4] Based on the extensive sediment testing and evaluations conducted by the Corps for those two dredging projects, LFR[5] (1997b) determined that those sediments can be assessed and appropriately classified as cover and noncover material suitable for use in wetlands creation projects. The final determination as to whether sediments from these projects (or from any other dredging projects) would be approved for use at the Montezuma site or its off-site alternatives would be determined by the SFBRWQCB, Corps, and EPA, with input from other agencies, as appropriate. These projects and a summary of the testing results are described below.

John F. Baldwin Project

The proposed channel and berth improvements would involve the dredging and disposal of approximately 9.0 mcy of bottom sediments from four main reaches of the shipping channel: West Richmond Reach (1.2 mcy), Pinole Shoal Reach (6.6 mcy), Carquinez Strait (6,249 cy), and Bulls Head Channel (1.0 mcy). The dredging would also include deepening maneuvering areas near several refineries, marine terminals, and berths (160,000 cy) located along the JFB channel in north Contra Costa County.

The majority of the sediments from the Baldwin project would likely be allowed for use as cover sediment. Summary tables of the sampling and analytical results for the Baldwin sediments are presented in Tables F-6 through F-12, Appendix F, and described briefly below.

Based on the SFBRWQCB's interim sediment screening criteria, all of the sediment from West Richmond reach and Carquinez Strait, as well as select portions of Pinole Shoal Reach and Bulls Head Channel reach, could be used for cover sediment. Two of the composite samples within the Pinole Shoal reach slightly exceeded (within 7 percent) cover criteria concentrations for chromium. It has been determined that these elevated chromium concentrations are likely due to naturally high chromite in the Bay sands and that the trivalent reduced form of chromium, in which these concentrations occur, is not bioavailable. Additionally, in effluent leaching tests conducted on Pinole Shoal sediment, chromium was observed to leach at concentrations below 0.001 mg/l (less than an order of magnitude below shallow water Basin Plan standards for chromium). Due to these factors, it is likely that these sediments (which represent over 50 percent of the JFB sediments) would be acceptable for use as cover material. All sediment designated as suitable for cover material could also be used as non-cover.

Of the eight composite samples analyzed from the Bulls Head Channel reach (including a large turning basin), two exceeded the cover criteria and two exceeded the non-cover criteria. In all four cases the only constituent exceeding the criteria was chromium. Similar to those samples described above for the Pinole Shoal reach, it is likely that the sediments associated with these high chromium concentrations would be allowed for use in wetlands creation.

None of the sediments from the berthing areas (less than 2 percent of the total JFB sediments) would be acceptable for use as cover material based on the interim screening criteria. It is likely that the majority of these sediments would be allowed as non-cover material even though the analytical detection limits for selenium were higher than the screening criteria. Discussions with the SFBRWQCB indicated that sediments from these areas would most likely be allowed as non-cover, provided a thicker layer of cover

4 Levine-Fricke 1995b
5 LFR 1997b

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sediments is placed over the non-cover sediments.[6] Approximately 40,000 cy of the berth sediments would not be allowed as either cover or non-cover material due to high levels of mercury.

Additional testing of the Baldwin sediments included leaching and bioassay tests. Bioassay results from applicable ocean disposal testing showed that all results, with the exception of two composites from the berth areas, showed no biological toxicity. To test leachability, sediments from the berth areas and the Bulls Head Channel were analyzed using the Waste Extraction Test (WET), which is recommended by the SFBRWQCB (see Appendix E). This procedure, described in Title 22 of the California Code of Regulations, measures the Soluble Threshold Limit Concentrations (STLC) of certain constituents. None of these samples had detected concentrations exceeding the STLC limits. The majority of the Baldwin sediments were not tested for leachability using the WET method.

West Richmond and Pinole Shoal sediments were evaluated for leachability by the Corps. Due to a realignment of the channel after testing conducted by the Corps, only testing results from the Pinole Shoal sediments are currently representative of the sediments to be dredged. These sediments were tested by the Corps[7] for effluent quality, surface runoff quality, and leachate quality to determine how the sediments would react in conditions similar to an upland environment. The regulatory agencies will use these data to further evaluate use of these sediments for beneficial reuse on a case-by-case basis.

The effluent tests are conducted by mixing sediments with water, allowing them to settle, then analyzing the extract or elutriate for chemical concentrations. These tests are designed to estimate both dissolved and particle-associated contaminant concentrations in the effluent. The surface runoff tests are designed to simulate land disposal and rainwater flushing of sediments after placement. Analyses are performed on runoff water from wet, unoxidized sediments, then conducted again 6 months later after sediments are allowed to dry and become oxidized. Leachate tests conducted include three different procedures that are generally more rigorous than those described above and allow thorough oxidation of the sediments. These include: kinetic batch tests in which sediment samples are shaken with fresh water over extended periods of time; sequential batch tests in which sediment samples are extracted repeatedly with changes of fresh water; and column tests in which sediments are placed in columns and repeatedly flushed with fresh water. Due to the oxidation of sediments and fresh water flushing that occurs in the latter two types of tests, the effluent quality test seems to most represent conditions that would be established at a wetland restoration site. Conclusions presented by Lee et al.[7] stated that these tests indicated "no toxicity associated with the John F. Baldwin sediments."

Richmond Harbor Project

Construction of the Richmond Harbor Navigation Improvements Project consists of widening and deepening the existing 4.7-mile Richmond Harbor Channel to -38 feet mean lower low water (MLLW) and constructing a new 1,260-foot diameter turning basin. The total channel length includes the Entrance Channel (1.3 miles), Potrero Reach (1.7 miles), Potrero Sharp turn and new turning basin (0.6 mile), Inner Harbor Channel (0.7 mile), Santa Fe channel and harbor berths (0.5 mile). The total project would create approximately 1.91 mcy of dredged material that would require disposal.

The majority of the Richmond Harbor dredged material meets the interim screening criteria for cover material. Consideration of the bioassay results in conjunction with these criteria would potentially require

6 personal communication, T. Gandesbery 1995

7 Lee et al. 1993a

that a good portion of this material be used for non-cover only. A summary of the sampling and analytical results for the Richmond Harbor sediments is presented in Tables F-13 through F-18, Appendix F. These summary tables include results from applicable bioassay testing required for open water disposal that would be considered for the cover/non-cover suitability determination.

Sediment composites collected from the Richmond Harbor berths, the Entrance Channel, and turning basin exceed cover screening criteria for several metals and one or more organic compounds. Non-cover screening criteria for total DDT was also exceeded in Richmond Harbor berths and Entrance Channel sediment composites.

Based on a comparison to the SFBRWQCB screening criteria, sediments from the Richmond Harbor entrance channel and portions of the turning basin could be used as cover material. Dredged sediments from the entrance channel, turning basin, as well as portions of the Harbor berths could be used as non-cover material. All of the Potrero Reach and Inner Harbor channel sediments, as well as a portion of the berth sediments exceed the non-cover criteria for DDT. However, at recent interagency meetings between the SFBRWQCB, EPA, National Marine Fisheries Service, and the Corps, it was determined that the SFBRWQCB screening criteria for DDT were set too low. Based on a review of scientific data presented in the EPA's Ecological Risk Assessment of the Marine Sediments at the United Heckathorn Superfund Site,[8] the general consensus among these participating agencies was that the cover and non-cover criteria for total DDT should be increased.[9] As a result, the SFBRWQCB is considering higher DDT criteria for the Project, which would slightly increase (by allowing the sediments in one berth area to be included in) the volume of material meeting the DDT cover criterion (1.22 mcy or 64 percent), and result in all of the material meeting the DDT non-cover criterion.

Similar to the testing described above for the Baldwin sediments, Richmond Harbor sediments were also subjected to bioassay and leaching tests. Of the 21 composite samples evaluated, only six were within the statistically acceptable mortality limits for benthic toxicity. It is possible that the majority of the Richmond Harbor sediments would not be allowed for use as cover material based on these results. These bioassay data are presented in Appendix F, as compared to three separate reference sites. Leachability of the sediments was evaluated by the WET method as well as the leaching (effluent) tests used by the Corps described above. Effluent test results using Santa Fe Channel composites (which exceeded cover screening criteria, but were within noncover screening criteria) showed that all effluent chemical concentrations were below all water quality standards, including the shallow water Basin Plan standards. These results indicate that noncover sediments are unlikely to leach contaminants into groundwater or the aquatic environment. None of these samples analyzed by the WET method showed concentrations exceeding the STLC limits. As stated above, the effluent test seems to be most representative of the conditions that will be established at a wetland restoration site. The effluent tests were conducted on the Santa Fe Channel sediments only. These sediments contain many of the higher concentrations of organic and inorganic chemicals in the Richmond project, making this similar to a worst case analysis. It was concluded in Lee et al.[10] that organisms exposed to the elutriate from the Santa Fe channel sediments demonstrated no toxicity.

8 U.S. Environmental Protection Agency 1994

9 Levine-Fricke 1995b

10 Lee et al. 1993b

6.6.1.1 The Montezuma Site

The Proposed Project would import about 20 million cubic yards (mcy) of dredged materials from dredging sites around the San Francisco Bay estuary to restore wetlands onsite and to rehandle for off-site sale . On-site soils (described in section 6.5.1.1)would be covered by dredged sediments. The type of material placed would have similar characteristics and require the same testing procedures described in the preceding section. The same basic issues of availability of contaminants and interim screening criteria would apply to the sediments to be placed at the Project site and rehandled for off-site sale.

6.6.1.2 The Bel Marin Keys Site

As at the Montezuma site, on-site soils at Bel Marin Keys (characteristics of which are summarized in section 6.5.1.2) would be covered by sediment dredged from various locations around San Francisco Bay. The type of material placed would have similar characteristics and require the same testing procedures described in section 6.6. The same basic issues of availability of contaminants and interim screening criteria would apply to the sediments to be placed at this site.

6.6.1.3 The Hamilton Site

The characteristics of the affected soils at the Hamilton site are summarized in section 6.5.1.3. Unlike either the Montezuma or Bell Marin Keys sites, some of the existing soils at the Hamilton site are contaminated with petroleum hydrocarbons which are planned to be remediated in 1999. Dredged sediments placed at the Hamilton site would serve to cap and isolate the petroleum contaminated soils, in addition to raising existing site elevations to facilitate wetlands restoration.

As at the Montezuma site, on-site soils at the Hamilton site would be covered by sediment dredged from various locations around San Francisco Bay. The type of material placed would have similar characteristics and require the same testing procedures described in Section 6.6. The same basic issues of availability of contaminants and interim screening criteria would apply to the sediments to be placed at this site.

6.6.2 Environmental Impacts and Mitigation Measures

Potential impacts related to sediment quality include the impacts that contaminants within the sediments could have on biological resources that could come into contact with the dredged material after deposition, the effect these sediments could have on water quality, and the presence or accumulation of chemical concentrations within the dredged material above the interim screening criteria.

6.6.2.1 Proposed Project

All dredged materials brought to the site for disposal would already have been subjected to sampling, analysis, and suitability determinations by the regulatory agencies (SFBRWQCB, EPA, and Corps) for disposal as cover or non-cover material. The proposed criteria for cover and non-cover materials are provided in Chapter 2, Table 2-1. The required sampling and analytical procedures[11] assure that contaminant concentrations in sediments approved for a specified use will generally meet these criteria, although small-scale exceedences of these criteria are possible due to spatially varying contaminant

11 See the Draft EIS/EIR for the Oakland Harbor Navigation Improvement (50-foot) Project, prepared by the U.S. Army Corps of Engineers San Francisco District and the Port of Oakland (February 1998).

concentrations[12]. Applicant-proposed sampling of the incoming sediments would provide additional information on the quality and quantity of sediments actually deposited on the site.

Impact P-SED-1: Chemical concentrations in sediments used on the site may on a small scale exceed the proposed criteria (based on the SFRWQCB Interim Screening Criteria). (Corps-S, County-S)

The Applicant has proposed confirmation sampling of the dredged material (1 composite each 60,000 cy of material) to ensure that the material used at the site is comparable to the material approved by the regulatory agencies. This would allow the detection of potential hot spots within the dredged materials and would further assist in determining proper placement of the materials within the disposal cells. Additional sampling of sediments in placement cells is also proposed.

Elevated contaminant concentrations, if undetected and left in place, could ultimately have adverse effects on estuarine plants, fish, and wildlife in the restored marsh. The following mitigation measure builds on the Applicant's proposed confirmation sampling and is intended to minimize the likelihood and consequences of such an occurrence.

> Mitigation Measure P-SED-1: The Applicant shall maintain complete records of the sediment sources, their physical and chemical characteristics, and of the disposition of such sediments within the site. If confirmation sampling indicates that sediments placed on the site have exceeded the required cover or non-cover criteria for placement according to the project design, additional sampling of the affected location(s) shall be undertaken immediately to develop a profile that establishes the nature and extent of the exceedence(s). Based on these results, subject to review and approval by the Corps, County, and RWQCB, one of the following alternative measures shall be implemented:
>
> a) If the exceedence is relatively isolated, small in magnitude (within the range of normally expected variability), and not expected to have adverse effects under the conditions of its placement, it may be left in place.[13]
>
> b) If the above circumstances do not apply, the sediments of concern shall be removed to an approved location based on their chemical characteristics. Material shall be removed with mechanical grading equipment or portable dredges capable of working in the marsh environment. Subject to agency review and approval, the sediments may be mixed with confirmed clean sediment to reduce concentrations to within acceptable ranges for placement on the site.
>
> c) The need for additional measures such as liming to reduce contaminant mobility, capping with fine sediments, increased depth of burial or horizontal isolation from channels, and increased long-term monitoring shall be considered by the Applicant and regulatory agencies. (LS)

12 E.g., see 1997 Annual Monitoring Report for the Sonoma Baylands Wetland Demonstration Project, prepared by the Army Corps of Engineers San Francisco District in cooperation with the California State Coastal Conservancy.

13 E.g., see 1997 Annual Monitoring Report for the Sonoma Baylands Wetland Demonstration Project, prepared by the Army Corps of Engineers San Francisco District in cooperation with the California State Coastal Conservancy.

Impact P-SED-2: Evaporation and concentration of water in ponds could result in a gradual buildup of contaminants to harmful concentrations in sediments and pond water. (County-S, Corps-S)

Chemical factors with the greatest effect on the potential availability of contaminants include changes in the oxidation potential and pH of the sediments. An increase in the oxidation potential or lowering of the pH (increased acidity) could result in mobilization of inorganic contaminants, and an increase in their bioavailability.

There are two activities related to the disposal of the dredged materials at the site that could result in chemical alteration of the sediment, making contaminants more available:

- Transfer and deposition (placement) of dredged materials.
- Dewatering of the sediments and operation of the ponds containing decant and make-up water, which could be used to create the slurry to transport sediments from the barges to the placement cells.

The process of creating slurry (mixing sediment with groundwater or pond water) would increase oxygenation and could decrease the pH of the dredged materials, possibly increasing the mobility of contaminants. However, this process would afford little opportunity for biological or chemical oxidation within the sediments due to the short period of time required to mix and discharge slurried sediment into the placement cells and the absence of oxygen remaining within the slurry pipeline. As the sediments settle and compact, excess water would drain off to the make up water pond for reuse, and anaerobic conditions would again become established within the sediments which will decrease the mobility and potential availability of the contaminants.

Non-cover material in cells would remain in a flooded or saturated condition during sediment placement and prior to capping with cover material. A balance between dewatering of the peat for consolidation and maintenance of flooded conditions at the surface will be established through visual monitoring and regulation of the subdrain system.

Once the dredged materials have been deposited at the desired location, the excess water would be allowed to clarify before being drained, allowing fine sediments to settle out of suspension. Geotextile fabric placed in the levee sidewalls of the non-cover sediment placement cells would also screen sediments from decant water. However, some of the finer sediments and colloids may remain in suspension, especially during windy conditions, and be transported to the ponds where sediments could settle out of suspension and colloids could flocculate (aggregate to become very fine sediment).

Repeated use, evaporation, and concentration of water in the ponds could result in a gradual buildup of contaminants in the water and in the sediments, especially if geotextiles do not filter all sediments, or if all water does not pass through the geotextiles. Over time, a substantial increase in the contaminants in the sediments and water of the ponds could occur, and contaminants could exceed the cover and non-cover interim screening criteria. As a consequence, the make-up water used to slurry sediments into cells could become contaminated, with potential biological effects in the pond itself, in sediment placement cells, or in the waters adjacent to the site where excess pond water would be discharged.

Mitigation Measure P-SED-2: Quarterly sampling and analysis of the pond sediments and water shall be conducted. If contaminant concentrations in the sediments exceed the screening criteria for cover material, the pond shall be closed until sediments can be removed by clamshell dredging and placed as non-cover material in an available noncover sediment placement cell. If contaminant concentrations in the pond sediments exceed the screening criteria for non-cover material, the sediments shall be removed by clamshell dredging for disposal at an appropriate class landfill. (LS)

Refer to sections 6.7 and 6.8 for discussions of sediment quality impacts on water quality and biological resources, respectively.

6.6.2.2 Alternative 1: Managed Wetland

Sediment quality impacts and mitigation measures discussed previously for the Proposed Project would all apply to Alternative 1 as well. Refer to the preceding discussions for details.

6.6.2.3 Alternative 2: Combined Wetland

Sediment quality impacts and mitigation measures discussed previously for the Proposed Project would all apply to Alternative 2 as well. Refer to the preceding discussions for details.

6.6.2.4 Alternative 3: The Bel Marin Keys Site

Sediment quality impacts and mitigation measures discussed previously for the Proposed Project would all apply to Alternative 3 as well. Refer to the preceding discussions for details.

6.6.2.5 Alternative 4: The Hamilton Site

Sediment quality impacts and mitigation measures discussed previously for the Proposed Project would all apply to Alternative 4 as well. Refer to the preceding discussions for details. Project monitoring and mitigation measures, as described above under P-SED-1 and P-SED-2, could also mitigate potential impacts associated with existing contamination at the Hamilton site.

6.6.2.6 No-Project Alternative

The No-Project Alternative would have no impact on sediment quality at the Project site. However, there could be a change in the sediment quality or bioavailability of contaminants at dredging locations that could use the Montezuma site for disposal of non-cover material. Since the contaminants would be in the sediments, their bioavailability at potential dredge sites would be limited; however, since the contaminants would be in the near surface sediments, this would allow for potential bioturbation and exposure of benthic organisms. In the long term, the dredging of these sediments and disposal under a 3-foot layer of cover material, as proposed for the Project, would limit potential plant and animal exposure. This benefit of limiting plant and animal exposure to contaminants in the surface sediments at potential dredging locations would thus not be achieved under the No-Project Alternative.

6.6.2.7 Cumulative Impacts

The Proposed Project, in combination with other projects that use dredged materials for wetland restoration and other beneficial uses, would have regional cumulative benefits by providing increased

disposal options and capacity for dredging projects and restoring regional wetland resources, especially tidal wetlands. Localized impacts on sediment quality at project sites would be mitigable as discussed for the Proposed Project, and it is not expected that there would be residual cumulative impacts.

6.7 Hydrology and Water Quality

6.7.1 Affected Environment

The following sections describe existing hydrologic and water quality conditions at each alternative site.

6.7.1.1 The Montezuma Site

Surface Water Hydrology

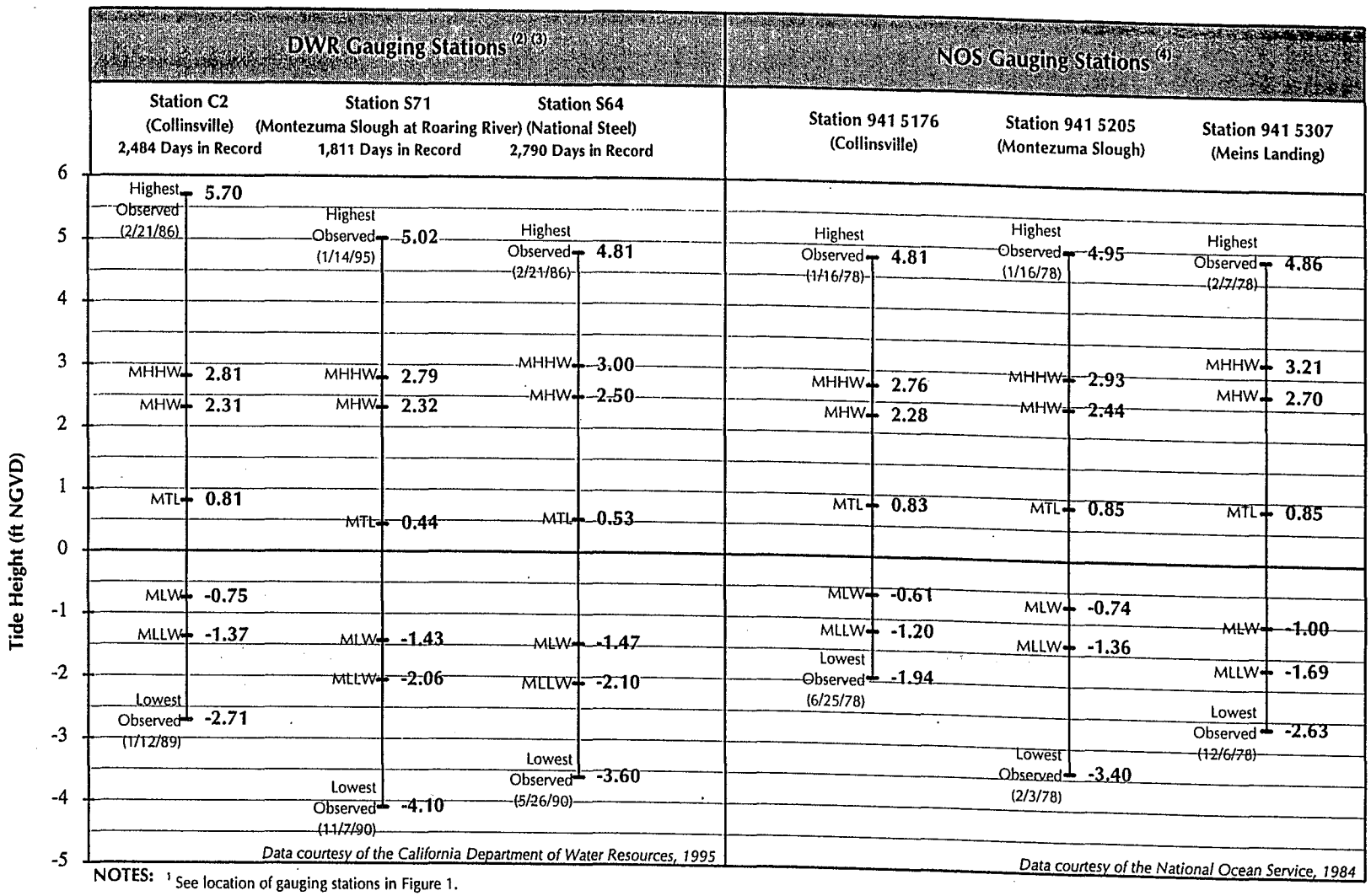
The site receives surface runoff from the Montezuma Hills, concentrated in two small tributaries with a total area above the 10-foot contour of about 3,300 acres. The northernmost of these is known as Clank Hollow; the southern drainage is nameless. Mean annual precipitation is about 14 inches, and mean annual runoff about 3 inches. The total rainfall runoff from the watershed areas above the 10-foot contour amounts to about 825 acre-feet/year; this estimate allows for soil moisture storage and evapotranspiration. The Project Applicant estimates the runoff for individual 24-hour events to be 100 to 230 acre-feet for the 2-year event, 350 to 570 acre-feet for the 10-year event, and 710 to 960 acre-feet for the 100-year event.

The runoff entering the site accumulates in low areas, where some of it infiltrates into the soil, and some of it evaporates. Runoff is also pumped from the site to Montezuma Slough. Interior drainage on the site is controlled by a system of ditches, levees, and roads. Fire Truck Road, providing access to the Day Use Area, is a major hydrologic barrier; water flows beneath it through culverts at five points. During major storm events, runoff from Clank Hollow can overflow onto the site. The frequency with which this occurs is not known.

Tidally influenced surface waters that border the site include the Montezuma Slough to the west, the Sacramento and San Joaquin rivers to the south, and the Suisun Bay to the southwest. Suisun Bay is the location of the San Francisco Bay estuary's null zone, where fresh water outflow from the Delta mixes with saline tidal water of the Bay.

Tidal elevations at the Project site have been calculated from data collected by DWR using six tide gauges whose locations are shown on Figure 4.2-2. Tidal heights for this area vary considerably up various sloughs within the Suisun Marsh. At the confluence of Montezuma Slough and Roaring River (just south of the Montezuma Salinity Control Structure), MHHW is 2.79 feet NGVD and MLLW is -2.06 feet NGVD. Tidal conditions at these gauges and elevations of high and low tides are shown in Figure 6.7-1.

The levee protecting the site from flooding from Montezuma Slough and the Sacramento River is at an elevation of 7 to 10 feet NGVD. There is some uncertainty about the 100-year flood level at Collinsville, but it is estimated by FEMA at 10 feet NGVD. The 100-year flood is associated with water levels of 10 feet NGVD in the river. Levees at the Montezuma site would be overtopped before this level is reached and thus the site would be expected to be inundated more frequently than once in 100 years. Water accumulating within the site interior as a result of normal seasonal rainfall and runoff is controlled by a series of drainage ditches and by pumping at two locations (see Figure 4.2-3) for discharge into Montezuma Slough and the Sacramento River.



NOTES: [1] See location of gauging stations in Figure 1.
[2] NGVD datum field verified for DWR gauging stations June 1995.
[3] DWR data representative of tidal datum with Montezuma Salinity Control Structure (MSCS) in operation.
[4] NOS data pre-date construction and operation of MSCS.

Source: Levine-Fricke (1995a)

MONTEZUMA WETLANDS PROJECT EIR EIS

Figure 6.7-1

Tidal Datum for Six Stations Adjacent to the Montezuma Wetlands Project Site

C-088310

Surface Water Quality

TOTAL SUSPENDED SEDIMENT CONCENTRATION (TSS). TSS is an important variable determining rates of sedimentation, the relative balance of erosion and sedimentation, and the rate at which a restored tidal marsh develops. TSS in the immediate vicinity of the site has not been measured, but regional monitoring data[1] and long-term observations[2], suggest that TSS is relatively high in the Suisun Marsh to West Delta region compared to other parts of the estuary. Local sediment sources include the Sacramento River, Montezuma Slough, and runoff from the adjacent Montezuma Hills. In contrast to San Pablo Bay, resuspended sediments from tidal mudflats are of minimal importance in this region.

CONTAMINANTS. Total dissolved concentrations of seven inorganic elements (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) were measured in surface water samples collected in a series of samples at five Department of Water Resources monitoring stations between May 1988 and September 1989, and in a single Montezuma Slough sample collected in 1990.[3] These data are of limited use because laboratory detection limits were in many cases not precise enough to allow comparisons with applicable thresholds for toxicity to aquatic organisms (see below), although one or more instances of elevated concentrations of copper, lead, and zinc were noted.

Concentrations of metals and other contaminants in the waters of the Bay-Delta estuary are being regularly measured as part of the Regional Monitoring Program (RMP) conducted by the San Francisco Estuary Institute.[4] The closest sampling stations to the Project site are (1) in the Sacramento River just east of Collinsville, and (2) in Honker Bay, several miles west of the Project site. RMP data for 1995 indicate that both total and dissolved concentrations of most contaminants at these sites were below the toxicity thresholds for aquatic organisms that are established in the SFRWQCB Water Quality Objective Limits[5] and in the U.S. EPA's California Toxics Rule.[6] One or more exceedences of criteria were observed for chromium, copper, nickel, and total PCBs. These contaminants are frequently observed at levels exceeding the criteria at other locations in the Bay-Delta estuary.

It is not anticipated that significant levels of contaminants exist in runoff water on the site. Land use in the area draining into the Project site is primarily used for sheep and cattle grazing, which typically requires only minimal use of pesticides and fertilizers. Livestock can be associated with increased levels of fecal coliform bacteria in surface runoff, but low-density sheep and cattle grazing activities such as those in the area are unlikely to contribute to bacterial contamination. Runoff water currently accumulating on the site is pumped directly into Montezuma Slough and the Sacramento River.

SALINITY. The Project site is just east of Collinsville at the western end of the Sacramento-San Joaquin Delta. Salinities (salt concentration) in the adjacent waters are subject to seasonal and annual variation dependent on Delta inflow values. Salinity at Collinsville is estimated to remain below 2,200 μmhos/cm,[7]

1 SFEI 1997
2 B. Grewell, Department of Water Resources, personal communication (8/22/97)
3 Levine-Fricke 1992a
4 SFEI 1996
5 SFRWQCB (1995) Water Quality Objective Limits
6 U.S. EPA's (1997) California Toxics Rule
7 μmhos/cm stands for micromhos per centimeter. This is a measure of conductivity and is related to salt concentration.

or approximately 1 part per thousand (ppt), at discharges above 7,900 cubic feet per second (cfs). In general, winter-spring flows of the Sacramento River at Collinsville are around 20,000 to 60,000 cfs. However, during the summer and during dry years, flows may decrease to below 8,000 cfs. Under such conditions, water salinity at Collinsville may exceed 10 ppt.[8] In recent years, salinities have decreased somewhat during summer and fall months due to discharge from reservoirs to retard salinity intrusion during these months. Since 1960 during the spring months (April-June) there has been an accelerating trend of increased salinity at Collinsville. Because spring flushing of waterfowl ponds is critical in establishing the appropriate vegetation, increased salinity at this time of year can have significant effects on soil salinities. Collinsville, however, is generally lower in salinity than the average values for Suisun Bay and Suisun Marsh, as illustrated in Appendix G. Salinities at Collinsville are generally half that of sites within the interior of Suisun Marsh and Bay. Water salinities at Collinsville generally range between 0 and 4 ppt.[9] By comparison, the salinity of seawater averages 34 ppt, and in central San Francisco Bay at the Presidio, average salinity is 30 ppt.

Water salinity in the Delta has been extensively studied for a variety of reasons, including its importance in determining wetland vegetation types. Waterfowl require certain food plants that have specific salinity tolerances. Extreme salinity generally results in a decline of the plant species preferred by waterfowl. Since the 1930s, on the average, Delta outflows of freshwater have decreased and the duration of salinity intrusion into Suisun Marsh has increased to a level that threatens future production of present waterfowl food plants. The salinity of waters in the Suisun Marsh and the Delta is required by law to be maintained at or below specified levels during certain times of the year (SFBRWCQB Water Quality Decision 1485). DWR has monitored salinity in surface waters at various locations throughout the Delta region. Collinsville is generally lower in salinity than the average values for Suisun Bay and Suisun Marsh; thus, DWR management efforts have focused on taking water from the Sacramento River at Collinsville to provide better water quality in the Suisun Marsh.

The Montezuma Salinity Control Structure (MSCS) was constructed as one of four phases of a DWR project to meet salinity standards established in the State Water Resources Control Board (SWRCB) Water Quality Decision 1485. The purpose of the MSCS is to reduce salinity in the Suisun Marsh during periods of low freshwater inflow from the Delta. This structure captures less saline water from the Sacramento River and pumps it by tidal action up the Montezuma Slough to the Suisun Marsh. The gates are opened on ebb tide when the water is lower on the north side than on the south side. On the flood tide, as water flows south, the gates are closed. The result is that fresh water is pumped by tidal action from the Sacramento River, up the slough toward the northwest. As shown in Figure 6.7-1, the Mean Diurnal Range on the north side of the MSCS is 0.25 foot greater than on the south side.

Groundwater Hydraulics and Quality

Based on a review of existing well data and additional project investigations of the subsurface conditions at the site, two water-bearing zones have been identified in the project vicinity: a shallow, brackish zone; and a deeper zone used for domestic supply. Shallow groundwater on the low-lying parts of the site generally lies within a few feet of the surface at an elevation of about -2.5 feet NGVD, with elevations as low as -7.6 feet NGVD in some areas. Available data indicate that the shallow aquifer does not extend

8 see Arthur and Ball 1979

9 Estimated salinity in the Suisun Bay and Marsh, Samples of Sacramento River water showing salinity levels, and changes in salinity at Collinsville are shown in Appendix G.

below 60 to 70 feet below ground surface (bgs) at the site. The water level of this shallow system responds to both tide levels and seasonal rainfall. The groundwater system has been found to flow from the Sacramento River and the Montezuma Slough toward the shallow groundwater, but this could have been the result of drought conditions, and it is expected that the flow would reverse in wet years. The permeability of the fine, near-surface sediments that underlie much of the site (Phases I, II, and III) is low, on the order of 10^{-5} cm/sec. These soils are mixtures of silt, clay and loam, interbedded with peat. A sandy layer (up to 60 feet thick), however, is present on the southern portion of the site (Phase IV), with higher permeability. Boring log data from soil borings taken at the southern perimeter of the site and synchronized water level fluctuations with tidal changes suggest that this sand layer is hydraulically connected to the Sacramento River and Montezuma Slough.

Salinity in the shallow groundwater at the south end of the site was found to be similar to that of the adjacent Sacramento River. Farther north from the Sacramento River, shallow groundwater becomes more brackish. The groundwater recharge rate from surface water flow is minimal due to the low permeability of the fine near-surface sediment, although the recharge rate could increase in wet years. The shallow groundwater on the site is not a viable source for domestic supply due to high salinity (i.e., total dissolved solids [TDS]). A sample from one shallow monitoring well (LF2) had a chromium concentration (0.013 mg/l), just above the Shallow Water Basin Plan Standard of 0.011 mg/l, but less than the California MCL of 0.05 mg/l; its nickel concentration (0.04 mg/l) exceeded the SFBRWQCB Marine Water Quality Objective (0.0083 mg/l), but was less than the California MCL of 0.1 mg/l. Samples from the other four shallow monitoring wells were within established criteria for all heavy metals.

Groundwater in the deep aquifers, generally deeper than 70 feet from the surface, is of high enough quality that it is used for drinking. TDS concentrations measured in two known water supply wells (Birds Landing and Collinsville) that draw water from deeper aquifers were two orders of magnitude lower than TDS levels measured in the on-site shallow monitoring wells.[10] These and other water quality differences between the shallow and deep water aquifers indicate a lack of hydraulic connectivity between these two zones.

6.7.1.2 The Bel Marin Keys Site

The Bel Marin Keys site is a diked, formerly tidal wetland that has been used for many years for pasture and oat hay production. Since the area was diked it has subsided to an elevation of about -7 feet below sea level. The area is bordered on the north by Novato Creek, on the west by San Pablo Bay, on the northwest by Bel Marin Keys Units 1-4, and on the south and southwest by the Hamilton site.

Surface Water

Runoff from rainfall is collected in a series of interconnected drainage ditches and pumped to San Pablo Bay. During large storms some runoff drains off to the Hamilton antenna field, where a levee has been breached.

The levee separating the site from Novato Creek is 7 feet NGVD, the same level as the FEMA-estimated 100-year high tide elevation at lower Novato Creek. The site would flood in a 100-year storm, and thus provides temporary storage of Novato Creek stormwaters. Since the site is zoned F-2 by the County Flood Control District, its flood storage capacity cannot be reduced by more than 25 percent by filling or

10 Levine-Fricke 1996

development, unless the reduction in storage capacity is mitigated. In addition, 300 acres are reserved for stormwater detention from the Bel Marin Keys Units 1-4 development.

CONTAMINANTS. Dispersion of contaminants in San Pablo Bay is poor, due in part to the Bay's large expanses of shallow water. Previous water quality measurements in the vicinity of the Novato/Ignacio and the Hamilton Field treatment plant outfalls found that annual median values for most physical and chemical water parameters reflected compliance with standards established by the SFBRWQCB in the San Francisco Bay Water Quality Control Plan (Basin Plan). However, the annual maximum values of pH, total coliform, turbidity, color, and ammonia exceeded the Basin Plan criteria at times.[11]

SALINITY. Surface water on the Bel Marin Keys site is currently is mix of surface runoff during rainstorms and shallow groundwater seepage. The salinity varies from fresh to brackish, depending on rainfall and evaporation. Salinity in San Pablo Bay varies from 6 to 26 ppt, being lower during periods of high runoff.

Groundwater

There are two groundwater systems at the site. Shallow groundwater occurs at depths varying from 0 to 10 feet below the surface. The water level of this shallow system responds to both tide levels and seasonal rainfall. This shallow aquifer is underlain by dense Bay mud. Below this restrictive layer lies the Novato Valley Groundwater Basin. The presence of the Bay mud layer prevents a hydraulic connection between the two systems. There are no wells on the site.

6.7.1.3 The Hamilton Site

The Hamilton site consists primarily of lowland areas. Much of this area is below sea level at around -5 to -6 feet NGVD, and is protected from Bay waters by a series of levees. Based on soil types, the site is expected to have rapid runoff rates, with low groundwater infiltration rate and low erosion potential.

Surface Water

The areas surrounding the Hamilton site are developed, exhibiting high runoff rates typically associated with urban development. Surface runoff from the site is drained by various storm drains and ultimately empties into Pacheco Creek and Ignacio Reservoir to the north, or to the drainage channels and pump stations in the lowlands on the eastern portion of the base. A large pump is located adjacent to the Bay at the south end of the airfield and is used to keep the site pumped.

Once waters from Pacheco Creek enter Ignacio Reservoir, they are combined with the flow of Arroyo-San Jose Creek. Arroyo-San Jose Creek drains areas north of the Hamilton site and does not enter the site but, nonetheless, contributes to the flooding of the airfield.

To prevent overtopping of the reservoir from high creek flows and high tidal backwater effects of San Pablo Bay and Novato Creek, two siphons from the reservoir to the northwest corner of the airfield have been installed. Excess waters are conveyed through the runway area drainage channel along the levee to the existing pumping facilities at the airfield for discharge into San Pablo Bay.

11 Bel Marin Keys Unit 5 Final Environmental Impact Report. ESA. August 1993.

Both Pacheco and Arroyo-San Jose creeks have 100-year floodplains within or adjacent to the airfield. Arroyo-San Jose Creek contributes significant flow into Ignacio Reservoir which, in turn, could contribute to spillover onto the runway area of the airfield via the siphons. Ignacio Reservoir is also used as part of a wetlands management program during summer months.

CONTAMINANTS. The Hamilton site is on the shore of San Pablo Bay, just south of the Bel Marin Keys site; contaminants are similar to those described above for the Bel Marin Keys site.

SALINITY. Salinity at the Hamilton site is similar to that described above for the Bel Marin Keys site.

Groundwater

The depth to groundwater varies at the site from near 0 foot NGVD at the surface to 8 feet. No aquifers with potable water are known to exist in this area. The area beneath the Petroleum, Oil and Lubrication (POL) point southeast of Ammo Hill has a direct hydraulic connection with the Novato Creek subsurface drainage and may be affected by tidal fluctuations. Most of the runway closure area is underlain by Bay muds. Due to the impermeable nature of Bay muds, tidal and surface runoff fluctuations have little effect on groundwater levels under the site or adjacent areas.

The general direction of groundwater flow at the Hamilton site varies. The groundwater flow direction under most of the airfield area and antenna field is to the east, toward San Pablo Bay and the tidal flats. These estimates are general and may vary according to local subsurface conditions.[12]

6.7.2 Environmental Impacts and Mitigation Measures

6.7.2.1 Proposed Project

Surface Water Hydrology and Geomorphology

The amount of water surface area that would be covered by the proposed off-loading facilities is 13,270 square feet. The Sacramento River is wide in this location, and water circulation is unlikely to be significantly affected, although there could be local sedimentation near the docks due to the creation of calm-water conditions. In Montezuma Slough, the Project could slightly delay and reduce the higher high tides north of the MSCS. The delay would be insignificant, about 1 hour, with reduction of about 2 inches in height of the higher high waters.[13]

As noted previously, TSS at the project site is expected to be relatively high compared to other parts of the estuary. This should allow the created marsh elevations to increase through sedimentation following tidal restoration once the dikes are breached, as has been observed in many locations throughout the estuary, including, for example, at Ryer Island, upstream of the Montezuma site in the Sacramento River[14]. The rate of sedimentation at Montezuma cannot at this time be presumed to be as great as would occur at the

12 Woodward-Clyde Consultants, 1985.
13 This conclusion is based on modeling of tidal circulation under pre- and post-project conditions (Crapuchettes and Crapuchettes, 1992). The project conditions modeled were those of an earlier iteration of the design, but similar enough to the final design that the impact on tides in Montezuma Slough would be essentially the same.
14 B. Grewell, Department of Water Resources, personal communication (8/22/97)

San Pablo Bay alternative sites, which are in a region of predictably high TSS where rapid sedimentation following tidal restoration is highly predictable[15].

The success or failure of the Project's marsh restoration will depend in large part on two factors: (a) the dimension of the constructed channels, and (b) the elevation of the marsh plains, in both the low marsh and high marsh. The channels must have adequate cross-sectional area to convey tides throughout the marsh. If they are too small, the tidal range in the upper marsh will be reduced, and the tidal flooding on the marsh plains will be inadequate. Undersized channels may tend to erode and widen, with a risk that the non-cover sediment could be exposed and mobilized.

The elevation of the marsh plain is similarly critical. If the marsh plain is set too high, the tidal prism will too small, and the bed shear stress will not be sufficient to erode small channels into the marsh plain. On the other hand, if it is set too low, the marsh plain tidal prism will be so large that deep channels could form, exposing the non-cover sediments to erosion. Accumulation of sediment to an appropriate marsh elevation could take many years.

A third important issue is wind fetch, that is, the uninterrupted distance the wind can blow across open water. If the fetch is too long, wave action may resuspend the dredged or naturally-deposited material on the marsh plain, thus preventing the accumulation of soft sediment that is essential for a natural marsh. Wind fetch does not by itself control sedimentation and marsh development on successional mudflats and dredge disposal sites. The horizontal gradient of mudflat elevation is important in dissipating wave energy, and sites with broad, shallow mudflats exhibit sediment accumulation and marsh development despite long fetch distances.

The earlier iteration of the design for the Project, which was evaluated in the Draft EIR/EIS, placed the marsh plain at mean higher high water, with somewhat smaller channels. That design has been modified to take account of hydrologic and geomorphic concerns about channel formation, tidal circulation, and channels cutting into noncover sediment. The revised design increases channel cross-sectional area by 75% and isolates noncover sediment at least 200 feet from large channels. Additionally, final marsh plain elevations have also been lowered to minimize the risk of placing the marsh plain too high and to allow for sedimentation to naturally build the marsh surface. The revised design calls for a low marsh plain at 0.5 foot below MHW. It calls for a high marsh plain at MHHW. Actual elevations in the different phases of the Project would be adjusted slightly (0.1 to 0.2 foot) upward or downward to approximate the closest local tidal datum (see Figure 6.7-1).

The main channels (3rd, 4th, and 5th order) would be formed by building levees to contain the dredged (suitable cover) sediments. These levees would be graded down to the elevation of the adjacent constructed marsh plain before the outer levees are breached, so the levees (made from soils on the site or from suitable dredged sediment dewatered at the on-site rehandling facility) would become the initial levee banks.[16]

The Applicant proposes to work with the San Francisco Estuary Institute to finalize the design of the tidal channel system, based on hydraulic geometry relationships developed from the results of a field evaluation

15 P. Baye, U.S. Fish and Wildlife Service. Data from the Regional Monitoring Program (SFEI 1997), LTMS (1998), and recent sedimentation modeling (e.g., Krone 1996) support the conclusion of consistently high TSS and rapid sedimentation rates in restored tidal systems along the northern San Pablo Bay shoreline.

16 The cross-sections are shown in Table 3 of Levine-Fricke (1995a).

of natural Suisun tidal marsh channels (most likely at Browns Island) prior to issuance of Corps §404, §10, and County use permits. The results would be incorporated into the Project's engineering plans and specifications.

To answer the questions about the hydrologic and geomorphic conditions that would result from the proposed design, three approaches were used. First, empirical data were gathered from three designed marshes around San Francisco Bay. The sampling effort focused on assessing marsh plain elevation, channel formation, and wind fetch length. Second, the channel design for the Project was compared with a data set on channel hydraulic geometry for natural tidal slough channels. Third, the tidal circulation with the Project design was modeled using the tidal hydrodynamic model ESTFLO. These approaches and models have been used to evaluate and design tidal wetlands throughout Californian estuarine environments. The models have been modified and updated using available data collected from ongoing field work conducted in tidal marshes. The methods used for these analyses and the detailed results are shown in Appendix D.

The hydrologic and geomorphic impacts of the Project are summarized below.

Impact P-HYDRO-1: If the designed channels are undersized, the tidal range at the upper ends of the slough channels would not provide the expected frequency and inundation of the marsh plain. (County-LS, Corps-LS)

To test the adequacy of the designed channel system, two tests were applied. First, the dimensions of the designed system were compared with a data set on slough channel hydraulic geometry for tidal channels in San Francisco Bay and other estuaries. The data set of seven relatively undisturbed tidal salt marshes was developed to relate channel depth, channel cross sectional area, channel width, and marsh area to the mean diurnal tidal prism. However, channel density, size and sinuosity would be expected to be reduced in the brackish water system of the Suisun Marsh as compared to more saline tidal systems in San Francisco Bay. These data sets provide an approximation of the channel dimensions required for a given marsh area or tidal prism volume (i.e., amount of water exchanged over one tidal cycle). The results of this comparison, given in Appendix D, show that the channel dimensions for the proposed Project are on the low side of the range of naturally occurring saline tidal channel dimensions; this is considered appropriate for channels in the less saline north Bay and Delta area because field investigations in these marshes have revealed that brackish water environments typically produce smaller, less densely spaced channel systems.

Second, to evaluate the possible attenuation of tides in the designed channel system, the one-dimensional model ESTFLO was set up and run for Phase I (see Appendix D). Results of the modeling indicate that the high water elevation in Clank Hollow would be virtually the same as in Montezuma Slough adjacent to the site. In a natural system of this size, one would expect some attenuation. The unexpected efficiency of the channels is probably a result of the relatively low slope of the channel bottom; the channels are almost as deep at the upper end as at the lower end. Over time, they would probably fill in at the upper end, and the tidal range in the upper marsh would be reduced somewhat. The marsh plain, however, would develop to an elevation consistent with the local high water.

Given the revised project design and the analyses described above, this is a less-than-significant impact. It should be noted that the project design changes implement the mitigation measures that were previously identified as sufficient to mitigate this impact in the Draft EIR/S. No additional mitigation is suggested (LS).

Impact P-HYDRO-2: The potential for flooding in the area adjacent to the constructed wetlands could be increased. (County-LS, Corps-LS)

Areas adjacent to the constructed wetlands (Collinsville to the east and Birds Landing to the North) are subject to flooding by high Delta outflow, high tides and wind driven waves and seiches. The community of Collinsville, to the east of the site, is currently subject to flooding from the Sacramento River. This Project will not affect that flooding potential since McDougal Cut (an existing open body of water) lies between Collinsville and the Project site, and the Project will not change the hydraulic condition (i.e., drainage) of McDougal Cut.

The 100-year flood boundary at the site[17] closely follows the 10-foot NGVD elevation contour. Daily tidal inundation of the site through the four levee breaches will typically affect wetland areas to around MHHW elevations, which in the site's vicinity range from 2.85 feet NGVD at Collinsville to ±3.21 feet NGVD at Meins Landing (just north of the site in the Montezuma Slough). However, storm-driven and other extraordinary high tide events could possibly affect areas at higher elevations. Based on observed extreme water levels at Port Chicago,[18] NOS has estimated a highest water level at Collinsville of +8.2 feet NGVD, at Montezuma slough of +8.9 feet NGVD, and at Meins Landing of +10.2 feet NGVD. These flood data are consistent with FEMA 100-year flood boundary at the site.

Flooding from upland storm runoff is expected to have minimal impact at the higher elevation upland areas (i.e., greater than 10 feet NGVD) because of the limited size of the site's upland drainage basins (approximately 3,100 acres). The runoff from a 24-hour 100-year storm event would contribute only 6 additional inches of water to the wetlands area.[19] The flooded area would, under extreme high tides, extend only a few feet farther into the upland-buffer parts of the project site, posing no significant flooding hazard to the off-site upland areas. Under normal tidal conditions, any storm runoff entering the wetland would drain to the adjacent surface waters of Montezuma Slough and the Sacramento River. The levee breaches and their free-draining characteristics would prevent excessive water accumulation behind levees which occurs under present site conditions or which might occur under the nontidal managed wetlands alternatives.

To the north of the Project site, Birds Landing is drained by the Lucol Hollow drainage basin. The Project's proposed northern boundary levee is designed to prevent flood waters from the tidal wetland from entering that drainage area. The Project's design includes culvert(s) with flap gates or other one-way control structures that will be incorporated into this levee so that during extreme storm events, runoff from Lucol Hollow can drain through the wetlands, thereby minimizing impacts of extreme weather flooding north of the site.

Based on the foregoing, the Project would have insignificant impacts on flooding in adjacent areas.(LS)

Impact P-HYDRO-3: The marsh plain could inadvertently be placed too high. This would prevent the formation of small channels, and the deposition of soft sediment. (County-S, Corps-S)

The survey of the three existing saline marshes (see Appendix D) showed that where the marsh plain is established above MHW, channels do not form naturally as a result of tidal action. The optimum marsh

17 FEMA 1988

18 National Ocean Survey [NOS], 1984

19 Levine-Fricke 1992

plain elevation for channel formation is within the range where low marsh typically occurs in the Bay-Delta region, at about 0.5 foot feet below the elevation of MHW.

The present design calls for the low marsh plain to be set at 0.5 foot below MHW, or 1.0 foot below MHHW, with a tolerance of 0.5 foot. If consistently achieved, this elevation would be satisfactory for the formation of small (first and second order) channels in the developing marsh plain at the natural density reflective of the site conditions.

> Mitigation Measure P-HYDRO-3a: The design criteria and action threshold should be stated as follows:
>
> "No more than 50 percent of the low marsh plain shall be higher than an elevation that is 0.5 foot below local MHW. Ninety-five percent of the low marsh plain shall be below the local MHW. No more than 50 percent of the high marsh plain shall be higher than local MHHW; 95 percent of the high marsh plain shall be lower than an elevation 0.5 foot above local MHHW. Corrective action shall be taken if these goals are not met."
>
> Mitigation Measure P-HYDRO-3b: In order to prevent overfilling, sediment placement shall be pulsed when the sediment elevation is estimated to be within 1 foot of the design elevation for both the noncover layer and the cover layer; i.e., thin lifts of sediment shall be placed into cells, and fill elevation shall be determined for each lift after initial consolidation. Each successive lift shall be thinner, to decrease the margin of error in achieving final design elevations. During placement, the slurry pipeline discharge point shall be moved as required to several locations within each cell to prevent mounding based upon visual observations at the outfall discharge point. Fill elevations shall also be monitored during sediment placement by means of topographic surveying and a network of resistivity probes. The number of resistivity probes installed within each sediment cell shall be related directly to the acreage and depth of the sediment cell and to the percent fines in the placed sediment. The number of grade control resistivity probes shall be increased in non-cover cells to enhance elevation control in those cells. The upper lifts of the non-cover sediments shall be gravity consolidated prior to placement of cover sediments. The sediment placement method has been modified from what was evaluated in the circulated DEIR to reduce the impact of turbulent flow of cover sediment over the placed non-cover sediments (see Sections 4.6.2 and 6.8.2 for further discussion). If monitoring results indicate that fill elevations have exceeded the criteria in Mitigation Measure P-HYDRO-3a, those overfilled areas shall be graded down to design elevations within six months of completion of sediment placement within each cell. Equipment capable of operating in a marsh environment shall be used, in order to avoid dewatering cells and exposing sediment to oxidation. Elevation control measures are described in more detail in Section 4.6.2. Alternatively, where subdrains are present, additional subdrain pumping could be used to reduce elevations to appropriate levels. (LS)

Impact P-HYDRO-4: The large open reaches of water could allow significant waves to form during high tides. These waves could resuspend deposited sediment, and retard the formation of a mature vegetated marsh. (County-LS, Corps-LS)

The survey of three restored tidal salt marshes (see Appendix D) found that where the wind fetch exceeds about 1,000 feet, wave action prevents the deposition of fine sediment and an increase in the elevation of the marsh plain; however, the effect of water depths on wave action was not evaluated. After tidal action is returned to the Project site, water depths in the low and high marsh plains are expected to be shallow (0.5

feet deep at MHW in the low marsh and 0 feet deep at MHHW in the high marsh plain), which should reduce wave action and minimize resuspension of sediments. With the appropriate initial elevation, water depths, and wind fetch, sediment accumulates from the water column to form a marsh plain. Channels form where freshly deposited sediment is resuspended by concentrated flow, and incise slightly into the placed cover material. The naturally deposited sediment has a higher pore volume and lower density than consolidated dredged material, and is thus a more suitable substratum for both plants and invertebrates.

> Mitigation Measure P-HYDRO-4: Although significant wave fetch is not expected to prevent sediment from settling out of suspension and accumulating under normal conditions, marsh vegetation shall be introduced into sediment cells (see P-BIO-2) where the wind fetch exceeds 1000 feet to reduce potential wave action and re-suspension of sediments that could occur under higher flood tides and storm events. (LS)

Impact P-HYDRO-5: Erosion of major channel banks or incision of small first-order and second-order channels into non-cover sediment could expose the non-cover sediment to erosion, releasing contaminated material into the environment. (County-S, Corps-S)

A major concern in the Project design is the possibility that: (a) the major designed channels could widen enough to cut into the sequestered non-cover sediment; and (b) small first and second order channels could cut downward and into the non-cover sediment. Significant design changes have been made since the DEIR/EIS to further isolate non-cover sediment. These changes include 200-foot lateral setbacks of non-cover sediment from large-order channels to account for the possibility of channel migration and incision into non-cover sediment (the previous design placed non-cover cells within 12 lateral feet of large-order channels) and lowering of the marsh plain surface by at least 0.5 feet to provide for increased sedimentation when tidal circulation is restored. As in the previous design, the non-cover material is designed to be isolated from first and second order channels by placement of approximately 3 vertical feet of cover material.

The modeling results discussed in Appendix D indicate that the velocities in the designed channel would never exceed 0.8 ft/sec, and most of the time would be less than 0.4 ft/sec. The bed shear stress, however, would be as high as 2.5 Newtons per square meter (N/m2) at channel junctions. Unfortunately, little information is available on the material and characteristics of the cell levees. They would presumably be made of native soil, compacted enough to be stable. For non-cohesive sediment, the maximum shear stress would be sufficient to move sand grains of 2 to 3 mm in diameter. As discussed in Appendix D, additional work with the model (especially sensitivity analysis) would be useful. On the basis of results to date, we conclude that: (a) some scour may occur at the channel junctions, where the maximum water surface slope occurs; (b) deposition at the channel junctions is unlikely; and (c) channel widening enough to cut into the non-cover material is unlikely.

Bank erosion in the main channels is a less-than-significant impact, and no mitigation is required.

As discussed in Appendix D, the hydraulic geometry relationships indicate that first- and second-order channels as deep as 4 feet below MHHW (deep enough to cut into the non-cover material) would probably not develop, but the possibility cannot be ruled out on the basis of existing information. As a result, this impact is still significant.

> Mitigation Measure P-HYDRO-5: The tops of the non-cover separation levees shall be constructed of compacted cohesive clays to prevent channels from cutting through them. The interior slopes of noncover separation levees shall be built with 2:1 to 5:1 interior slopes

(depending on exposure to wind fetch), rather than just 2:1 as was previously proposed, which geotechnical evaluations indicate is a sufficiently shallow slope to prevent excessive erosion of the levees during sediment placement operations. They would then function as sills to prevent the upstream channel segments from cutting into the non-cover sediment. The formation of first and second order channels shall be assessed and documented on a quarterly basis during the first year following tidal restoration, and annually thereafter. In the unlikely event that channels greater than 2 feet below MHHW develop over non-cover cells, further channel development shall be prevented by placement of straw bales, and/or revegetation. (LS)

Surface Water Quality

Impact P-WQ-1: There may be an increase in the concentration of contaminants in water in the make-up water pond, which, if discharged to the Sacramento River, would violate water quality standards. (County-S, Corps-S)

The Project would use two categories of dredged sediment (cover and non-cover), which contain different concentrations of contaminants. "Non-cover sediment" would have slightly elevated concentrations of contaminants, including heavy metals and polynuclear aromatic hydrocarbons (PAHs). This non-cover sediment would be sequestered behind interior separation levees, and covered with sediment that is essentially free of contamination. The chemical criteria for cover and non-cover sediment are discussed in section 2.3 and in Levine-Fricke.[20]

After the non-cover sediment is pumped to the containment cells, it would be allowed to settle. The decant water would be removed by filtering through geotextile fabrics in the levee side-walls and pumped to the make-up water pond. The use of geotextile fabrics in levee sidewalls of ponds is a conventional treatment technology used to remove contaminants bound to suspended sediment. In the San Francisco Bay, this approach has been used successfully on projects such as the Pt. Isabel dredging and contaminated sediments containment project. To determine whether the decant water from non-cover sediment would meet SFBRWQCB water quality standards for shallow and/or deep-water discharge, the Applicant evaluated Corps elutriate testing data on composite sediment samples from the Santa Fe Channel, in Richmond, which are representative of relatively contaminated sediments that might be expected at the Montezuma Wetlands site. The samples tested had contaminant concentrations that met the interim screening criteria for non-cover sediment, but not for cover sediment. The non-cover sediments were mixed with water (4 parts water to 1 part sediment, which is similar to or less dilute than the 15-20% slurry that will be created at the Project site), and allowed to equilibrate and settle for 1 hour before the elutriate (the water) was collected and analyzed. Based on recommendations made in interagency meetings, elutriate test results were compared to standards for deep-water discharge presented in the "San Francisco Bay Region Water Quality Control Plan, 1995 Basin Plan Update," issued by the RWQCB. These standards are appropriate because the Project proposes discharge into the relatively deep waters of the Sacramento River. Both shallow and deep-water discharge standards are shown in Table 6.7-1.

The results indicate that the water decanted from the non-cover sediment would meet all of the SFBRWQCB Basin Plan standards for discharge into deep water and also for shallow water. This is to be expected, since heavy metals are usually bound by sediment through a number of mechanisms, including cation adsorption onto clay, adsorption onto iron and aluminum oxides, and precipitation as sulfides.

20 Levine-Fricke (1995b)

The foregoing data provide assurance that the Project can meet applicable standards for discharge. Under operational conditions, however, given recycling of the make-up water and evaporation from the pond, contaminant concentrations could still increase, posing a risk of water quality impacts if the water is discharged. Project discharges to the Sacramento River would be regulated and monitored through an NPDES permit issued by the SFBRWQCB. In conjunction with that permit, to further ensure that the Project achieves all water quality objectives, the following are proposed.

> Mitigation Measure P-WQ-1: If the concentration of any chemical of concern in the make-up water pond exceeds one-half of the Basin Plan standard for deep water discharge, or other standard imposed through the NPDES permit, one or more of the following measures shall be implemented as necessary to ensure that water quality remains in compliance with discharge standards:
>
> 1. Increase the settling time in the sediment placement cells;
> 2. Increase the filtering capacity of the geotextile fabrics used in the non-cover cells;
> 3. Decrease the amount of recycled water used in the water supply system and increase the amount of make-up water to reduce concentrations;
> 4. Add limestone to maintain dredged sediment slurry pH above 6.5;
> 5. Add iron chloride or iron sulfate to enhance precipitation;
> 6. Add flocculating agents to increase settling of clays and fine-grained sediments;
> 7. Set up and use an alkaline hydroxide treatment system;
> 8. Set up and use a sulfide treatment system;
> 9. Set up and use an ion-exchange or carbon treatment system.

With these mitigations, this is a less-than-significant impact. (LS)

Table 6.7-1
Effluent Limitations for Selected Toxic Pollutants Discharged to Surface Water [a,b,c]

	Shallow Water (μg/L)	*Deep Water (μg/L)*
Arsenic	20.0	200.0
Cadmium [d]	10.0	30.0
Chromium (VI) [e]	11.0	110.0
Copper [d]	20.0	200.0
Cyanide [f]	25.0	25.0
Lead [d]	5.6	56.0
Mercury	1.0	1.0
Nickel [d]	7.1	71.0
Silver [d]	2.3	23.0
Zinc [d]	58.0	580.0
Phenols	500.0	500.0
PAHs [g]	15.0	150.0

Notes:
a. All values are 24-hour averages.
b. These limits are based on a combination of fresh and salt water quality objectives, technological achievability, limits of detection, and limited allowance for dilution. They are intended to be achieved through a combination of Best Available Technology and source control.
c. These limits apply to effluent discharges from POTWs and process water discharges from industrial facilities. The Regional Board may apply them to discharges of cooling water, runoff, or other types of discharge on a case-by-case basis, but other programs as identified in this Plan, such as Urban Runoff Management, are intended to address those discharges.
d. These values represent effluent limitations based on 100 mg/L hardness. Individual limits may be calculated based on hardness of ambient receiving waters.
e. Dischargers may at their option meet this limit as total chromium.
f. Cyanide may not persist in the environment in the same manner as the heavy metals. The Regional Board will consider information on the persistence of cyanide in evaluating alternate limit proposals.
g. As identified by EPA Method 610. If a discharge exceeds the limit for PAHs, concentrations of individual constituents should be reported.

Source: California Regional Water Quality Control Board 1995.

C-088323

C-088323

Impact P-WQ-2: Salinity increases in make-up pond water leached from sediments could increase salinity in the receiving waters of the Sacramento River and Montezuma Slough; this increase would be quickly dispersed. (County-LS, Corps-LS)

The dredged material barged to the site would have pore water concentrations of salt comparable to the part of the Bay from where the material originated. The engineering plans call for this material to be mixed in a slurry with local groundwater, pumped to the sediment placement cells, and allowed to settle. The decant water would then be pumped back to a holding pond, and reused for makeup water. Over time, the salt concentration in the holding pond could build up, and some overflow would be discharged through a pipe to deep water of the Sacramento River near Collinsville.

To calculate the volume and concentration of water that would be discharged, the Applicant performed an evaluation taking into account the import of water, groundwater usage, recycling of make-up water, evapotranspiration, etc. The results of the salt/water balance shows that the greatest discharge of salt would occur in November. The discharge rate would be about 87 liters per second, with a salt concentration of about 17.7 ppt. This would amount to a salt load of about 1.5 kg/sec.

To put this discharge into perspective, the mean tidal discharge at Collinsville is about 2.3 million liters per second.[21] The salt concentration varies with Delta outflow, from 0.24 ppt at 12,000 cfs to 7.3 ppt at 3,000 cfs.[22] During the fall, when the highest discharge of water from the Project relative to Delta outflow would occur, the average tidal flux of salt at Collinsville is about 16,800 kg/sec. This is about 11,000 times the load of salt expected to be discharged from the Project; thus any increase in salinity in the receiving waters of the Sacramento River and Montezuma Slough would be insignificant.

Impact P-WQ-3: Some increase in salinity of the receiving waters of the Sacramento River and Montezuma Slough could be expected from salts leached from dredged materials in the wetland cells. (County-LS, Corps-LS)

Once tidal action is introduced to the wetland cells, some salt can be expected to leach from the dredged materials. Because the hydraulic conductivity of the placed sediment would be relatively low, the volume of material subject to leaching would amount to only about 5 percent of the total placed volume.[23] The daily load of salt that could leach from the material due to tidal action would be less than the amount released in the decant water, and it would decrease rapidly (within a few days) after the introduction of tidal action.

This increase in salinity would not be a significant impact and no mitigation is required.

Impact P-WQ-4: The change in circulation and increased tidal prism in the restored wetlands could slightly decrease salinity in the Montezuma Slough. (County-LS, Corps-LS)

Tidal flows, in combination with the operation of the Montezuma Salinity Control Structure, result in a net transport of low-salinity water from the Sacramento River into Montezuma Slough. Opening the Project

21 Williams 1988

22 Based on DWR data cited by Crapuchettes and Crapuchettes 1992

23 Levine-Fricke 1993e

area to tidal action would increase the flow of tidal water up Montezuma Slough. To evaluate the effect of increased circulation on salinity, the Applicant used the model HYDSAL, designed for modeling tidal circulation and salinity in Suisun Marsh. The modeling results show that the salinity in Montezuma Slough would decrease slightly. This is because the increased tidal prism would pull more water from the southern end of the Slough near the Sacramento River, through the Montezuma Salinity Control Structure.

This is a less-than-significant impact; no mitigation is required.

Groundwater Quality and Quantity

Potential impacts to groundwater include (1) the potential depletion of water supplies available to neighboring domestic wells due to the drawdown effects of pumping large amounts of shallow groundwater by the project proponent; and (2) potential degradation of groundwater quality from the disposal of dredged sediments containing known contaminants, leading to the potential degradation of the quality of neighboring domestic water supplies.

Impact P-GW-1: The Project's withdrawal of shallow groundwater on the site could reduce groundwater supplies for residents east of the site. (County-S, Corps-S)

The Project approach to pump shallow groundwater from the sands located adjacent to the Sacramento River was designed to minimize this potential impact. The proposed groundwater supply system (GWSS) is a network of large diameter, shallow wells (not yet installed) located in the southern portion of the site, adjacent to the Sacramento River. The targeted zone for extraction would be shallow groundwater between approximately 20 and 40 feet below ground surface (bgs), which is at least 30 feet above the deep groundwater aquifer (see Section 6.7.1.1) which is utilized by neighboring domestic wells located east of the Montezuma site. Lithologic data from soil borings in the south and southwest portions of the site, as well as a correlation between tidal fluctuations and water levels in shallow on-site wells, indicate that the extraction zone is hydraulically connected to the Sacramento River and Montezuma Slough. This sandy shallow zone is separated from the deeper groundwater by silty and clayey sands with lower hydraulic conductivities (i.e., permeability) than the extraction zone.

An estimated total water demand of 5 million gallons per day will be necessary to slurry the sediments for subsequent placement in the disposal cells. Most of this water will be reused; new water will be pumped from shallow groundwater in the southern portion of the site to replace losses from evaporation and incidental losses. With storage and reuse of water on site, the estimated peak groundwater demand could exceed 2,000 gallons per minute. Existing evidence suggests that the shallow and deeper aquifers are hydraulically separated, but this has not yet been conclusively demonstrated. If there is some hydraulic connectivity between the shallow aquifer and the deeper aquifer, pumping the shallow groundwater at this high flow rate could draw water from the deeper zones, potentially impacting the water levels in the nearby supply wells. The following measure is intended to mitigate this potential impact.

> Mitigation Measure P-GW-1: Prior to receiving Corps §404 and §10 permits and County use permits, the Applicant shall submit the results of pump tests, supported by data from piezometers and neighboring wells confirming that the Project's withdrawal of groundwater will not affect neighboring wells. The Applicant shall also monitor water levels in local supply wells during the start-up and first month of operation of the GWSS. If water levels are reduced in local wells, the Applicant shall implement one or more of the following measures as necessary to avoid reducing water supplies in neighboring wells: reduce the rate of groundwater pumping; increase on-site water storage capacity; modify well locations or the

groundwater extraction system; or provide the affected neighbors with alternative water sources. (LS)

Impact P-GW-2: The Project could cause localized increases in contaminant concentrations in shallow brackish groundwater on the site, but it is extremely unlikely that the deeper aquifer would be affected (County LS, Corps LS).

There are concerns regarding the potential water quality impacts to shallow and deep water supply aquifers. The potential impact from placed dredged sediments leaching contaminants into surface water was discussed above under Impact P-WQ-1, and was determined to be a less-than-significant impact with Mitigation Measure P-WQ-1. As discussed previously, a shallow brackish aquifer occurs beneath the site at variable depths beginning within a few feet of the surface, while a deeper freshwater aquifer occurs at a depth of approximately 70 feet or more. The potential for contaminants in the sediments to leach into shallow and deeper groundwater is low at the site for several reasons: 1) all sediments proposed for use at the site would have passed leachability tests prior to approval for disposal at the site by the regulatory agencies; 2) fine-grained surface and shallow sediments have very low vertical permeabilities; 3) fine-grained surface and shallow sediments would promote the attenuation (i.e., absorption and binding) of soluble contaminants; and 4) the lack of available oxygen within the saturated sediment layers will promote anaerobic conditions that immobilize metals as sulfides. The two orders of magnitude difference in TDS between the shallow groundwater and the deeper groundwater aquifer cited previously in section 6.7.1.1 shows that the existing subsurface geology can inhibit the migration of contaminants into the deeper groundwater aquifer.

The salt water entrained in the sediments is not expected to significantly impact the shallow groundwater at the site due to the already brackish composition of this water. The water added to slurry the sediments would tend to dilute the more saline water within the sediments as well. Even in the event that the pumping test described above determines a hydraulic connection between shallow groundwater and the deeper fresh water aquifer in the southern portion of the site, the upward hydraulic gradient between the deeper water producing zone and the shallow groundwater would prevent downward migration of the shallow groundwater.

As noted previously, low-permeability soils on the site would inhibit the downward migration of contaminants. The non-cover separation levees that surround non-cover sediment provide an additional sediment filter that would trap contaminants and inhibit their horizontal migration in subsurface water. Finally, saturated, anaerobic or reducing conditions will be established within sediment placement cells, reducing the solubility of contaminants in the dredged materials. Other site factors that will attenuate potential leachate include: high levels of soil organic matter from the peat in the on-site soils would provide a high capacity for adsorbing (e.g., physically binding) contaminants; clay in the dredged sediment and on-site soils would provide additional surfaces for adsorption of contaminants; high cation exchange capacity within clays (i.e., montmorillonite) known to be prevalent in Bay sediments would also tend to immobilize contaminants; and metal-sulfide precipitation under anaerobic conditions[24] would also occur.

As added assurance that water quality in groundwater would not be affected by the disposal of dredged material at the site, the Applicant is proposing to sample the local supply wells of concerned owners prior to and during project implementation. Water quality in the wells that is currently meeting federal and state

24 Levine-Fricke 1991

drinking water quality standards would continue to meet these standards for the duration of the Project, or an alternative supply would be provided by the Applicant.

Based on the above discussion and with implementation of Mitigation Measures P-WQ-1 and P-GW-1, the potential for contamination of groundwater is a less than significant impact; no further mitigation is required.

6.7.2.2 Alternative 1: Managed Wetlands

Under the diked managed wetland alternative, the restored wetlands would be managed with either seasonal or year-round flooding. By careful manipulation of the hydraulic regime, an artificial mosaic of wetland vegetation would be created. Water levels would be managed in this manner through a series of tide gates, pumps, and weirs. Most of Suisun Marsh is presently managed. The operation of the gates and pumps could be modified to change the vegetation.

Surface Water Hydrology and Geomorphology

Because there would be no tidal energy to scour new channels, the channels would have to be formed before material is placed, or excavated after dewatering. Channels could be smaller than for the Proposed Project. This alternative would not have significant effects on the tidal prism of Montezuma Slough. The marsh plain elevation would not be critical with the managed wetland alternative, since water levels would be controlled by gates and pumps. In other respects, this alternative would be similar to the Proposed Project.

Surface Water Quality

Impacts P-WQ-1 through P-WQ-3 and corresponding mitigation measures discussed in the previous section would also apply to this alternative. Impact P-WQ-4 would not apply to this alternative.

Groundwater Quality and Quantity

Assuming that the water supply and demand for this alternative would be similar to that of the Proposed Project, impacts P-GW-1 and P-GW-2 and corresponding mitigation measures previously would be applicable as well to this alternative.

6.7.2.3 Alternative 2: Combined Wetlands

The combined wetlands alternative would involve a combination of the fully tidal regime and the diked management scheme. As a result, all impacts and corresponding mitigation measures described previously for the Proposed Project would apply to this alternative as well.

6.7.2.4 Alternative 3: The Bel Marin Keys Site

Surface Water Hydrology and Geomorphology

Impacts P-HYDRO-3 through P-HYDRO-5 and corresponding mitigation measures discussed previously for the Proposed Project would apply to this alternative as well. In place of Proposed Project impacts P-HYDRO-1 and P-HYDRO-2, the following are specific to this alternative.

Impact 3-HYDRO-1: The Phase II levee breach could cause the enlargement of the channel of Novato Creek, and the Phase I breach would cause a new channel to form across the mud flat. (County-LS, Corps-LS)

The hydraulic effects of the new tidal prism would depend on where the slough channel openings are placed. In Phase I, the levee would be breached at the San Pablo Bay shoreline and, in Phase II, at Novato Creek. The tidal prism for Novato Creek would increase, which would cause channel scour and enlargement between the levee breach and San Pablo Bay, an effect advantageous for both navigation and flood control. The direct breach to San Pablo Bay would cause scouring of a new channel, the size of which would depend on the tidal prism formed by dredged materials placement. No mitigation would be require for this impact.

Impact 3-HYDRO-2: Wetlands restoration would reduce the flood storage capacity of the area. (County-S, Corps-S)

The flood storage capacity of the site would be reduced by this alternative. If the area were restored to an elevation that would support pickleweed, the flood storage capacity could be reduced by about 35 percent. A new flood control channel could be constructed to offset flooding impacts, but this in itself could have significant impacts to both seasonal and tidal wetlands.

> Mitigation Measure 3-HYDRO-2: A new channel could be constructed to offset any flooding impact. The implications of reducing the basin capacity for flood storage should be carefully determined by hydraulic modeling. The environmental impacts of excavating a new flood control channel would require more detailed evaluation. (LS)

Surface Water Quality

Impacts P-WQ-1, through P-WQ-4 and corresponding mitigation measures described previously for the Proposed Project are specific to the Montezuma site and would not apply to this alternative. The following impacts are specific to this alternative.

Impact 3-WQ-1: There may be an increase in the concentration of contaminants in water in the make-up water pond, which, if discharged to San Pablo Bay, would violate water quality standards. (County-S, Corps-S)

In most respects, water management procedures would be the same for this alternative as for the Proposed Project, leading to similar risks of increasing contaminant concentrations in the make-up water pond. Please refer to the preceding discussion under P-WQ-1 for details. In contrast to the Proposed Project, however, this alternative site is not immediately adjacent to deep water. To discharge excess water from the make-up water pond, this alternative would either have to meet shallow water discharge criteria, which are much more stringent than deep-water discharge criteria (Table 6.7-1), or construct a discharge pipeline extending several miles offshore into the deep waters of the Bay. This is reflected in the following mitigation measure.

> Mitigation Measure 3-WQ-1: To mitigate potential impacts related to discharges from the make-up water pond into the shallow waters of San Pablo Bay, a water discharge pipeline could be constructed, allowing discharge into deeper waters farther offshore. If this is not feasible, and in any case, operations should be managed as necessary to meet applicable

discharge criteria. All mitigation measures included under P-WQ-1 for the Proposed Project would also be required for this alternative.

Impact 3-WQ-2: Construction and operation of the off-loading facility and pipeline would locally increase suspended sediment concentrations in San Pablo Bay. (County-LS, Corps-LS)

San Pablo Bay already has very high concentrations of suspended sediment, especially during windy periods. The increase due to construction and operation would not be significant. No mitigation would be required.

Groundwater Quality and Quantity

The anticipated water supply for this alternative would be surface waters of San Pablo Bay. Therefore, there would be no impact to the water supply of domestic wells in the area.

6.7.2.5 Alternative 4: The Hamilton Site

Surface Water Hydrology and Geomorphology

Impacts P-HYDRO-3 through P-HYDRO-5 and corresponding mitigation measures discussed previously for the Proposed Project would apply to this alternative as well. In place of Proposed Project impacts P-HYDRO-1 and P-HYDRO-2, the following are specific to this alternative.

Impact 4-HYDRO-1: The levee breaches would cause scour of channels through the existing marsh and across the mud flat. Some existing pickleweed marsh would be lost in the short term. (County-LS, Corps-LS)

This is considered a less-than-significant impact, since the eroded marsh would rapidly be replaced by a much greater area of marsh. No mitigation is necessary.

Impact 4-HYDRO-2: Filling of Hamilton Airfield with dredged material could affect management of Ignacio Pond for flood control. (County-S, Corps-S)

Construction of a wetlands at this location would require a breach or breaches in the levee at San Pablo Bay. Dikes would be constructed where necessary to protect adjacent development. The runway area can presently receive overflow from Ignacio Pond during large floods. If that area were restored to tidal action, it would no longer be available to receive runoff. The flood control implications of the loss of detention storage have not been quantified, but the following measure should be sufficient to mitigate a reasonable worst-case impact.

> Mitigation Measure 4-HYDRO-2: If necessary to provide continuing flood protection for adjacent property, the wetland restoration design for this site shall be modified to incorporate an area of diked, managed marsh that can, in emergency conditions, provide additional floodwater storage. (LS)

Surface Water Quality

Impacts P-WQ-1, through P-WQ-4 and corresponding mitigation measures described previously for the Proposed Project are specific to the Montezuma site and would not apply to this alternative. The following impacts are specific to this alternative.

Impact 4-WQ-1: There may be an increase in the concentration of contaminants in water in the make-up water pond, which, if discharged to San Pablo Bay, would violate water quality standards. (County-S, Corps-S)

In most respects, water management procedures would be the same for this alternative as for the Proposed Project, leading to similar risks of increasing contaminant concentrations in the make-up water pond. Please refer to the preceding discussion under P-WQ-1 for details. In contrast to the Proposed Project, however, this alternative site is not immediately adjacent to deep water. To discharge excess water from the make-up water pond, this alternative would either have to meet shallow water discharge criteria, which are much more stringent than deep-water discharge criteria (Table 6.7-1), or construct a discharge pipeline extending several miles offshore into the deep waters of the Bay. This is reflected in the following mitigation measure.

> Mitigation Measure 4-WQ-1: To mitigate potential impacts related to discharges from the make-up water pond into the shallow waters of San Pablo Bay, a water discharge pipeline could be constructed, allowing discharge into deeper waters farther offshore. If this is not feasible, and in any case, operations should be managed as necessary to meet applicable discharge criteria. All mitigation measures included under P-WQ-1 for the Proposed Project would also be required for this alternative.

Impact 4-WQ-2: Construction and operation of the off-loading facility and pipeline would locally increase suspended sediment concentrations in San Pablo Bay. (County-LS, Corps-LS)

San Pablo Bay already has very high concentrations of suspended sediment, especially during windy periods. The increase due to construction and operation would not be significant. No mitigation would be required.

Groundwater Quality and Quantity

The anticipated water supply for this alternative would be surface waters of San Pablo Bay. Therefore, there would be no impact to the water supply of domestic wells in the area.

6.7.2.6 No-Project Alternative

The No-Project Alternative would have no short-term hydrological or water quality impacts. Water quality and hydrological conditions could remain unchanged for many years. Ultimately, however, the levees along Montezuma Slough could fail, restoring the area to tidal action. Without placed dredged material, the area would become an open-water embayment. It would take many years for the site to develop into a productive wetland.

6.7.2.7 Cumulative Impacts

Cumulative impacts for the Proposed Project and project alternatives would generally be similar. The total amount of water surface area that would be covered by filling of the Bay would increase with implementation of marsh restoration projects. In addition, tidal action and tidal prisms would change with the alteration of the Bay's shoreline and tidal systems. However, these impacts are not expected to significantly affect the quality of the hydrologic environment with proper implementation of site specific mitigation.

Since hydrology and flooding impacts are generally related to site-specific conditions, no impacts would occur through the cumulative development of marsh restoration projects. Mitigation of site-specific hydrological impacts would eliminate the potential for hydrological impacts from cumulative development.

6.8 Biological Resources

6.8.1 Environmental Setting

The Montezuma site is within the Suisun Marsh system, which is generally located adjacent to the mixing zone of the Sacramento-San Joaquin rivers and the San Francisco Bay estuary. The geographic boundaries of the Suisun Marsh system, for the purposes of this discussion, extend from Fairfield and Denverton on the north, Sherman Island on the east, Morrow Island on the west, and the Sacramento River on the south (as shown in Figure 4.1-1).

The Suisun Marsh system is one of the largest contiguous brackish marsh areas remaining in the United States and represents approximately 12 percent of California's remaining wetland habitat. The system has been substantially modified by levee construction and agricultural and industrial development over the last century. In fact, the San Francisco Bay estuary, including the Suisun Marsh system, has lost more than 90 percent of its natural tidal marsh to filling and diking for agriculture, development, salt production, and managed wetland habitat. The original extent of tidal marsh in the Suisun Marsh system was 112 square miles. Currently there are 22 square miles of tidal marsh and 75 square miles of diked marsh. This conversion has resulted in loss of valuable wildlife habitat and ecological functions and values associated with natural tidal wetlands.

Of the 84,000 acres of land and water which make up the Suisun Marsh, approximately 52,000 acres are wetlands managed to provide wintering habitat for migratory ducks and geese and other resident and migratory species such as the northern harrier; 15,000 acres are managed by the state and 37,000 acres are operated by 150 privately owned duck clubs. The managed seasonal wetlands[1] in the Suisun Marsh system are generally flooded during the winter months and drained during the summer. Various water management regimes are used to promote different plant assemblages, including those dominated by pickleweed (*Salicornia virginica*), alkali bulrush (*Scirpus robustus*), or brass buttons (*Cotula coronopifolia*).There are also 6,300 acres of unmanaged tidal wetlands within the Suisun Marsh. The tidal marshes surrounding the Suisun Marsh system diked wetlands are typically narrow fringes of wetlands which either border the Bay or are found along tidal channels and sloughs throughout the managed marsh region. Plant communities are highly variable, depending on location within the Suisun Marsh system. Salinity, hydrological regime (diked or tidal), marsh age, elevation and other factors contribute to a highly diverse mosaic of plant communities within this system.

The Suisun Marsh system provides habitat for approximately 200 species of birds, 45 species of mammals, and 36 species of reptiles and amphibians, including numerous state and federally listed, candidate and other special status species. These species are described more thoroughly in Section 6.8.2.1. The following sections describe the regulatory definitions for special status plants and wildlife, as well at wetlands. A detailed discussion of regulatory requirements for these is included in Appendix H.

1 The term "seasonal wetlands," as used in this EIR/EIS, refers to wetlands which are wet in winter and spring or early summer, and are dry in summer to early fall. They are distinct from tidal wetlands, which are subject to periodic ebb and flow of tidal waters rather than seasonal rainfall.

6.8.1.1 Special Status Plants

Special status plant species consist of plants listed by the federal government as threatened or endangered, and/or by the state Department of Fish and Game (CDFG) as rare, threatened or endangered;[2] federal candidates which are currently under consideration for listing as threatened or endangered;[3] federal Species of Concern (former candidate species); or plants included in any of four categories of sensitivity developed by the California Native Plant Society (CNPS).[4] Plants on the CNPS List 1B are considered rare and endangered in California. Those on the remaining CNPS lists do not have the same degree of rarity and vulnerability. These lists include: List 2 (plants rare in California, but common elsewhere), List 3 (plants about which more information is needed), and List 4 (plants of limited distribution — a watch list). In this chapter, plant species are also considered that qualify under the definition of "rare" in the California Environmental Quality Act, Section 15380.

6.8.1.2 Special Status Wildlife

Special status animal species consist of state and federally listed species, federal candidates for listing, federal Species of Concern, and CDFG California Species of Special Concern. Listed species include those designated by the federal and/or state governments as threatened or endangered.[5] Federal candidates include species which are currently under consideration for federal listing as threatened or endangered. Federal Species of Concern include former candidates. California Species of Special Concern are those included on the list of regionally declining wildlife including those for birds,[6] reptiles and amphibians,[7] and mammals.[8] In addition, bird species that have experienced serious population declines are included on the National Audubon Society Blue List.[9]

6.8.2 Affected Environment

6.8.2.1 The Montezuma Site

The Montezuma Site comprises many of the habitats common throughout Suisun Marsh, including managed seasonal wetlands characterized largely by pickleweed, and limited fringes of tidal marsh, dominated by tules and cattails. The majority of the site supports peaty soils. As the site is located at the

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2 California Department of Fish and Game, Natural Heritage Division, Natural Diversity Database. 1995. Special Plants List. October.

3 USFWS (U.S. Fish and Wildlife Service). 1996. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species; Notice of Review. *Federal Register*, February 28.

4 Skinner, M.W. and B.M. Pavlik. 1994. Inventory of Rare and Endangered Vascular Plants of California. California Native Plant Society Special Publication No. 1 (Fifth Edition).

5 California Department of Fish and Game (CDFG). 1996. Endangered and Threatened Animals of California. The Resources Agency, Department of Fish and Game. Revised April.

6 Rensen, J.V. 1978. Bird Species of Special Concern in California. An annotated list of declining or vulnerable bird species. Federal aid in wildlife restoration, Project PR 2-54-4-9, Nongame Wildlife Investigations. Report 78-1.

7 Jennings, M. 1983. An annotated checklist of the amphibians and reptiles of California. *California Fish and Game Bulletin* 69(3):151-171.

8 Williams, D.F. 1986. Mammalian species of special concern in California. California Department of Fish and Game, Wildlife Management Division, Administrative Report 86-1. June.

9 National Audubon Society. *American Birds*. 1986. Volume 40.

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southeastern edge of Suisun Bay, and the intrusion of saline waters diminishes with distance from San Francisco Bay, conditions are somewhat fresher than those found through the majority of Suisun Marsh. Dominant tidal marsh plants in the vicinity include tules (*Scripus* spp.) and cattails (*Typha* spp.) in the low intertidal zone. High marsh communities in natural tidal wetlands in the project vicinity support a variety of plant species; pickleweed (*Salicornia virginica*) is present though rarely dominant. At Rush Ranch (8 miles northwest of the Montezuma site), for example, a mixed high marsh community is present in which any one of a number of species, including pickleweed, saltgrass (*Distichilis spicata*), common rush (*Juncus balticus*), arrow grass (*Triglochin* spp.), celery (*Apium graveolens*), cinquefoil (*Potentilla anserina*), jaumea (*Jaumea carnosa*), alkali heath (*Frankenia salina*), fat hen (*Atriplex triangularis*), and pepperweed (*Lepidium latifolium*) may be locally dominant.

Some habitats on the site, while highly disturbed and degraded, provide high seasonal wetland habitat values for waterfowl and shorebirds, primarily in the saline basins scattered over the site. The pickleweed wetlands onsite also provide habitat for the endangered salt marsh harvest mouse (SMHM). Numerous special status bird species have been observed on the site. Little is known of amphibian and reptilian use of the area, but western pond turtles and Pacific treefrogs are known to occur in the ponded habitats. Some limited portions of the seasonally ponded areas (0.39 acre) support vernal pool fairy shrimp, a federally listed threatened species. The highest proportion of native plant species and species diversity occurs in the habitat patches peripheral to the site. No legally protected plant species are known to occur within the area proposed for dredged material disposal, although there are some sensitive plant species that are not legally protected. Between the Project boundary and the area proposed for placement of dredged material are several alkali vernal pools and sensitive plant species. Vegetation and wildlife resources of the site are described in detail below.

Vegetation[10]

The Project site supports plant species that are affiliated with a variety of plant communities including freshwater marsh, salt marsh, brackish marsh, wet pasture, and vernal pools. A total of 301 plant species, subspecies, and varieties representing 58 families were identified on the Project site. Approximately half of the plants identified were native species, including a large number of freshwater wetland species some of which are associated with vernal pools.

- Survey results identified vegetation and habitat types corresponding to map units that were identified based on visual interpretation of the dominant cover at the site. In total, a complex mosaic of 23 vegetation patch types were identified. Descriptions of these patch types along with a species list are found in Appendix J. It is interesting to note that between a drought and non-drought year approximately 40 additional species were observed.

The original habitat maps were based on June 1990 color infrared (IR) aerial photography, with ground-truthing of patch types during 1991-92. Since that time, a succession of relatively wet years has occurred, resulting in seasonal ponding of greater extent and duration than occurred during the early 1990s. To address these changes, additional color IR aerial photographs of the site were taken during April 1996 and

10 The following existing setting description is based on a patch-type analysis of the site conducted by the Project Applicant in 1992. The assessment of existing vegetation conditions on the Project Site is based primarily on documentation provided by Levine-Fricke (1992), including plant surveys conducted by Jake Ruygt (Napa Botanical Surveys), and on discussions with resource agency personnel, reviews of published and unpublished literature and documents, and site visits.

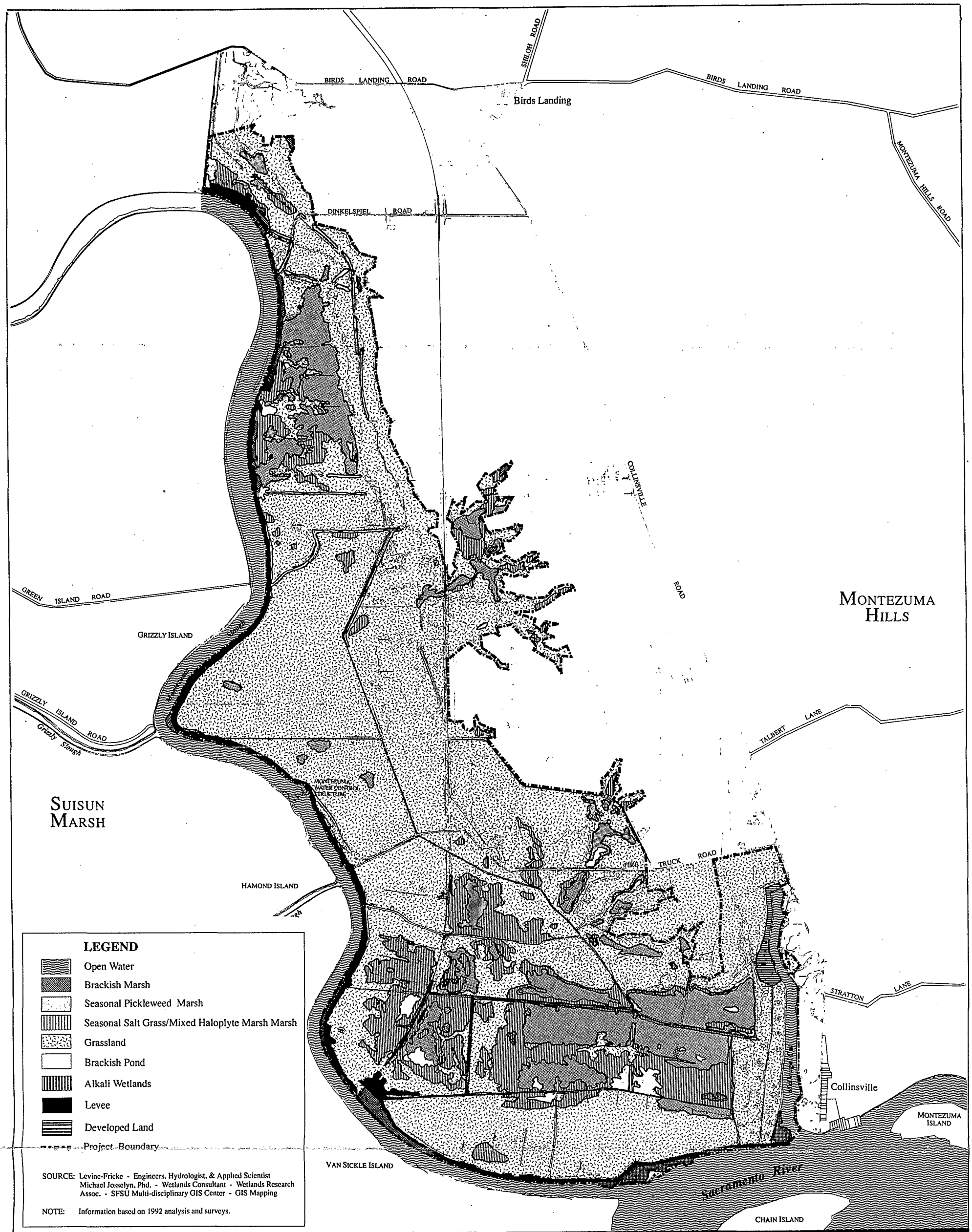
analyzed for this Final EIR/EIS (Appendix J). In general, the new map and characterizations validate the original characterization of patch types, which took into account seasonal and potential between-year variations in rainfall. The Final EIR/EIS vegetation description of necessity combines a number of patch types (see below), and this results in some apparent discrepancies with the 1996 map, as noted in Appendix J. Too a large extent, however, these discrepancies (noted in Appendix J) are artifacts of the mapping processes rather than significant changes in the actual distribution of vegetation types.

HABITAT AREAS. For purposes of this discussion the 23 vegetation and habitat types that were identified in 1992 were subjectively classified into eight general vegetation types, as shown in Figure 6.8-1. Table 6.8.2-1 shows the acreages by vegetation type found on the Project site. The acreage and distribution of vegetation types are not stable. Seasonal wetland vegetation behind dikes varies significantly among years, depending on rainfall (Appendix J). Vegetation types are described as follows:

Table 6.8.2-1
Montezuma Site: Existing Vegetation Types and Acreage[11]

Vegetation Type	Acreage
Open Water	50
Brackish Marsh	30
Seasonal Pickleweed Marsh	290
Seasonal Salt Grass/Mixed Halophyte Marsh	282
Grassland	1,690
Brackish Pond	21
Alkali Wetlands (Vernal Pool)	5
Levee	55
Developed Land	10
Total	2,433

11 Mapping and acreage calculations were done by Wetlands Research Associates as part of the DEIR/S analysis. Figure 6.8-1 and Table 6.8.2-1 include an area of open water in McDougal Cut that is outside of the Project boundary, resulting in a greater acreage of open water and greater total acreage than is actually proposed. At one time, Project-related dredging and use of McDougal Cut were considered, but this is no longer the case.



Source: Brady and Associates (1994)

MONTEZUMA WETLANDS
PROJECT
EIR EIS

Figure 6.8-1

Montezuma Site: Existing Vegetation

N

0' 800' 1600' 3200'

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- *Open Water.* Most of the open water classification consists of tidal waters of McDougal Cut that would not be directly affected by the Project. Within the Project site, it includes the larger drainage ditches with narrow zones of small patch types paralleling the ditch bank. The dominant species associated with open water include brackish emergent vegetation and halophytes. Cattails (*Typha* spp.) and tules (*Scirpus acutus*) have colonized the ditches where the water is less saline. These areas are flooded most of the time.
- *Brackish Marsh.* The brackish marsh covers about 30 acres subject to regular tidal inundation on the Project site perimeter. It includes the emergent tidal assemblage and the reed habitat areas of the original habitat survey. The brackish marsh is the most species-rich habitat of the site, with approximately 30 percent of the total plant species recorded for the Project area, including habitat for Mason's lilaeopsis, a State-listed rare species.
- *Seasonal Pickleweed Marsh.* The seasonal pickleweed classification accounts for approximately 290 acres of the site. This habitat type includes seasonally ponded areas of pickleweed and (upon drying) bare ground. These habitats and those of the following category were subject to prolonged inundation during the 1994-95 and 1995-96 rainy seasons. Most were classified as either "brackish pond" or "seasonal salt marsh" in the 1996 re-evaluation (Appendix J).
- *Grasslands.* Grasslands account for two-thirds of the Project site. The grasslands include introduced grassland, introduced grassland/bare ground, bare ground/introduced salt-tolerant annuals, and wild barley/star thistle/spearscale. These areas are temporarily to seasonally saturated or inundated, depending on rainfall. In the April 1996 re-evaluation, approximately 200 acres of this habitat type were found to be ponded or bare ground (Appendix J).
- *Brackish Pond.* Brackish ponds, also referred to as saline basins, are seasonally inundated. They are fresh to brackish when fully inundated during winter-spring, but the ponded area shrinks and becomes increasingly saline during the summer. They are essentially unvegetated and surrounded by pickleweed (*Salicornia* spp.), above which is a ring of perennial halophytes which grades to grassland. These saline basins expand or contract depending on ponding caused by annual rainfall, as do the concentric rings of pickleweed and halophytic vegetation surrounding them. The pickleweed is densest and tallest in the southwest corner of the site near the Jerico Towing Company facility. This area also has the highest densities of salt marsh harvest mice (SMHM).
- *Alkali Wetlands.* Small alkali wetlands account for 5 acres of the site along the eastern upland edge. These wetlands mostly occur above the elevations proposed for wetland restoration and include areas described in site surveys as alkali vernal pools.

In addition, the site includes areas of levees and developed land. These areas do not have significant vegetative cover.

CORPS JURISDICTIONAL DETERMINATION. A Section 404 jurisdictional determination has been completed for the Project site (see map in Appendix N). Approximately 1,620 acres within the wetland restoration area and another 14 acres within the area to be filled to create the rehandling facility are classified as wetlands and "other waters" subject to Corps of Engineers' jurisdiction under Section 404 of the Clean Water Act. Table 6.8.2-2 shows the acreage of these jurisdictional areas in each of the Proposed Project phases. Wetland jurisdiction is a legal boundary, not an ecological classification of vegetation or habitat types. Based on extensive field observations, wetlands and other jurisdictional waters do prevail over the area delineated.

Table 6.8.2-2
Montezuma Site: Acreage of 404 Jurisdictional Area
(Revised August 5, 1993)[a]

Phase	Total	Uplands (Acres)		404 Jurisdictional Wetlands and Other Waters (Acres)	
		Total Within Phase[b]	Within Limits of Fill for Wetlands	Total Within Phase	Within Limits of Fill for Wetlands
I	786	62	34	724	576
II	438	100	63	337	334
III	357	110	39	247	205
IV	647	124	64	523	504
Water Related Industry	165	148	—	16	14
Totals	2,394	544	202	1,849[c]	1,634

a Revision to the table reflects a shift of 19.8 acres of jurisdictional wetlands from Water Related Industry to Phase IV. This acreage supports SMHM habitat. See Appendix N for further information.

b Delineated wetlands within Water Related Industry.

c The "total within phase" represents all acreage within the Project boundary (Montezuma Slough/Sacramento River to the +10-foot NGVD contour line) for each phase. A total of 22.9 acres of jurisdictional wetlands are located in the area above wetlands design elevations and below the +10-foot NGVD boundary. There would be no fill placed in these areas.

Source: Levine-Fricke.

SPECIAL STATUS PLANTS. Botanical surveys of the Project site were conducted by J. Rugyt (Napa Botanical Survey Services) during April through September 1991 and during March and April 1993 (Levine-Fricke 1992a, 1993). The surveys were floristic in nature and consistent with CNPS guidelines for assessing impacts on rare plants (Skinner and Pavlik 1994). Table 6.8.2-3 lists the sensitive plant species that were observed on the Project site and those that were surveyed for, but not found. No federally listed or proposed species were encountered. Mason's lilaeopsis was the only legally protected special status species found on the Project site. This species is found along the exterior side of the perimeter levee of Phases I, II and IV, outside the area where dredged materials would be placed.

Thirteen other special status species are found on or adjacent to the site that are not legally protected, as summarized in Table 6.8.2-3. Three of these species are outside the Project boundary:

- downingia (*Downingia humilis*)
- fritillary (*Fritillaria liliacea*)
- Carquinez goldenbush (*Isocoma arguta*).

Two other species occur within the project boundary but outside of the wetland restoration :

- alkali milk-vetch (*Astragalus tener* var. *tener)*
- San Joaquin saltbush (*Atriplex joaquiniana*)

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The occurrence of alkali milk-vetch on the property is noteworthy as it is known from only one other location in the region (Fiedler and Zebell 1995 [Appendix Q.3]). Dwarf peppergrass (*Lepidium latipes* var. *latipes*) occurs in several lowland areas in Phase I and Phase II and in the adjacent uplands. Dwarf peppergrass on the site consists of the common variety (personal communication, J. Rugyt), which is no longer considered a sensitive plant (Skinner and Pavlik 1994). One northern California black walnut (*Juglans hindsii*) occurs along the southern perimeter levee.

Six of the other special status, but not legally protected, plants were found in the intertidal zone:

- heart-leaved saltbush (*Atriplex cordulata*)
- delta tule pea (*Lathyrus jepsonii* ssp. *jepsonii*)
- Suisun marsh aster (*Aster lentus*)
- limosella (*Limosella subulata*)
- Parish's saltbush (*Atriplex depressa*)
- salt marsh gumplant (*Grindelia stricta* var. *angustifolia*).

Wildlife

Wildlife species and their associated habitats are discussed below.

BIRDS. Appendix I lists the bird species observed at the site during bird surveys conducted in 1991 and 1992 and groups the observed species within habitat areas in which birds were observed. Appendix I also *Federally Listed and Proposed Species*. Two state and federally listed endangered bird species may occur in the project vicinity: the bald eagle (*Haliaeetus leucocephalus*) and American peregrine falcon (*Falco peregrinus anatum*). Neither species is known or expected to occur on the Project site at present (Appendix I), although transient occurrence is possible. The California clapper rail (*Rallus longirostris obsoletus*), also state and federally listed as endangered, is not known to occur this far east, or expected to occur in the project vicinity due to the species' association with fully tidal marshes that are more saline and are better developed, including adjacent high marsh and upland-transition habitats, than occur in the eastern Suisun Marsh-Collinsville area.

Bird Habitat Groups. Although there are large differences in the acreages of the habitat areas, overall annual use was roughly uniform. The data indicate that the relatively small aquatic and palustrine (marsh) habitat areas supported considerably higher densities and species per unit area than the larger mixed-halophyte and grassland or upland areas. For the purposes of this discussion, birds are divided into three broad categories: terrestrial birds, aquatic birds, and palustrine birds. Of these, over half of the birds were migrants.

Terrestrial Birds. Terrestrial birds are those birds whose habitat is primarily on land. Of the birds observed on the site, 53 percent were terrestrial, or landbirds. The most diverse assemblage of landbirds were found in the emergent tidal ecotone and levee boundary thickets. These habitats support resident populations and provide important migratory and dispersal corridors.[12] Common breeding landbirds are horned lark, western meadowlark, and savannah sparrow. In addition, ten species of diurnal raptors and three species of owls were observed on the avian surveys. The most common diurnal raptors were white-tailed kites (*Elanus caeruleus*), northern harriers (*Circus cyaneus*), and American kestrels (*Falco* spp.) includes additional survey data from 1995 and 1996. The bird habitat areas are shown in Figure 6.8-2.

12 Levine-Fricke 1992.

Table 6.8.2-3
MONTEZUMA SITE: SPECIAL STATUS PLANT SPECIES THAT OCCUR OR POTENTIALLY OCCUR
(page 1 of 3)

Scientific Name	Common Name	Status	Notes
Aster lentus	Suisun marsh aster	FSC; CNPS 1B	Two individuals were discovered in two separate locations in the saturated intertidal zone on the outside slope of the Sacramento River levee at the southern boundary of the site.
Astragalus tener var. *ferrisiae*	Ferris' milkvetch	CNPS 1B	Searched for but not found during rare plant surveys.
Astragalus tener var. *tener*	alkali milkvetch	CNPS 1B	650 plants found in 4 locations around one alkali vernal pool.
Atriplex cordulata	heart-leaved saltbush	FSC; CNPS 1B	A single individual was discovered in the intertidal zone on the outside slope of the Montezuma Slough, near the Montezuma Salinity Control Structure.
Atriplex joaquiniana	San Joaquin saltbush	FSC; CNPS 1B	A few individuals were located on disturbed ground adjacent to Fire Truck Road near the Day Use Area.
Atriplex depressa	Parish's saltbush	FSC; CNPS 1B	A small colony was located on the intertidal mudflat at the base of the outside bank of the levee of the Sacramento River, at the southern boundary of the site.
Cirsium hydrophilum var. *hydrophilum*	Suisun thistle	Fed E; CNPS 1B	Not found during rare plant surveys or expected onsite under current conditions. Occurs in Suisun Marsh brackish tidal marshes.
Cordylanthus mollis ssp. *hispidus*	hispid bird's-beak	FSC; CNPS 1B	Not found during rare plant surveys or expected onsite.
Cordylanthus mollis ssp. *mollis*	soft bird's-beak	Fed E; State R; CNPS 1B	Not found during rare plant surveys or expected onsite under current conditions. Occurs in Suisun Marsh brackish tidal marshes.
Cordylanthus palmatus	Ferris' bird's-beak	Fed E; State E; CNPS 1B	Not found during rare plant surveys or expected onsite.
Delphinium recurvatum	recurved larkspur	CNPS 1B	Not found during rare plant surveys.
Downingia pusilla	dwarf downingia	CNPS 2	Found in scattered vernal pools outside Project boundary.
Eleocharis parvula	small spikerush	CNPS 4	Found in intertidal zone along Montezuma Slough.
Fritillaria liliacea	fragrant fritillary	FSC; CNPS 1B	Sparsely distributed at the 10-20 foot contour outside the Project boundary.
Gratiola heterosepala	Bogg's lake hedge-hyssop	FSC; State E; CNPS 1B	Not found during rare plant surveys or expected onsite.

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Table 6.8.2-3
MONTEZUMA SITE: SPECIAL STATUS PLANT SPECIES THAT OCCUR OR POTENTIALLY OCCUR
(page 2 of 3)

Scientific Name	Common Name	Status	Notes
Grindelia stricta var. *angustifolia*	salt marsh gumplant	CNPS 4	A single individual was discovered at the south edge of the site, on the outer levee slope. This location may approximate the upstream limit of the species within the estuary.
Hibiscus lasiocarpus	California hibiscus	FSC; CNPS 2	Occurs in Delta riparian habitats. Not found during rare plant surveys or expected under brackish conditions.
Isocoma arguta	Carquinez goldenbush	CNPS 1B	Found north of Bird's Landing Road, near Lucol Hollow, outside the Project boundary
Juglans hindsii	Northern California black walnut	FSC; CNPS 1B	A single tree was found on the outside slope of the Sacramento River the southern boundary of the site. This individual exhibited outward signs of environmental stress (e.g., poor leaf health, limited growth during its growing season).
Lasthenia conjugens	Contra Costa goldfields	Fed E; CNPS 1B	Searched for but not found during rare plant surveys.
Lathyrus jepsonii ssp. *jepsonii*	delta tule pea	FSC; CNPS 1B	Individuals were sparsely distributed in the drier intertidal zone on the outside slope of the levees of the Sacramento River and Montezuma Slough.
Legenere limosa	legenere	FSC; CNPS 1B	Not found during rare plant surveys. Possible in brackish tidal marsh.
Lepidium latipes var. *latipes**	dwarf peppergrass	formerly CNPS 4*	A few individuals were distributed intermittently along the upland ecotone between patches of mixed halophytes and the upland grassland, and also within some of the alkali vernal pools of the uplands that border the east side of the middle section of the site.
Lessingia hololeuca	lessingia	CNPS 3	Not found during rare plant surveys.
Lilaeopsis masonii	Mason's lilaeopsis	FSC; State R; CNPS 1B	Colonies are associated with other diminutive species in the turf community distributed intermittently in the lower intertidal zone along the outside of the perimeter levee. This community is found amidst rock riprap along the outside slope of the levee in the Sacramento River at the southern boundary of the site, and on slump blocks or internal berms along the levee in Montezuma Slough. These colonies seem to represent an early successional stage of the plant community of slump blocks that eventually change to tall emergent vegetation, including tules. This turf community persists in some areas on thin layers of sediment atop riprap, where the later successional stages typical of slump blocks in the area do not develop.

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Table 6.8.2-3
MONTEZUMA SITE: SPECIAL STATUS PLANT SPECIES THAT OCCUR OR POTENTIALLY OCCUR
(page 3 of 3)

Scientific Name	Common Name	Status	Notes
Limosella subulata	limosella	CNPS 2	Found with Mason's lilaeopsis on south part of site, on outboard levee.
Neostapfia colusana	Colusa grass	Fed T; State E; CNPS 1B	Searched for but not found during rare plant surveys.
Plagiobothrys histriculus	bearded popcornflower	FSC; CNPS 1A	Searched for but not found during rare plant surveys.
Sagittaria sanfordii	Stanford's sagittaria	FSC; CNPS 1B	Searched for but not found during rare plant surveys.
Suaeda californica	California suaeda	Fed E; CNPS 1B	Not found during rare plant surveys or expected onsite; historically occurred in SF Bay salt marshes.
Tuctoria mucronata	Crampton's tuctoria	Fed E; State E; CNPS 1B	Searched for but not found during rare plant surveys

Status:

PE: Proposed for federal listing as endangered

PT: Proposed for federal listing as threatened

Fed E: Listed by United States as endangered

Fed T: Listed by United States as threatened

FSC: Federal species of concern (former candidate, could be reconsidered for listing in the future)

State R: Listed by California as rare

State E: Listed by California as endangered

CNPS 1A: Presumed by California Native Plant Society (CNPS) to be extinct in California

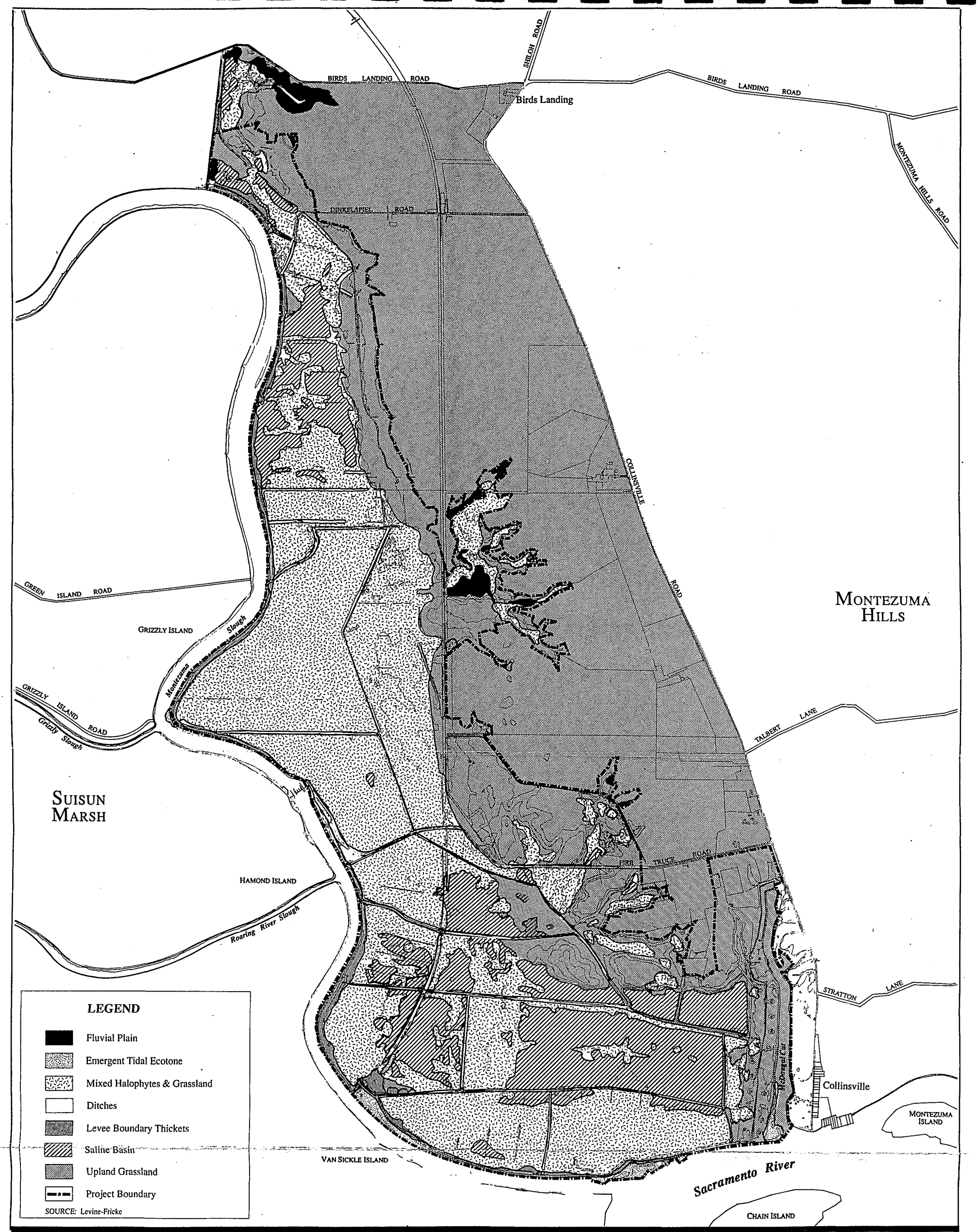
CNPS 1B: Listed by CNPS as rare, threatened, or endangered in California and elsewhere

CNPS 2: Same as 1B but more common outside of California

CNPS 3: Listed by CNPS as data not sufficient to determine CNPS status

CNPS 4: Listed by CNPS as very limited distribution

* The DEIR/S did not distinguish between var. latipes and var. heckardii, the latter being a CNPS 1B plant that could be considered endangered. J. Rugyt (personal communication, 5/15/96) confirms that the plants present at the Project site are var. latipes, which is not considered sensitive.



Source: Brady and Associates (1994)

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Figure 6.8-2

Montezuma Site: Avian Habitat

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sparveius). Burrowing owls (*Athene cunicularia*), a special status species, are known to breed onsite (see below; Appendix I). These raptors forage on prey ranging from insects, small mammals to birds and are thus found in habitats across the Project site.

- *Aquatic Birds*. Of the 90 species of birds observed at the site, 36 percent were aquatic (i.e. "waders, waterfowl and rails"; Appendix I). The Montezuma site is adjacent to large expanses of habitat managed specifically for waterfowl, which likely contributes to the relatively high numbers and diversity observed on the site. Waterfowl and rails (as represented by American coot) were observed primarily in the saline basins in periods of inundation and also in other open water areas on the site. Of "open water dependent" birds, the following relative abundances (% of total) were observed: northern shoveler (33%); American coot (31%); northern pintail (10%); American widgeon (6%); mallard (6%); green-winged teal (5%); gadwall (5%); cinnamon teal (3%); diving ducks (<1%). Regarding use of the adjoining waterfowl management unit (south of Birds Landing Road) by waterfowl, too few data are available to determine percent composition, seasonal variation, or absolute densities and to compare those with use of the low-lying portions of the Montezuma site. Use of either site varies with water depth and it is likely that similar densities and species composition per unit area occur at both sites when water levels are similar. Because water levels are managed at the waterfowl management unit, and because the low-lying areas of the project site are allowed to dry out, it is likely that, on an annual basis, the management unit supports greater numbers and higher densities of waterfowl. Although comparative data are limited, on one visit (April 6, 1996), the following numbers were recorded at each site, respectively (see Table 6.8.2-4).

Table 6.8.2-4
Comparison of Waterfowl Observed at Montezuma Site and at Adjacent Management Unit, April 6, 1996

Species	Project Site	Managed Unit
Northern Pintail	52	120
Northern Shoveler	37	97
American Coot	73	201
Cinnamon Teal	4	34
Mallard	16	45
American Wigeon	50	48
Gadwall	8	2
Green-Winged Teal	2	3
Total Waterfowl	242	550

Source: Avocet Research Associates

- Number of species and abundance densities relative to Suisun Marsh are difficult to quantify because of discontinuities in the data from both sites. Numbers and relative densities of waterfowl species are highly variable depending on rainfall, evaporation rates, disturbance (e.g. hunting pressure), food availability, etc. The Sacramento-San Joaquin Delta, including the project site and Suisun Marsh, is a waterfowl wintering area of

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national significance, generally supporting about 10 percent of California's wintering waterfowl.[13] The Delta, as a whole, supports about 25 waterfowl species, including one swan species, four gooses species and twenty duck species. Northern pintail comprises about 37 percent of the total number of birds observed. Given the habitat characteristics of the region, the avifauna observed in these site surveys mirror those patterns for Suisun Marsh and the region as a whole; however, because of the site's relatively small size, lack of deep water habitat, and lower diversity of habitat types, it is somewhat depauperate and does not support many of the species found at Suisun (e.g. swans and geese). When the saline basins at the site are hydrated, the available shallow water habitat favors shorebirds over waterfowl, and, within the waterfowl group, favors shallow water species (i.e. "dabbling ducks") over deeper water species (i.e. "diving ducks")[14]

- *Palustrine Birds.* Eleven percent of the birds observed at the Montezuma site were classified as palustrine, based on their use of seasonally inundated (palustrine) wetlands. This group consists primarily of shorebirds. Shorebirds are less common in the Suisun Marsh than in other seasonal wetlands in the San Francisco Bay that have adjacent, extensive mudflat habitat. For example, a single flock of 1,200 long-billed dowitchers accounted for the majority of shorebirds observed in spring of 1992 on the Project site. Dowitchers, western sandpipers, and dunlin were the most common shorebirds observed. The saline basins provide important habitat for shorebirds on the Project site.

In summary, most of the migratory species were associated with the saline basins, levee boundary thicket, and mixed halophyte-grassland. Migratory waterfowl and shorebirds used the saline basins, and passerines (perching birds) used the levee boundary thickets. Raptors (hawks, falcons etc.), migratory shorebirds, and passerines were found in the mixed halophyte-grassland; this diversity reflects seasonal variation in values for these species within this habitat group.

Sensitive Bird Species. No threatened or endangered avian species were observed on the Montezuma site. However, 23 special status bird species were observed on or near the Project site, and are presented in Appendix I. Thirteen Federal Species of Concern (FSC), CDFG Species of Special Concern (SSC) or National Audubon Society Blue List (NASBL) species were observed on the site or nearby, of which most were in the levee boundary thicket, emergent tidal ecotone, Montezuma Slough, or mixed halophyte and grassland avian habitat groups shown on Figure 6.8-2. These include the following:

- American white pelican (SSC)
- black-crowned night heron (NASBL)
- American bittern (NASBL)
- northern harrier (SSC, NASBL)
- ferruginous hawk (FSC, SSC)
- golden eagle (SSC, NASBL)
- burrowing owl (FSC, SSC, NASBL)
- loggerhead shrike (FSC, SSC, NASBL)
- yellow warbler (SSC, NASBL)
- salt marsh yellowthroat (FSC, SSC)
- Suisun song sparrow (FSC, SSC)

13 San Francisco Estuary Project, 1992. Status and Trends Report of Wildlife of the San Francisco Estuary. Pg. 109

14 Discussion provided by J. Evens, fax to A. J. Glauber (LFR), July 3, 1997.

- tricolored blackbird (FSC, SSC)
- horned lark (FSC)

Burrowing owls nest on the site in Phases I and II (Appendix I).

In addition, eight special status species were not recorded at the site, but have occurred in other portions of Suisun Marsh and could occur at the Montezuma site in the future. These special status birds are detailed in Appendix I). A few of the species listed in Appendix I, such as clapper rails,[15] are known to historically occur from past records, but no longer occur in the vicinity of the site. In addition, some of the observed special status species, such as the Suisun song sparrow, were more closely associated with tidal marshes in the area, and may be expected to occur after tidal marsh is restored at the Project site.

REPTILES AND AMPHIBIANS. Reptiles and amphibians were assessed in conjunction with the baseline biological resources descriptions (Levine-Fricke 1993a), and focused surveys for special status species, including the federally listed threatened California red-legged frog, the federal candidate California tiger salamander, and the northwestern pond turtle, a state species of concern, were conducted in the spring and fall of 1996. Potential habitat for these special status species includes ditches, farm ponds, some of the seasonally ponded areas, and vernal pools adjacent to the site. Northwestern pond turtles are known to inhabit areas of standing water on the site; the recent surveys did not identify any individuals of this species within Phase I[16]. No tiger salamanders were found during field surveys across the project site, and no suitable habitat (freshwater pools and associated vegetation) was identified for red-legged frogs[17]. There has been no evidence of other federally listed or proposed species, including western spadefoot toad, or giant garter snake, or of suitable habitats within areas of project impact. Pacific tree frogs are common in extensively ponded areas such as Clank Hollow in some years. Regionally common reptiles such as gopher snake and western fence lizard are expected in the upland grasslands of the site.

MAMMALS. The native mammals observed on the site include California ground squirrels, pocket gophers, western and salt marsh harvest mouse, deer mice, California voles, black-tailed hares, Audubon cottontail rabbit, raccoon, coyote, and river otter.

The Montezuma Slough levee, and several observed game trails, may provide travel and dispersal corridors for mammals moving across the site. Overall, aside from use by small mammals, use of the site by larger mammals is not considered high due to the fragmentation of habitats, the isolation of the site from nearby high-quality habitats, and the lack of cover over most of the site.

Sensitive Mammal Species. The only special status species mammal known to presently occur on the Project site is the northern subspecies of salt marsh harvest mouse (*Reithrodontomys raviventris halicoetes*; SMHM), a state and federal endangered species. Site-specific surveys were completed in June 1991 to document the existence of SMHM and to evaluate the current habitat. Trapping grids were placed at six sites deemed high quality habitat (see definitions of habitat quality below) associated with the saline basins. At that time, pickleweed cover was sparse and habitat quality considered low in the northern portion of the Project site (Phase III), which was not trapped. [18] A portion of Phase III comprising approximately 80 acres is now considered medium-quality habitat, having improved due to increased rainfall in recent years.

15 J. Evans, personal communication.

16 Levine-Fricke letter, October 24, 1996

17 Letter from Mark Jennings to Levine-Fricke, October 6, 1996

18 H. Shellhammer, personal communication.

Presently, this area is likely to support SMHM. A total of 21 SMHM were captured at four of these locations as shown on Figure 6.8-3. Most captures occurred at the southern end of the site and 12 of 21 were caught in grid #3 where pickleweed (*Salicornia*) was most dense and vigorous and integrated with tall, dense annual grassland. The latter provides a seasonal seed source and escape cover during infrequent but prolonged flooding in high rainfall years.

A total of 524 acres of SMHM habitat currently exists at the Montezuma site. Approximately 19 acres of the site provide relatively high quality habitat, approximately 100 acres provide medium quality, and approximately 405 acres provide lesser quality habitat for the SMHM, as shown on Figure 6.8-4.

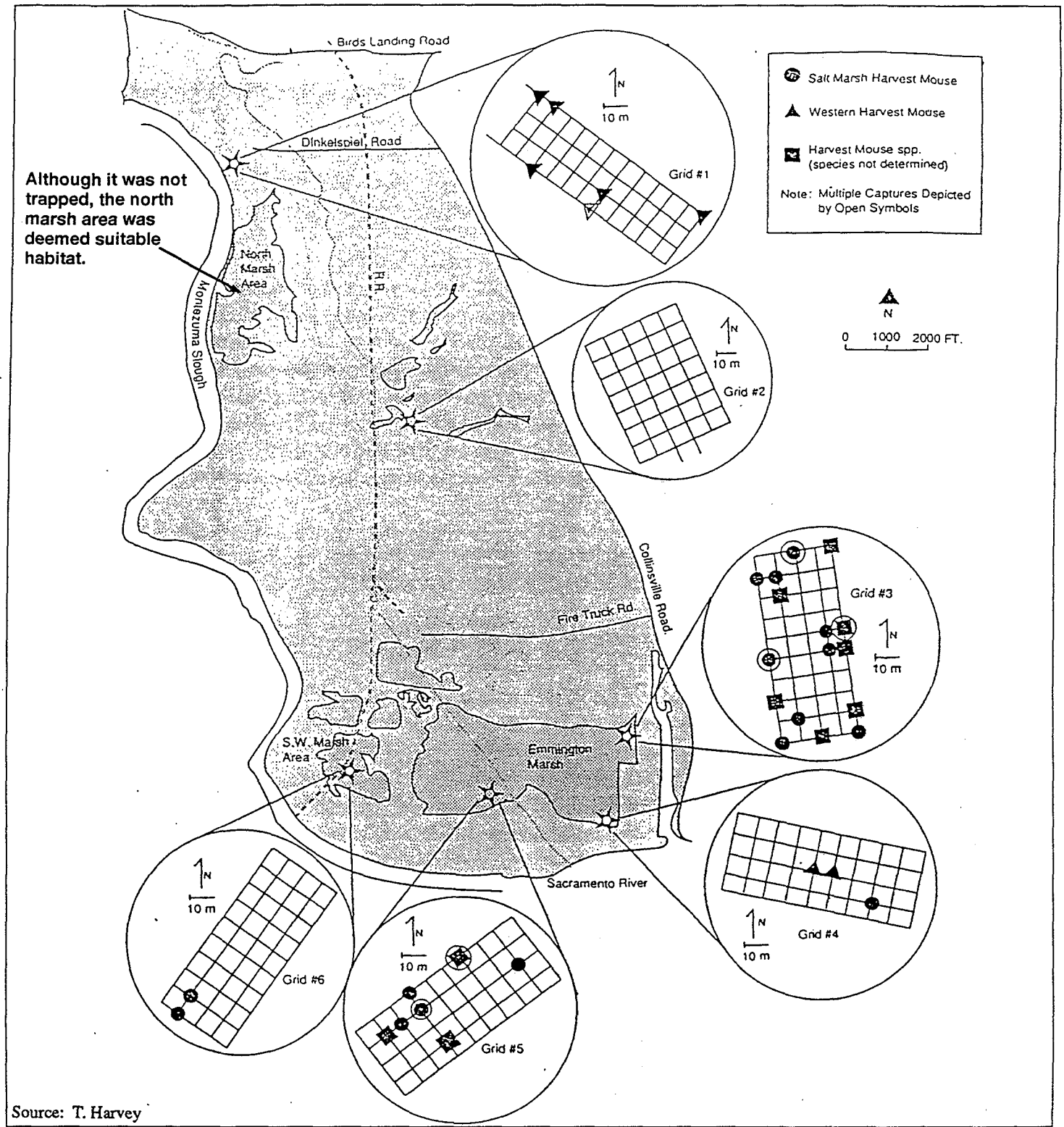
A determination of salt marsh habitat at the site was qualitatively done through mapping of aerial photos, ground-truthing the site, and consultation with Dr. Howard Shellhammer regarding the conditions in the summer of 1991. Aerial photos were taken in June 1990 and trapping to determine presence and relative abundance of SMHM occurred in June 1991. The criteria used to define the three categories of SMHM habitat were based on the vegetation patch types for the site (as described in Appendix J) and correspond as follows: high = type 5 with highest cover; moderate = type 5 with moderate cover; and poor = types 2, 3, and 17. Although no quantitative measurements were made of vegetation composition or structure, the following criteria for high, moderate, and poor quality habitat were adopted from the Draft SMHM Mitigation Plan, Montezuma Wetlands Project (Levine-Fricke 1993n), and include elements described in the patch type definitions (Appendix J, Montezuma Site Vegetation).

SMHM Habitat Types at Montezuma Wetlands

High:	100 percent vegetative cover; 75 to 100 percent pickleweed with the remainder including a diverse halophytic mix.
Moderate:	75 to 100 percent vegetative cover; 50 to 75 percent pickleweed with the remainder including a diverse halophytic mix.
Poor:	75 to 90 percent vegetative cover; 5 to 50 percent pickleweed with the remainder including a diverse halophytic mix.

Although the composition and spatial distribution of these habitat types is likely to change both within and between years, the amount of variation in broad vegetation categories is low as indicated by the site conditions in April 1996. A gross comparison of habitat types from aerial infra-red photos taken in 1996 and 1990 confirmed the general trends in vegetation characteristics, with some small-scale changes in ponding due to the difference in rainfall between the two years. The duration and extent of water coverage during the spring and summer may be the primary factor affecting the distribution, abundance, and vigor of pickleweed, and consequently the population of SMHM. Therefore, the conditions in 1991, when mice were captured, represented an average to above-average year due to the drought conditions that produced higher soil salinities and lower levels of water inundation leading to improved pickleweed growth. The relative abundance and distribution of high quality habitat, including dense pickleweed, in the saline basins varies depending on surface water conditions, and may be greatly influenced by both drought and periodic flooding. The area with the highest capture rates was adjacent to an area that receives runoff water that enhanced the habitat value for this species. However, the habitat requirements for this northern subspecies may differ from those of the southern subspecies, on which most of the work on habitat requirements has been done. The northern subspecies may use brackish marsh habitats to a greater degree, and be less dependent on pickleweed.[19] Although the three categories of habitat provide a qualitative valuation of

19 P. Sorenson, USFWS, personal communication to Wetlands Research Associates.



Source: T. Harvey

Source: Brady and Associates (1994)

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Figure 6.8-3

Montezuma Site: Salt Marsh Harvest Mouse Capture Locations

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potential SMHM impacts, the actual population densities within each type may be a more accurate indicator of SMHM value.

One method of determining the value of the habitat is by using the Capture Efficiency (CE) (calculated by the total mice caught per 100 trap nights) for each habitat type. Using the 1991 trapping data and the three habitat types, the average CE for each type is high = 6.0, medium = 1.75, and low = 0.33. The average capture efficiency over the entire site, weighted by the amount of each habitat type, is 0.81. The value is low compared to the overall CE mean of 4.0 for the northern subspecies (USFWS, unpublished data). However, the optimum habitat type for the northern subspecies has yet to be defined.

In addition to the extent of suitable habitat, the site may support several independent breeding populations separated by areas of low quality marsh and grassland, such as the north marsh in Phase III and the southeast portion of Phase IV. These areas may be poor for continuous habitation, but provide alternative habitat during flooding and act as corridors for dispersal.

The Salt Marsh Harvest Mouse Recovery Plan[20] identified the diked marshes to the east of Collinsville as essential habitat for this species that should be managed or improved. These diked marshes constitute the only nontidal management area in the Recovery Plan. It is assumed for the purposes of this assessment that the Montezuma site is an important, but not critical, population of the northern subspecies. Appendix Q contains additional details on the population status, ecology, and regional habitat conditions of the mouse.

FISH. The Project site does not support any significant fish resources. However, the adjacent Montezuma Slough and Sacramento River provide habitat for numerous special status fish species and commercial and sport fish. Special status fish that occur in the area are listed in Table 6.8.2-5 and are discussed below:

- **Sacramento Splittail.** The Sacramento splittail (*Pogonichthys macrolepidotus*) is a native minnow that commonly reaches 12 to 16 inches in length. Sacramento splittail are found in the Delta, Napa and Suisun Marshes, Suisun Bay, San Pablo Bay, Carquinez Strait, and in slow-moving stretches of the Sacramento River up to the Red Bluff Diversion Dam. Sacramento splittail are tolerant of brackish water and have been found in salinities as high as 10 to 12 parts per thousand (ppt).[21] During spring, they congregate in dead-end sloughs to spawn over beds of aquatic or flooded terrestrial vegetation. They also make upstream migrations from the Bay and Delta to spawn in flooded margins of the lower portions of the Sacramento and San Joaquin rivers and their tributaries. Population declines are attributed to loss and degradation of habitat in the Sacramento-San Joaquin River System and drought periods.[22] Water diversions in the Delta and the construction of dams in the upper reaches have reduced the frequency of winter and spring flooding on which the splittail depend for spawning habitat. Once distributed widely throughout the Central Valley, the population is now concentrated in and adjacent to marshes of San Pablo and Suisun Bays and the Delta.

20 USFWS 1984.

21 Moyle 1976.

22 50 CFR Part 17; CDFG 1989; USFWS 1994.

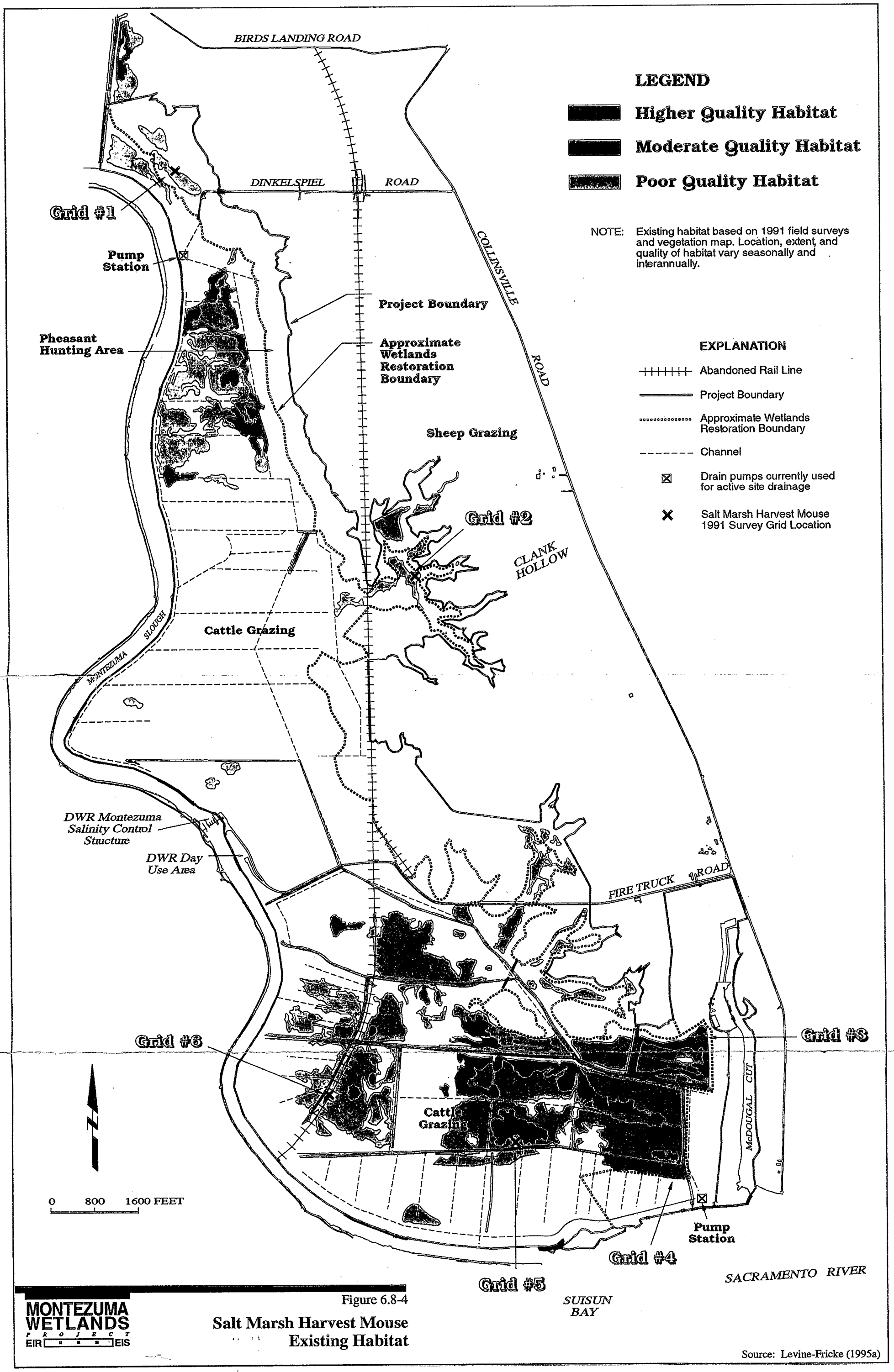

Figure 6.8-4

Salt Marsh Harvest Mouse Existing Habitat

Source: Levine-Fricke (1995a)

Table 6.8.2-5
Montezuma Site: Special Status
Fish Species in the Project Vicinity

Species	Common Name	Status[a]	Usage
Oncorhynchus tshawytscha	winter-run chinook salmon spring-run chinook salmon fall-run chinook salmon	FE, SE FPE FPT	Rearing and smoltification[b]
Oncorhyncus mykiss	Central Valley steelhead	FT	Migratory in river.
Hypomesus transpacificus	delta smelt	FT, ST	Resident
Pogonichthys macrolepidotus	Sacramento splittail	FPT, CSC	Resident
Spirinchus thaleichthys	longfin smelt	CSC[c]	Resident
Acipenser medirostris	green sturgeon	CSC[c]	Resident

a FE=Federally Endangered, FT=Federally Threatened, FPE=Federally Proposed Endangered, FPT=Federally Proposed Threatened, SE=state endangered, ST=state threatened, CSC=California Species of Special Concern.

b Smoltification is a conglomerate of physiological processes in which juvenile anadromous salmonids gain the ability to osmoregulate in a marine environment and assume adult coloration by gradually migrating through the salinity gradient of an estuarine environment. Age of smoltification is highly variable among species ranging from six months to almost two years. Chinook salmon generally undergo smoltification by the first year.

c Based on Moyle et al. (1995).

Though predominantly a freshwater fish, they are also found in brackish waters of the Bay, and are relatively abundant in U.C. Davis' Suisun Marsh trawl surveys in low-salinity water (Meng 1993). Their abundance in surveys varies widely, with highest abundance in high flow years. Decreases in riparian marshlands in recent decades are considered a major contributor to an overall apparent decline in their population (USFWS 1994). A decline in the productivity of the aquatic food web, in part due to a large increase in Asiatic clams in Suisun Bay, may also be a contributor.

- **Winter-Run Chinook Salmon.** The winter-run chinook salmon (*Oncorhynchus tshawytscha*) is one of four recognized chinook salmon races in California, all of which are considered evolutionarily significant units (ESUs) by NMFS. The winter-run chinook salmon can be distinguished from the other three races by several traits, including its migration pattern and timing of events in its life cycle. Winter-run chinook salmon spawning historically occurred primarily in the Upper Sacramento, Pit and McCloud river drainage where relatively cool water temperatures prevail in the summer incubation period. Declines in winter-run chinook salmon have been attributed in part to dams on the upper Sacramento River, unsuitable water temperatures, toxic discharge from mines, entrainment at unscreened and poorly screened diversions, and stranding of juveniles in rearing areas during major flow fluctuations. In wetter, high river flow years, some

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winter-run fry move downstream to the Delta and Bay during the winter and rear in marsh habitats.

The portion of the Sacramento River from Keswick Dam to Chipps Island, all waters westward of Chipps Island to the Carquinez Strait Bridge, all waters of San Pablo Bay, and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge have been designated as critical habitat for winter-run chinook salmon (58 FR 33212, June 16, 1993). Critical habitat includes the river water, river bottom, and adjacent riparian zone.

Most chinook fry appear in the Sacramento-San Joaquin Delta between January and March and rear in primarily freshwater areas for several months before migrating to sea (Kjelson et al. 1981, 1982). The estuarine residence time of chinook fry is quite variable (Healey 1991) but appears to be about 50 to 60 days in the Sacramento-San Joaquin (Kjelson et al. 1981, 1982).

In the Sacramento-San Joaquin estuary, fry appear to occupy shallow nearshore areas during the day and move to deeper water at night. The period when fry leave coincides with the arrival of fingerling chinook smolts, which appear to reside for brief periods in deeper water in the estuary in spring (April-June) and fall (Kjelson et al. 1982). Similar patterns of habitat use and residence time of chinook fry and fingerlings have been noted in British Columbia estuaries (Levy and Northcote 1981, 1982), although Healey (1991) suggests that estuarine habitat may be more important to juvenile chinook in California.

Studies from British Columbia suggest that estuarine habitat use of fry changes with the tides. At high tide, fry appear to use shallow marsh edges near the furthest extent of the tide, and retreat into tidal channels and sloughs at low tide (Healey 1980, 1982, 1991; Levy and Northcote 1982). Fry also appear to move seaward and use deeper water as the season progresses. This seasonal pattern may be due to the fact that fry prefer deeper water and are able to withstand higher salinities as they grow, but it may also be due to avoidance of high temperatures in shallow tidal channels later in the spring (Healey 1991).

There is good evidence from British Columbia that juvenile chinook are associated with tidal channels, sloughs, and nearshore areas (Macdonald et al. 1987; Healey 1991). Although there is limited information specific to the Sacramento-San Joaquin estuary, this suggests that the habitat created by the Project may be suitable for winter-run chinook salmon juveniles. Chinook salmon juveniles have been captured in winter in the marsh areas of Suisun Bay and in trawling surveys in adjacent Suisun Bay, and their abundance is related to the amount of inflow to the estuary (USFWS 1993). Intensive monitoring of fish abundance and habitat use at the site and in nearby areas both before and after project activities commence is recommended to determine the potential effect of this project on winter-run chinook.

The extent to which winter-run smolts use Montezuma Slough as opposed to the Sacramento River during their downstream migration through the Suisun Bay area is unknown. Smolts migrating through Montezuma Slough are exposed to entrainment from unscreened diversions serving managed wetlands off Montezuma Slough. Operation of the Suisun Marsh Salinity Control Gates during extended low Delta outflow increases the percentage of Delta outflow entering Montezuma Slough and may increase the percentage of smolts migrating through Montezuma Slough.

- **Spring- and Fall-Run Chinook Salmon.** These ESUs of chinook salmon were proposed for listing as endangered and threatened, respectively, by NMFS on March 9, 1998. The major differences between these runs and the winter-run concern the timing of adult spawning runs and juvenile return runs. In other respects, similar use of habitats in the vicinity of the Montezuma site may be anticipated.
- **Central Valley Steelhead.** This ESU of steelhead was listed as threatened by NMFS on March 19, 1998. Transient occurrence and foraging in shoreline habitats during migration up and down the Sacramento River are expected.
- **Delta Smelt**. The delta smelt (*Hypomesus transpacificus*) is one of two native resident species of smelt in the Sacramento-San Joaquin Estuary. Most of the year, the population is found in the San Joaquin River below Mossdale, in the Sacramento River below Isleton, and in the Suisun Bay Area. Delta smelt are also found in the Carquinez Strait and San Pablo Bay when high river flows move the salinity gradient downstream. Delta smelt have been found at salinities as great as 10 parts per thousand (ppt), but most of the population occurs at less than 2 ppt. They are most abundant in the entrapment zone (where incoming saltwater and outflowing freshwater mix[23]) during much of the year, with the exception of their upstream movement into freshwater areas to spawn in late winter and spring (USFWS 1994). Designated critical habitat for the delta smelt includes the Sacramento River and Montezuma Slough.
- **Longfin smelt** (*Spirinchus thaleichthys*) is a small 3- to 5-inch long fish found in the Bay-Delta estuary. Prior to 1984, they were among the most abundant fish in the estuary. In 1993, the USFWS was petitioned to list the longfin smelt under the federal Endangered Species Act. In January 1994, the USFWS determined that the longfin smelt does not warrant listing because (1) other longfin smelt populations exist along the Pacific Coast from San Francisco Bay to Prince William Sound in Alaska, (2) the Bay-Delta estuary population does not appear to be biologically significant to the species as a whole, and (3) the Bay-Delta estuary population may not be significantly reproductively isolated (59 FR 869, January 6, 1994). Longfin smelt may be eligible for listing under the California Endangered Species Act (Moyle et al. 1995).

  Longfin smelt are found predominantly in brackish waters of the estuary, except during upstream migrations into freshwater areas in late winter and spring to spawn. Young spawned in freshwater are transported downstream to brackish waters of Suisun Bay and San Pablo Bay, where they rear to the adult stage. Montezuma Slough and Suisun Marsh are rearing habitats of young longfin smelt in most years, and may be important spawning habitat in wetter years. Longfin smelt were consistently caught in large numbers in UCD Suisun Marsh surveys until the early 1980s, after which their numbers have fallen sharply (USFWS 1994). Annual production appears to be positively associated with higher freshwater outflow (USFWS 1994), either through better downstream transport of larvae to Bay nursery areas, less entrainment into diversions, higher food production for larvae, reduced concentration of toxins, greater or higher quality spawning and rearing habitat in the Bay, or combinations of these factors.

  Spawning generally occurs in late winter to early spring; however, protracted spawning may occur from November into June. Habitat requirements for spawning includes fresh,

23 Arthur and Ball 1979.

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shallow water areas over sandy-gravel, rock, or aquatic plant substrates (USFWS 1994). Tidal marshes may be important spawning and rearing areas based on the high abundance of longfin smelt in Suisun Marsh surveys. The apparent extinction of longfin smelt populations in the Eel River and Humboldt Bay may be related to loss of intertidal marsh (USFWS 1994). Entrainment into agricultural diversions is also a contributing factor.

- **Green sturgeon** (*Acipenser medirostris*) are found in low numbers in the Bay-Delta estuary. They are far less abundant than white sturgeon (*Acipenser transmontanus*). Green sturgeon are distributed from the Bering Sea in Alaska and Asia to Mexico, including the entire coast of California (USFWS 1994). Spawning has been recorded in the Sacramento River and its tributaries, and possibly the San Joaquin River. Their primary habitat is considered to be rivers; there is little information on their use of the estuary other than possibly passing through between the rivers and ocean. Like the white sturgeon, green sturgeon may spend part of their life cycle as adults migrating through or feeding in Suisun Bay or even Montezuma Slough, and they may depend on food produced in Suisun Bay and Marsh. They may merit consideration for protection under the state or federal endangered species act (Moyle et al. 1995).

Invertebrates (Endangered Species)

One federally listed invertebrate species, the threatened vernal pool fairy shrimp (*Branchinecta lynchi*), occurs on the site. Additional detail follows below.

Federally listed species identified by the USFWS (personal communication, D. Wright) as possibly occurring on the Project site include the Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*B. longiantenna*), vernal pool fairy shrimp (*B. lynchi*), vernal pool tadpole shrimp (*lepidurus packardi*), and Delta green ground beetle (*Elaphrus viridus*). Based on a reconnaissance survey during April 1996, potential habitat for these species exists in two seasonally wet depressions within the Phase I area, a seasonally wet depression in the Phase III area, in the drainage basins proposed as Managed Fluvial Hollows during Phase II, and in a vernal pool in the upland buffer portion of the site (Levine-Fricke 1996 [letter to D. Wright]; personal communication, D. Wright; Jones & Stokes, March 17, 1997). A borrow pit in the eastern portion of Phase I was also identified as potential habitat during additional site investigations.

All areas identified as potential habitat for special-status fairy shrimp, tadpole shrimp, as well as Delta green ground beetle were surveyed from November 1996 to February 1997. In accordance with USFWS protocols, sampling consisted of a dry-season survey to determine the potential for these species to occur on the project site through analysis of soil samples for special-status shrimp cysts (eggs), sampling during the wet season for adult shrimp, and by visual inspection of pool margins for the delta green ground beetle. Survey results did not detect Delta green ground beetle or any special status tadpole shrimp within the project site. Vernal pool fairy shrimp (*B. lynchi*) were identified from sampled pools only within Phase I and Phase III areas proposed for seasonally wet depressions and high marsh, respectively (Figure 6.8-5), No special-status invertebrates were detected within the managed fluvial hollows.

6.8.2.2 The Bel Marin Keys Site

The Bel Marin Keys is located in northern Marin County on the western shore of San Pablo Bay, south of Novato Creek. Most of the site lies within the historic margins of San Francisco Bay and adjacent marshes. These marshes were part of a series of tidal marshes that once bordered San Pablo Bay, extending from Corte Madera to Petaluma. Diking and drainage of these marshlands on the fringes of the

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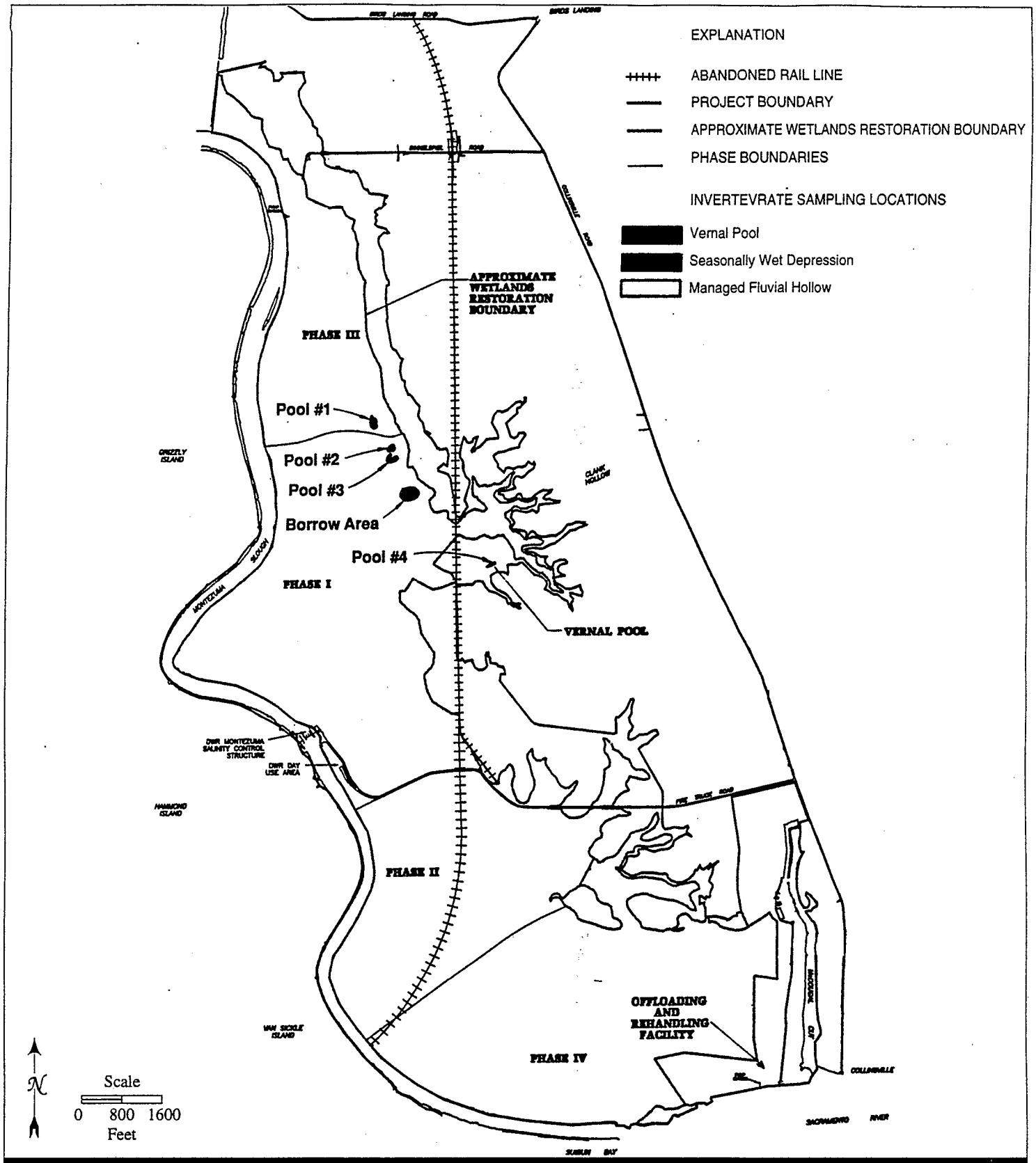

Source: Levine-Fricke;
Jones & Stokes Assoc., Inc.

MONTEZUMA WETLANDS
PROJECT
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Figure 6.8-5

Invertebrate Sampling Locations
Montezuma Wetland Site

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Bay in the late 1800s and early 1900s allowed dry land farming. Like many other diked baylands, the Bel Marin Keys site has experienced consolidation, oxidation, and subsidence. Average elevations on the site are 4 to 5 feet below mean sea level.

Vegetation

The following discussion of vegetation on the Bel Marin Keys site includes a general summary of the vegetation and habitat types found at the site, followed by a specific discussion of the special status plants found at the site.

HABITAT AREAS. The majority of the site is cultivated for oat hay production. The noncultivated areas include margins of ruderal vegetation, a small stand of eucalyptus trees, a patch of non-tidal pickleweed habitat along the inboard toe of the Bay levee, and drainage ditches. One of the three brackish marsh borrow pit ponds occurs within the site boundary while the remaining two border the site to the west. The site can be categorized into upland and wetland habitats and a more detailed discussion of these habitats is provided below.

Uplands. Cultivated land utilized for oat hay production is the most abundant upland habitat of the site. The hay fields are subject to regular ground disturbance such as disking, seeding, and mowing. In the winter, portions of the fields occasionally pond and provide low to moderate habitat values for raptors, wintering ducks, herons/egrets, and migratory shorebirds. In the spring, plant species in these oat fields include toad rush (*Juncus bufonius*), popcorn flower (*Plagiobothrys leptocladus*), ryegrass (*Lolium* spp.), brass buttons (*Cotula coronopifolia*), hyssop loosestrife (*Lythrum hyssopifolium*), and spurrey (*Spergularia* spp.).

Ruderal (weedy) vegetation occurs along field edges, roads, levees, and the dredge disposal area in the northeastern portion of the site. These areas are dominated by salt- or disturbance-tolerant exotic weedy plant species including curly dock (*Rumex crispus*), ryegrass, wild radish (*Raphanus sativus*), and black mustard (*Brassica nigra*). Woodland dominated by Tasmanian blue gum (*Eucalyptus globulus*), an invasive non-native tree, covers 4 acres in an otherwise open environment.

Wetlands. The site supports extensive seasonally ponded swales and depressions in the hayfields. In wet years, individual ponded hayfield areas can exceed 50 acres in size, collectively resulting in hundreds of ponded acres. These areas are known to support a significant level of seasonal usage by waterbirds.

Drainage ditch vegetation on the site is dominated by persistent wetland plant species including cattail (*Typha latifolia*) and alkali bulrush (*Scirpus robustus*). The borrow pit ponds, created in the 1960s, range from permanently flooded to seasonally saturated, depending on depth. The largest pond occupies about 14 acres and provides brackish open-water habitat. Vegetation around the shoreline of these ponds is dominated by saltgrass and pickleweed.

Patches of vegetation dominated by pickleweed grow between the upper levee slopes and the cultivated fields. Although these stands make up only a small percentage of the total site, they may serve an important function with respect to providing suitable endangered species habitat for the SMHM, although none were captured during trapping conducted in these areas.

Water features are limited to small drainage ditches and seasonally to permanently ponded areas, the most significant of which is the 14-acre borrow pit, which contains a permanent brackish pond. None of the ditches are tidally flooded; however, a combination of fresh water from surface runoff and salt water

seepage from San Pablo Bay cause the ditch waters to have varying degrees of salinity. The salinity of the water may reach levels similar to that of seawater in summer. A portion of the drainage ditches contain water year-round, while others are dry by late summer.

Tidal salt marsh and extensive mudflats are present along the outboard side of the levee. These mudflats provide foraging habitat for shorebirds at low tide. At higher tides, waterbirds likely move between the mudflats and the extensive hayfield which may be used for roosting sites. This occurs primarily during the winter-spring period when large numbers of wintering and migratory shorebirds are present and the hayfields are ponded.

JURISDICTIONAL WETLANDS. While there is currently no valid jurisdictional determination for the site, in 1985, pursuant to Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers asserted jurisdiction over 116 acres of the proposed Bel Marin Keys Unit 5 residential development. Areas within the Corps jurisdiction include drainage ditches, borrow pits, seasonal wetlands and pickleweed stands. The acreage of jurisdictional wetlands within the site has not been determined. Most of the diked wetlands on the Bel Marin Keys site are cropped and qualify as prior converted croplands. The Corps is in the process of confirming the wetland determination with the Natural Resource Conservation Service. If on-site wetlands are confirmed to have prior converted cropland status, they are exempt from regulation under Section 404. However, portions may still be subject to regulation under Section 10 of the Rivers and Harbors Act, because the elevation of much of this area is below mean high tide.

SPECIAL STATUS PLANTS. No rare, threatened, or endangered plants have been observed in studies of the Bel Marin Keys site. One CNPS List 4 plant, salt marsh gum plant (*Grindelia stricta*), was found at the upper tidal marsh margin on the Bay side of the levees.

Wildlife

High wildlife habitat values occur in the brackish drainage ditches, brackish ponds, non-tidal pickleweed stands, and ruderal forb-grassland. Seasonally flooded cropland is important habitat for water birds.[24]

Special status species known to occur in Marin County and potentially occurring at the Bel Marin Keys site are summarized in Table 6.8.2-6. Eight special status species have been documented at the proposed Bel Marin Keys site. Six of these species are raptors, which suggests the importance of this site to avian predators. The occurrence of the long-billed curlew is additional evidence that the site is also seasonally important for migrating shorebirds. Agricultural forage areas as well as freshwater marsh are the preferred habitat of the eighth species, the tricolored blackbird.

At the Bel Marin Keys site, different wildlife are associated with the habitat areas described above. These general characteristics are summarized below.

24 *Habitat Plan* prepared by LSA Associates as part of the Bel Marin Keys Unit 5 Master Plan Application, 1990; *Waterbird Habitat Usage: Tidal vs. Seasonal Wetlands, Bel Marin Keys*, Prepared by LSA Associates, Part 12 of Bel Marin Keys Unit 5 Revised Master Plan Precise Development Plan Vesting Tentative Map, Project Submission January 3, 1996.

Table 6.8.2-6
Bel Marin Keys Site:
Special Status Wildlife Potentially Occurring

Common Name/ Scientific Name	Status*	Habitat	Occurrence
Chinook Salmon *Oncorhyncus tshawytscha*	**	Migratory in SF-San Pablo Bay, transient occurrence in tidal creeks.	Recorded in Novato Creek
Steelhead *Oncorhyncus mykiss*	FT	Potential spawning in streams of San Pablo Bay	Recorded in Bel Marin Keys lagoon.
Osprey *Pandion haliaetus*	CSC	Occurs in association with rivers and bays.	Observed hunting from pilings bayward of levee near pumphouse.
White-tailed Kite *Elanus caeruleus*	CSC	Primarily forages in open pastures, grasslands, meadows and marshes.	Previously observed and currently expected onsite.
Northern Harrier *Circus cyaneus*	CSC	Typically inhabits lowland marshlands.	Previously observed and currently expected onsite.
Sharp-shinned Hawk *Accipiter striatus*	CSC	Scrub and woodland habitats, occasional in grasslands.	None observed during surveys.
Cooper's hawk *Accipiter cooperi*	CSC	Woodland and riparian areas.	None observed during surveys.
American Peregrine Falcon *Falco peregrinus anatum*	FE,SE	Coastal and inland marsh and riparian habitats.	Peregrine falcons have been observed in the vicinity of the Unit 5 site.[a]
California Clapper Rail *Rallus longirostris obsoletus*	FE,SE	Tidal salt and brackish marshes and associated channel, mudflat, and high marsh habitats.	Critical habitat along bayside levees and Novato Creek. No recent survey data but likely to occur, at least temporarily, in pickleweed patches and brackish marsh on the site.
California black rail *Laterallus jamaicensis coturniculus*	FSC, ST	Similar to clapper rail, but also in freshwater marshes.	Occurrences along Novato Creek in the vicinity of the project site.
Long-billed curlew *Numenius americanus*	FSC	Preferred winter habitats include estuaries, grasslands, and croplands	None observed during surveys.
Tricolored blackbird *Agelaius tricolor*	FSC, CSC	Typically occurs in freshwater marshes, often on agricultural land.	Observed on-site in 1981, but not during the 1988 or 1991 surveys.
Salt marsh harvest mouse *Reithrodontomys raviventris*	FE,SE	Pickleweed-dominated salt marsh is the primary habitat for this species.	Marshes along San Pablo Bay and Novato Creek are considered essential habitat for this species. Not found in previous trapping efforts on-site.

a Madrone Associates, 1981.
* Status definitions:
FE = Federally listed as endangered; FT = Federally listed as threatened; FSC = Federal species of concern; SE = State listed as endangered; ST = State listed as threatened; CSC = California species of special concern. ** = listing status uncertain, but could be federally listed endangered, proposed endangered, or proposed threatened, depending on which run of chinook salmon is represented.
Source: Bel Marin Keys Unit 5 Final EIR/EIS. ESA, August 1993.

UPLANDS WILDLIFE. The oat hay fields are fallow for at least part of the year and provide abundant foraging habitat for raptors that prey on mice, voles, small birds, and jackrabbits. Seasonally saturated

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agricultural fields were identified as important feeding habitat for wintering waterfowl and shorebirds.[25] Aerial and ground surveys by the USFWS as part of the Diked Baylands Study identified 41 water bird species using seasonal wetlands at the site.

Woodland dominated by Tasmanian blue gum (*Eucalyptus globulus*), an invasive non-native tree, cover 4 acres in an otherwise open environment. These trees provide a resting and nesting substrate for several resident and migratory bird species as well as potential roosting areas for migrating monarch butterflies, which were observed in small numbers on the site during the Fall 1991 surveys. Most conspicuous are large roosting flocks of blackbirds. A red-tailed hawk nest was identified in the crown of a eucalyptus tree in the southern portion of the site.

In addition to the red-tailed hawk, other raptors commonly using upland and wetland habitats on the site (primarily for foraging) include the turkey vulture (*Cathartes aura*), white-tailed kite (*Elanus caeruleus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), and common barn owl (*Tyto alba*). Other raptors which have been observed onsite or in the immediate vicinity include the osprey (*Pandion haliaetus*), great horned owl (*Bubo virginicus*), short-eared owl (*Asio flammeus*), Cooper's hawk (*Accipiter cooperii*), golden eagle (*Aquila chrysaetos*), and the sharp-shinned hawk (*Accipiter striatus*). Several of these raptors are state or federal species of concern; however, they have no legal protection.

Ruderal, upland vegetation on the site supports many common wildlife species, including western meadowlark (*Sturnella neglecta*), Brewer's blackbird (*Euphagus cyanocephalus*), savannah sparrow (*Passerculus sandwichensis*), black-tailed jackrabbit (*Lepus californicus*), California vole (*Microtus californicus*), striped skunk (*Mephitis mephitis*), and raccoon (*Pyocyon lotor*). Columbian black-tailed deer (*Odocoileus hemionus*) are also common; eight deer were observed during surveys in 1988 and five deer were observed during 1991.

WETLAND WILDLIFE. Tidal wetlands have been designated as essential habitat for the recovery of the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), California clapper rail (*Rallus longirostris obsoletus*), and the state listed California black rail (*Laterallus jamaicensis coturniculus*) by the USFWS in 1984. Tidal salt marsh provides habitat for other small bird and mammal species and provides additional foraging habitat for raptor species that frequent the site.

The salt marsh harvest mouse (SMHM) is likely to be found inboard of the levees in the pond margin vegetation and pickleweed patches. However, no SMHM were captured during small mammal live-trapping surveys conducted in 1988, although the habitat is suitable.

The extensive system of drainage ditches provides potential nesting and foraging habitat for species such as salt marsh yellowthroat (*Geothlypis trichas sinuosa*) and red-winged blackbird, which nest in the cattails and bulrushes found in the ditches. The drainage ditches provide relatively undisturbed areas with cover that may provide nesting habitat for ducks and other birds, and movement corridors for black-tailed deer, striped skunk, and other animals.

The borrow pit ponds, created in the 1960s, are suitable habitat for the SMHM, although none were captured during trapping conducted in these areas.[26] Open water within the ponds provides resting areas for migratory waterbirds as well as foraging areas for resident waterfowl. Forty species of waterbirds were

25 Madrone Associates 1981.

26 WESCO 1988.

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using the ponds.[27] Seasonal wetlands provide important habitat for migratory waterbirds during the fall and winter, and serve as foraging and nesting habitat for northern harrier, and foraging habitat for numerous other raptor species.

The aquatic areas of the site contain no significant fish, crustacean, or mollusc populations. The only fish species that inhabit the ditches on a year-round basis are the common threespine stickleback (*Gasterosteus aculeatus*) and the introduced mosquitofish (*Gambusia affinis*). The sport fish most common to the lagoons is reportedly striped bass. Other fish occasionally found include steelhead trout (*Oncorhynchus mykiss*), and juvenile and adult salmon.

6.8.2.3 The Hamilton Site[28]

The Hamilton site includes approximately 840 acres of the Hamilton Airfield on the former 1,600-acre Hamilton Air Force Base and adjacent antenna field. The airfield has been the subject of remediation/cleanup efforts and is in the process of transfer to the City of Novato. As a result, habitats existing on the airfield have been greatly modified. The antenna field is included in this alternative, consistent with current planning efforts for wetland restoration in the area.

The airfield and antenna field are fronted by tidal salt marsh along the outboard levee slope, descending to the mudflats of San Pablo Bay. Approximately two acres of tidal salt marsh are included within the site boundary in the vicinity of the levee breaches identified for this alternative.

The airfield portion of the site includes approximately 600 acres, much of which has been recently disturbed, and would be further modified upon completion of cleanup and remediation activities. The site formerly consisted predominantly of paved runways and aircraft parking areas surrounded by non-wetland grassland vegetation, maintained relatively dry by drainage control and pumping. Small areas (7.1 acres) of seasonal wetlands were mapped in an inventory of the site prior to cleanup/remediation activities (Jones & Stokes 1996). Within this area as of late-1996, a 20-acre temporary borrow pit had been excavated, creating a pond, and another 20 acres had been scraped, resulting in seasonal wetland habitat. In addition, a new flood control levee had been built at the western edge of the site (personal communication, P. Baye). Pre-existing areas of wetland habitat, including 2.9 acres of brackish marsh in Pacheco Pond at the northwest end of the site, and 1.2 acres of wetland habitat in ditches around the site perimeter (Jones & Stokes 1996) are presumably still present.

The antenna field, comprising 240 acres, consists of grassland vegetation, much of which provides seasonal wetland habitat. The area is heavily used by wintering and migratory waterbirds, raptors, and songbirds (USFWS 1996).

HABITAT AREAS. The following discussion of habitat types found on the Hamilton site includes a general summary of the vegetation and wildlife found at the site, followed by a specific discussion of the special status plants and animals found at the site. The habitat areas of the Hamilton site can be categorized into grasslands, wetlands, and developed areas. These habitats and the corresponding vegetation are described

27 Madrone Associates 1981.

28 This section is based in part on the Preliminary Draft of Dredged Material Disposal and Wetlands Creation Baseline Study prepared by Jones and Stokes Associates in 1993, and in part on personal communications of P. Baye and C. Vassel, USACE.

below. Acreages and distributions of habitat types within the airfield have been recently modified by abandonment and remediation activities.

Grasslands. Two types of grassland communities occur throughout most of the unpaved portions of the airfield, on levee slopes, and in the active Petroleum, Oil and Lubricants (POL) site. Annual grassland, dominated by naturalized mediterranean grasses, is the most widespread grassland community at the Hamilton site. Fescue grassland, which is dominated by naturalized perennial forage grasses, occurs mostly in low areas around the east and north margins of the airfield. Grasslands are actively drained and pumped at the airfield site, and lack seasonal wetland characteristics.

At the Hamilton Airfield site, the wildlife value of the grassland community is enhanced due to its proximity to oak woodlands and marsh habitats. The taller fescue grassland also provides habitat for many of the species found in the annual grasslands; however, unlike the annual grasslands, fescue grassland is not periodically mowed.

Among the reptiles observed in annual grasslands during field surveys were the gopher snake (*Pituophis melanoleucus*) and western fence lizard (*Sceloporus occidentalis*). Turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), California quail (*Callipepla californica*), ring-necked pheasant (*Phasianus colchicus*), savannah sparrow (*Passerculus sandwichensis*), and western meadowlark (*Sturnella neglecta*) were among the birds observed in the grasslands. Mammals included black-tailed jackrabbit (*Lepus californicus*), black-tailed deer (*Odocoileus hemionus*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*).

WETLANDS. Wetland communities found at the Hamilton site include coastal salt marsh, brackish marsh, seasonal wetlands, and wetlands that occur in drainage ditches. These communities are described below. In addition, a freshwater marsh has been constructed along the northwestern stretch of the airstrip as mitigation for loss of wetlands filled as part of the project to cap Landfill 26, located on the GSA sale parcel (USACE 1996). The boundaries of wetland communities within the airfield were determined during a delineation of potential jurisdictional wetlands (Jones & Stokes Associates 1991), and wetland communities at the airfield were verified by the San Francisco District of the U.S. Army Corps of Engineers (USACE) as meeting the definition of wetlands under Section 404 of the Clean Water Act (33 CFR 328.3, 40 CFR 230.3). However, the delineation was done over 3 years ago, and the USACE verification has expired. A new delineation would need to be done to encompass the antenna field and take into account the recent changes due to abandonment and remediation of the airfield.

Coastal Salt Marsh. Many of the salt marsh plant communities were once part of San Pablo Bay and have been altered by the construction of the levees. A strip of tidal salt marsh occurs outboard of the levee at the east end of the airfield antenna field. A small area of nontidal salt marsh occurs between the northwest end of the runway and Ammo Hill. The tidal salt marsh is located outside the diked area considered for disposal of dredged materials and restoration of tidal salt marsh.

Among the birds observed in the salt marsh during field surveys were great blue heron (*Ardea herodias*), great egret (*Casmerodius albus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), northern harrier (*Circus cyaneus*), a CDFG Species of Special Concern, and the San Pablo song sparrow (*Melospiza melodia samuelis*), a CDFG Species of Special Concern and a federal species of concern.

Brackish Marsh. Pacheco Pond, a permanently flooded water body, is located at the northern edge of the airfield. A portion of the pond is in the study area. Brackish marsh occurs in shallow areas and along the margins. Dominant emergent wetland plants include coastal bulrush and cattail.

The brackish marsh is considered moderate- to high-quality habitat for wildlife as it supports open water and emergent wetland vegetation. The open water provides foraging habitat for waterfowl and other water birds such as herons, egrets, and shorebirds. Wildlife species that use the brackish marsh habitat include great blue heron, great egret, mallard, American coot, northern harrier, red-winged blackbird, raccoon, striped skunk, and aquatic garter snake.

Seasonal Wetlands. The Hamilton airfield site has its groundwater actively pumped and drained, and flooding is prevented by the drainage ditches and pumping operations, but shallow ponding may occur briefly following storms. Scraped areas and pits associated with abandonment/remediation activities may currently provide some wetland habitat, but the future of these areas is uncertain.

Other seasonal wetlands surrounding the airfield are considered low-quality habitat for wildlife because this habitat occurs at small, scattered sites about the airfield, supports water for only a short duration, and provides little cover for wildlife. This marsh habitat does not have sufficient continuous acreage to meet the breeding and foraging habitat requirements for large numbers of marsh-dependent wildlife. Seasonally wet marsh, however, does provide seasonal foraging habitat for some wetland wildlife species such as the great blue heron, great egret, killdeer, red-winged blackbird, raccoon, striped skunk, and aquatic garter snake.

Drainage Ditch Habitats. A drainage ditch surrounds most of the airfield between the perimeter road and the north, east, and southeast levees. The ditch varies in size, but averages approximately 5 feet deep and 25 feet wide. The ditch is lined with concrete for most of its length. It has been periodically cleared of sediment and vegetation. Dominant vegetation between ditch-clearing episodes includes alkali bulrush (*Scirpus robustus*), cattails (*Typha* spp.), and water-plantain (*Alisma plantago-aquatica*).

At the airfield, patches of seasonal wetland vegetation occur where the concrete lining of the ditch is broken, covered with sediment, or absent. Cattail is the dominant plant in these areas. Other plants present may include blackberry (*Rubus* sp.), curly dock (*Rumex crispus*), and annual ryegrass (*Lolium multiflorum*). Grassland vegetation and dense stands of fennel are common along the margins of the ditch.

Table 6.8.2-7
Hamilton Site: Special Status Plants Potentially Occurring

Common Name/ Scientific Name	Status[a]	Habitat	Proximity to Hamilton Site
Soft bird's-beak *Cordylanthus mollis* ssp. *mollis*	FE, SR, CNPS 1B	Coastal salt marsh	San Antonio Creek and Petaluma Marshes
Point Reyes Bird Beak *Codylanthus maritimus* ssp. *palustrisvestitus*	FSC	Coastal salt marsh	San Antonio Creek and Petaluma Marshes
Marin knotweed *Polygonum marinense*	CNPS 3	Coastal salt marsh	Burdell Island, Larkspur

a Status definitions same as Table 6.8.2-3

Barn swallow (*Hirundo rustica*), savannah sparrow, red-winged blackbird (*Agelaius phoeniceus*), lesser goldfinch (*Carduelis psaltria*), house finch (*Carpodacus mexicanus*), and black-tailed deer were observed in the ditch habitats during field surveys. Northern harriers have been observed foraging along portions of

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the drainage ditches. In addition, the grassy banks, brambles, and patches of cattail marsh provide cover and food for many birds and mammals.

SPECIAL STATUS PLANTS. Results from CDFG's Natural Diversity Database (NDDB) (1994) and CNPS's list of rare and endangered plants in California (Skinner and Pavlik 1994) revealed that 12 special-status plant species have the potential to occur in the study area, based on an assessment of their regional distribution and habitat association. Suitable habitat exists for only three of these plants at Hamilton airfield: soft bird's beak, Point Reyes bird's beak, and Marin knotweed (Table 6.8.2-7).

Because the grasslands at the airfield are on historically salt-marsh soils and fill material, and are dominated by a dense cover of weedy, non-native plants, they do not provide suitable habitat for special-status plants that occur on native grassland or serpentine soils. The salt marshes are characterized by low species diversity. The uniformity of this habitat (i.e., continuous mats of pickleweed and California cordgrass) provides only low potential for special-status plants to grow.

The transitional zone at the upper margins of the salt marsh provides the most suitable habitat for special-status plants. This area was surveyed most intensively during the August 1993 survey. Plant species with high potential to occur that were targeted during the field survey include soft bird's beak, Point Reyes bird's beak, and Marin knotweed. Although small areas of potentially suitable habitat exists for these species, no populations or individual plants were found and none have been previously reported from the project site (CNDDB 1994).

SPECIAL STATUS WILDLIFE. Special status animal species known to occur or possibly occur in the vicinity of the Hamilton site are listed in Table 6.8.2-8. Some species may be resident breeders of the communities on or adjacent to the project site, such as the Suisun shrew, black rail and California clapper rail. Other species may use the area for foraging while breeding offsite, such as the Cooper's hawk and the California least tern. Still others, such as the snowy plover and the California brown pelican, use the mudflats or open water habitats for foraging only.

6.8.3 Environmental Impacts and Mitigation Measures

6.8.3.1 The Proposed Project

The Proposed Project would use dredged materials to restore extensive tidal wetlands, and create a 68-acre managed pickleweed marsh, within a diked, subsided area of historic tidal marsh that now supports seasonal wetlands and other seasonally ponded habitats, as well as non-wetland grasslands. The existing upland grasslands on the eastern side of the property would be restored to their historic landscape position as an upland-transition zone on the edge of the tidal wetlands, and would provide a buffer for the restoration area.

The Project entails the conversion of existing diked seasonally flooded habitats, which are relatively common in the Suisun Marsh system, to predominantly tidal wetlands, relatively small areas of which remain (e.g., LTMS 1998). This habitat conversion would result in a 17% increase in the total amount of tidal marsh in Suisun Bay, while it would represent only a 4% decrease in the amount of seasonal

Table 6.8.2-8
Special Status Wildlife Species with Potential to Occur at Hamilton Army Airfield
(Page 1 of 2)

Common and Scientific Name	LISTING STATUS* Federal/State	Habitat/Occurrence in Project Area
Bird Species		
American peregrine falcon *Falco peregrinus anatum*	E/E	Nests in coastal and mountain cliffs; forages in open areas (e.g., open water, wetlands, and grasslands); no suitable nesting habitat at Hamilton Airfield.
California clapper rail+ *Rallus longirostris obsoletus*	E/E	Occurs year round in coastal salt marshes; observed in salt marsh outboard of eastern levee (USACE 1995).
California brown pelican+ *Pelecanus occidentalis californicus*	E/E	Nests on coastal cliffs; forages in deep water; coastal salt marsh could provide seasonal foraging habitat; could occur year round in the open water, but on an irregular basis.
California least tern *Sterna antillarum browni*	E/E	Nest on open, flat beaches; forages in open water; no suitable nesting habitat at Hamilton Airfield; could forage in shallow water beyond the salt marsh.
Western snowy plover (coastal population) *Charadrius alexandrinus nivosus*	T/SC	Nests on open, flat beaches and alkali flats; forages on beaches and mudflats; no suitable nesting habitat exists in affected area; could forage irregularly on the mudflats at low tide.
Black rail+ *Laterallus jamaicensis*	SC/T	Occurs year round in salt marshes; observed in salt marsh outboard of eastern levee (USACE 1996).
Salt marsh common yellowthroat+ *Geothlypis trichas sinuosa*	SC/SC	Occurs in salt marshes and coastal riparian habitats; observed near Hamilton Airfield in coastal salt marsh.
San Pablo song sparrow+ *Melospiza melodia samuelis*	SC/SC	Occurs in salt marshes and coastal riparian habitats; site supports suitable habitat; observed in coastal salt marsh.
Western burrowing owl+ *Athene cunicularia hypugea*	SC/SC	Nests in grasslands and open fields; formerly nested along the edges of the runway and levees along airfield; none observed during field surveys in 1994, but reported by Hamilton Airfield staff in 1995.
Ferruginous hawk *Buteo regalis*	SC/SC	Occurs throughout the grasslands and agricultural fields of California; could occur irregularly and in low numbers at Hamilton Airfield.
Northern harrier *Circus cyaneus*	---/SC	Nests and forages in grassland and marsh habitats; observed foraging in salt marsh, nesting on the airfield parcel during the 1994 surveys.
Short-eared owl *Asio flammeus*	---/SC	Nests and forages in grassland and marsh habitats; no records of occurrence at Hamilton Airfield; salt marsh near Hamilton Airfield is suitable habitat.

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Table 6.8.2-8
Special Status Wildlife Species with Potential to Occur at Hamilton Army Airfield
(page 2 of 2)

Common and Scientific Name	LISTING STATUS* Federal/State	Habitat/Occurrence in Project Area
Mammal Species		
Salt marsh harvest mouse+ *Reithrodontomyus raviventris*	E/E	Occurs in coastal salt marsh habitats; site supports suitable habitat in coastal salt marsh; assumed to occur at the Project site.
Suisun ornate shrew *Sorex ornatus sinuosus*	SC/SC	Occurs in tidal marshes in the Suisun Bay and San Pablo Bay area in Solano County; no records in Marin County; not likely to occur at Hamilton Airfield.
Amphibian Species		
California red-legged frog *Rana aurora draytonii*	T/SC	Occurs in streams with deep pools and ponds; no suitable habitat at Hamilton Airfield; no records of occurrences.
California tiger salamander *Abystoma californiense*	C/SC	Occurs in grasslands and savannahs with vernal pools and stock ponds; no suitable habitat at Hamilton Airfield.
Reptile Species		
Northwestern pond turtle *Clemmys marmorata marmorata*	SC/SC	Occurs in slow-moving streams and ponds throughout northern California; could occur in Pacheco Pond, but none observed.
California horned lizard *Phrynosoma coronatum frontale*	---/SC	Occurs in northern California in habitats with loose or sandy soil; no records at Hamilton Airfield; potential low-quality habitat exists at Hamilton Airfield; none observed during field surveys.
Fish Species		
Tidewater goby *Eucyclogobius newberryi*	E/SC	Occurs from Del Norte County to San Diego County in shallow lagoons and lower reaches of coastal streams. Tidal marshes and channel at Hamilton Airfield considered marginal-quality habitat.
Sacramento splittail *Pogonichthys macrolepidotus*	PT/SC	Generally restricted to tidal freshwater and low-salinity habitats upstream of San Pablo Bay; no suitable habitat at Hamilton Airfield.
Longfin smelt+ *Spirinchus thaleichthys*	SC	Spawns in the lower Sacramento-San Joaquin Delta and Suisun Bay; prespawning adults and juveniles inhabit shoal areas of San Pablo Bay; could occur in or near tidal marsh at Hamilton Airfield.

* E = Listed as Endangered; T = Listed as Threatened; PT = Proposed for listing as Threatened; C = Candidate for listing; SC = Species of Concern.

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wetlands.[29] As discussed previously, most seasonal wetland habitat values on the site (e.g., as feeding or resting sites for shore- and waterbirds) are reduced in quality compared with either appropriately managed diked wetlands or natural tidal marshes for the area. The goal of the Project is to use dredged sediments to

re-establish tidal habitats on a site where they were formerly present, providing functions and values that adequately replace and/or offset the loss of existing wetland, aquatic, and upland habitats on the site.

Dredged materials would be placed on the site in four phases over a period of 10-15 years. The proposed distribution of habitat elements by phase and a description of these elements is provided in Chapter 4 (see Table 4.2-1). In response to public comments on the Draft EIR/EIS, the originally Proposed Project has been modified as shown in Table 4.3-1.

As described in Chapter 4 (Table 4.2-2 and accompanying text), the Project is designed to proceed in a phased manner, in which the least environmentally sensitive areas are impacted first, and further development is contingent upon successfully achieving ecological or engineering objectives and mitigating potential impacts. The performance criteria proposed in Chapter 4 are to be refined or augmented where appropriate based on EIR/S mitigation measures, and finalized as part of permitting.

Each phase of the Project would have an independent tidal connection to the Montezuma Slough (Phases I, II, and III) or Sacramento River (Phase IV). The development of plant and animal communities in earlier phases would overlap the construction of later phases. The timeline for full development of the Project is approximately 10-15 years for construction of the levees and sediment placement, and up to approximately 30 years for the development of tidal habitats whose functions and values approach those of reference wetlands.

Achieving restoration of tidal wetlands on the site while providing for the disposal of cover and non-cover dredged materials entails certain risks and impacts to existing resources on the site. These can be grouped into four general categories:

a. Potential release of contaminants into the environment;
b. Potential loss of ecological value and function;
c. Loss of habitat for special status species; and
d. Impacts related to mosquito breeding.

These impacts are discussed in more detail below.

Release of Contaminants

The following section begins with a discussion of impacts that are less than significant because of features in the original and/or revised project design, existing regulatory requirements, and/or mitigation measures called for in previous sections of this EIR/EIS, and do not require additional mitigation. This is followed by a discussion of potentially significant impacts and recommended mitigation measures.

29 Using data from San Francisco Estuary Project's *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. June 1992.

IMPACTS THAT ARE LESS THAN SIGNIFICANT

All dredged materials accepted at the site must pass interim screening criteria set by the SFBRWQCB[30] as well as bioassay tests (cover material only) and leachate tests (cover and non-cover material). These tests have been designed to minimize the possibility of release of contaminants to ground and surface water as well as to plants, fish and wildlife. These interim screening criteria, as well as cover and non-cover material, are discussed in sections 2.2, 2.3, and 6.6; the SFBRWQCB report on screening criteria and testing requirements is included in Appendix E. Application of the screening criteria to the Project by the regulatory agencies will take into account recent analyses of contaminant concentrations in natural Bay and Delta wetlands (Lee et al. 1995), a re-analysis of the incidence of adverse biological affects associated with contaminant concentrations in field and laboratory studies (Long et al. 1995), and other relevant data as available[31]. Based on a review of Lee et al (1995) regarding mercury concentrations in Suisun Marsh sediments (0.321 mg/kg at Browns Island and 0.362 mg/kg at Suisun Slough), the applicant has proposed lowering the SFBRWQCB's screening criteria for mercury from 0.35 mg/kg to 0.32 mg/kg.

About 80% of the material accepted for deposition on the site would consist of sediments meeting criteria for use as cover in wetlands; such sediments are generally acceptable for unconfined aquatic disposal as well. The 80% calculation is based on the existing site topography in relation to site design elevations, and the fact that any areas where non-cover material is placed would have to be covered by 3 feet of cover material[32]. Given mitigation measures in sections 6.6 and 6.7 to ensure that contaminant concentrations in sediments and surface waters on the site remain within required limits, potential biological impacts associated with the low concentrations of contaminants that are typically present in cover sediments are considered insignificant.

The risk of contaminant releases from non-cover material due to erosion have been substantially mitigated by project design changes. After restoration has been initiated and the marsh evolves towards equilibrium, the channel network will mature accordingly. Smaller-order channels will likely form, draining the marsh plain into the larger constructed channels, and constructed channel banks will likely erode somewhat, exposing underlying material. Under the previous project design, formation of these smaller-order channels would likely have eroded into the non-cover sediment cells over time, exposing contaminants to aerobic conditions where they would become more available for uptake by plants and wildlife.

Several changes to the project design since the draft EIR/EIS have significantly reduced the possibility of larger order channels eroding into the non-cover sediment. The inclusion of 200-foot setbacks between constructed channels and non-cover sediment cells will minimize the possibility of larger order channels eroding into the non-cover sediments. Secondly, non-cover sediments will be further isolated behind compacted non-cover separation cell levees. Lastly, with regard to smaller order channels, the upper elevational limit for non-cover sediment placement has been lowered significantly throughout the project to minimize the possibility that non-cover material will become exposed. In high marsh areas, the revised design elevation of non-cover sediment (+/- a tolerance of 0.5 ft) is at about mean sea level (0 NGVD), 0.75 ft. lower than in the previous design. In low marsh, non-cover sediment would be one foot deeper than in high marsh, placing it 0.25 ft lower than in the previous design. This means the upper surface of

30 *Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse*, California Regional Water Quality Control Board, San Francisco Bay Region and California Environmental Protection Agency, August 4, 1992.

31 Gandesberry, Tom, SFBRWQCB. Personal Communication, April 1998.

32 Lipton, Doug, Levine-Fricke-Recon. Personal Communication, March 1998.

non-cover will be at or below most channel beds of small tidal creeks, and would be set back 200 feet from the mouths of any small creeks that may form off the constructed channels. Given these changes, plus mitigation measures provided under Geology in section 6.5 and Hydrology in section 6.7, the risk of contaminant releases due to erosion into the non-cover material are less than significant.

The same design changes cited in the previous paragraph substantially mitigate the risk that, as invertebrates colonize the restored marsh, their burrowing could mix non-cover sediment and the associated contaminants into the upper part of the soil. Burrowing is expected to be concentrated along channels where aeration and food availability are greater, and higher species diversity may be expected in the channels than in the marsh plain[33]. Peat banks of Suisun Marsh are heavily colonized by burrowing invertebrates. Common bottom-dwelling species of Suisun Marsh include euryhaline amphipods (*Corophium* spp., *Orchestia* spp., *Eogammarus confervicolus*), estuarine isopods (e.g. *Gnorimosphaeroma oregonesis, Sphaeroma* spp.), annelid worms (*Limnodrilus* spp., *Neanthes* spp.), the introduced eastern soft-shell clam, *Mya arenaria*, and the Asian clam, *Potamocorbula amurensis*. Among these species, the soft-shell clam is the deepest burrower, to depths of up to 1-2 feet, but this species, however, is primarily found where salinities are higher than occur at the Project site. Crayfish (*Pacifastacus* sp.) are important burrowers in low marsh and channel habitats of the Delta-Suisun Marsh region. Their burrows can extend several feet laterally into levees and channel banks, but deep vertical burrowing into saturated sediments would not be expected.

As discussed under Sediment Quality and Water Quality in section 6.6 and 6.7, respectively, project design changes that increase sediment retention in disposal cells, and mitigation measures P-SED-2 and P-WQ-1, adequately mitigate the risk that contaminants could be transported from sediment disposal cells and accumulate to harmful levels in the make-up water pond.

Revised sediment acceptance criteria and handling procedures described in Chapter 4 and analyzed in section 6.7 (e.g., mitigation measure P-HYDRO-3a), minimize the likelihood of insufficient (less than 3 feet) cover deposition over non-cover sediment, and ensure that non-cover material is capped with relatively fine-grained cover sediment. In particular, the design now specifies that acceptable cover material over non-cover sediment will contain less than 15% sands. The 15% sand criterion is based on the following knowledge: (1) soil classified as "clays" can contain up to 20% sands (USDA 1975); (2) the hydraulic conductivity of soils (i.e. it's permeability) is governed more by a continuous fine-grained matrix (i.e. clays and silts) than by the sands or gravels contained within the matrix[34] and (3) laboratory testing has demonstrated that increasing sand content from 0 to 15% in clay soils does not significantly affect hydraulic conductivity.[35] These procedures will contribute to the maintenance of saturated, anaerobic conditions in the non-cover layer, reducing the potential mobility of contaminants and the possibility of root penetration and contaminant uptake by marsh plants.

SIGNIFICANT IMPACTS

After consideration of the above impacts which are less than significant, remaining potentially significant impacts related to contaminants in non-cover sediment are as follows.

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33 Dudley, Tom. Lecturer, U.C. Berkeley. Personal communication. 1997.

34 Freeze, R.A. and J.A. Cherry. 1979. *Groundwater*. Prentice-Hall, New Jersey.

35 Rawls, W.J. and D.L. Brakensiek, "Prediction of Soil Water Properties for Hydrologic Modeling," *Watershed Management in the Eighties*, ASCE, pp. 293-299, 1985.

Impact P-BIO-1a: Wildlife could be attracted to sediment placement cells and exposed to potentially harmful levels of contaminants if non-cover material is exposed onsite long enough for plant and/or invertebrate colonization to occur. (County-S, Corps-S)

Dredged materials deposited on the Project site would be allowed to settle before being covered with additional dredged materials. Under the Proposed Project, non-cover material, covered by 1-2 feet of water, could be left in place for up to 6 months before being buried with cover material. During this time, the shallow ponded area could be colonized by plants and invertebrates and be attractive to wildlife, resulting in the potential short-term exposure of wildlife to contaminants. Covering the non-cover material sooner than 6 months would lessen the risk of impact.

Impact P-BIO-1b: Once dredged materials are in place and plant colonization has begun, plant uptake of, and wildlife exposure to, contaminants derived from non-cover sediments could occur under certain conditions. (County-S, Corps-S)

Plants may provide a conduit for contaminant transfer to higher trophic level organisms. Although plants are not usually harmed by common contaminants in San Francisco Bay sediments, they may be vectors for contaminants to enter detrital and herbivore food webs. This pathway could occur if plant roots penetrate into the non-cover material, at which point certain contaminants could be absorbed into the plant tissue, and then could become available to other organisms through plant decomposition and herbivory with a resulting potential for adverse impacts to fish and wildlife species.

Once sediment placement within a particular cell has been completed, the sediments in that cell can be divided into three zones: the *surface zone* (the top few centimeters); the *root zone* of the vegetation; and the *underlying zone* (the material below the root zone, potentially including non-cover material on portions of the site), as discussed below.

Within the surface zone, the top few centimeters of the sediments would be oxidized, and eventually become occupied by benthic organisms as well as plant roots that would further promote oxygenation, and increase mobility of contaminants in adjacent soils to the overlying surface water where they would become available to the benthic organisms and plants.

Uptake of water, nutrients, and trace elements by vegetation occurs in the root zone. Plant roots absorb nutrients in a narrow zone around the root, called the rhizosphere. Oxygen diffuses from roots to the rhizosphere, where it locally aerates soil. This local aeration may affect the availability of soil contaminants. Most wetland vegetation tends to have shallow root systems, concentrated within 1-2 feet of the tidal marsh surface[36]. This is a consequence of (1) the physiological problems associated with anaerobic conditions in the soil (i.e. the need for oxygen for root growth); (2) the fact that most wetlands have shallow water tables, obviating the need for deep roots; and (3) most organic matter and cycling of major plant nutrients occurs in the upper soil horizons, and roots proliferate where nutrients are most available and abundant. Consistent with this pattern, plants of the low marsh habitats at Rush Ranch and Denverton Creek have roots 1 to 2 feet deep along channel banks[37] .

36 Collins, Joshua, N., *Rooting Depth of Tidal Marsh Vegetation: A Brief Summary of the Literature*. San Francisco Estuary Institute. June 15, 1994.

37 Dungan, Michael, Ecologist, SAIC. Personal Observations made during preparation of this EIR/S.

Plant nutrient uptake from depths of 3 feet and deeper has been documented in a Georgia tidal marsh (Reimold 1972). In that location, it is likely that extensive burrowing by crabs facilitates drainage and aeration and, as a consequence, deeper rooting. Rooting depths in excess of 3 feet are reported in saline aquolls that support the tidal marsh of the Morro Bay estuary (USDA Soil Conservation Service, San Luis Obispo County Soil Survey). Similarly, soils of the Camarillo series in coastal Santa Barbara County that occur on the edges of tidal marshes have fine roots in the soil profile at depths greater than 3 feet[38]. Both of these cases refer to high intertidal to above-tidal marsh vegetation in areas where the water table is generally shallow but fluctuates in response to tidal and fluvial flooding. Finally, in controlled greenhouse studies, pickleweed readily extends roots to depths exceeding 3 feet as the water table declines[39].

Conditions in the underlying soils, such as high clay content, high levels of organic matter, and high sulfur content, would minimize the migration of contaminants from the dredged materials being placed on these soils. Once sediments are deposited at the site, and normal redox conditions are established, the bioavailability of the contaminants in sediment would be substantially reduced.

The foregoing suggests that rooting depths in excess of 3 feet could occur in the restored marsh at the Project site if the overlying material were to significantly drain or dry out (through evaporation). The revised project design minimizes this risk by lowering design marsh elevations by 0.75 feet in the high marsh and 0.25 feet in the low marsh so that there will be at least an additional 0.25-0.75 feet of natural sedimentation on top of the 3 feet of cover, compared to the previous design. This design helps ensure that noncover material remains in a saturated condition; the design was developed used local tidal datums (e.g., Figure 6.7-1).

Significant root growth into, and nutrient uptake from, the non-cover material would not be expected as long as regular tidal inundation is maintained (see section 6.7 and above discussion on site-specific tidal datums). Within the diked pickleweed marsh, however, maintaining saturated conditions near the surface may be incompatible with the need to periodically dry out the upper part of the soil to encourage pickleweed growth and discourage weedy brackish marsh plants such as pepperweed. As a result, the risk of deep rooting by marsh plants and contaminant uptake from non-cover material would probably be highest in the diked pickleweed marsh. The risk is considered significant for this aspect of the Project design.

<u>Impact P-BIO-1c:</u> It is unlikely but possible that plant growth, animal burrowing, or physical processes could make contaminants in non-cover sediments available for plant and animal uptake. The resulting risks of bioaccumulation and toxicity to wildlife are low but potentially significant. (County-S, Corps-S)

Project redesign measures and additional EIR/S mitigations make it unlikely that contaminants would be released or taken up from the buried, non-cover sediments due to physical or biological processes. The possibility, however, cannot be completely ruled out given the experimental nature of the project, and, if it did occur, the accumulation of contaminants in food chains on the site would compromise the Project's goals and potential ecological benefits.

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38 USDA Soil Conservation Service, Santa Barbara County [South Coastal Part] Soil Survey. The soil survey description was confirmed by M. Dungan during preparation of this EIR/S. High marsh plants in an estuarine-palustrine transitional marsh habitat near the upper limit of tidal action in the Goleta Slough included pickleweed, alkali bulrush, and cocklebur, all of which could occur in high marsh at Montezuma.

39 Callaway, John, Pacific Estuarine Research Laboratory, San Diego State University. Personal Communication, 1996.

MITIGATION MEASURES

The following mitigation measures should be implemented to minimize the potential for adverse biological impacts associated with the release of contaminants:

Mitigation Measure P-BIO-1a: During project implementation, the dimensions and sediment holding capacity of individual non-cover sediment cells shall be designed in conformity with a confirmed source of sediment to ensure that they are filled with cover sediment within six months and restoration initiated, with minimal exposure of non-cover material to wildlife. Plant and wildlife colonization or use of the non-cover disposal cells shall be closely monitored, and the permitted interval during which non-cover material is left exposed shall be shortened as necessary to minimize plant and invertebrate colonization, and potential wildlife exposure to non-cover sediments. (LS)

Mitigation Measure P-BIO-1b: In addition to measures identified in sections 6.6 and 6.7 of the EIR/EIS, non-cover sediment shall not be placed within the diked pickleweed marsh or within other project design elements where management of the hydrologic regime through controlled flooding and evaporation or water drawdown may be necessary to achieve project goals or mitigation requirements as they relate to the salt marsh harvest mouse (SMHM). (LS)

Mitigation Measure P-BIO-1c: Remedial steps will be taken if monitoring reveals bioaccumulation of contaminants. Project monitoring shall include sampling of above-ground plant tissues, submerged macrophytes (e.g. *Rupia, Potamogeton*), two species of invertebrates, *Eogammarus confervicolus* and *Neomysis mercedis*, or other species that are especially appropriate for comparison with regional monitoring data. Samples shall be analyzed to determine if the concentration of any toxic contaminant is significantly higher than background concentrations. In the event that the concentration of any chemical exceeds this threshold, or in the event that plant roots extend into the non-cover material in the low marsh habitat, the following contingency measures shall be implemented as appropriate: (1) further sampling and analysis shall be performed to verify the findings; (2) affected areas shall be delineated via additional sampling; (3) higher trophic level species shall be sampled to determine if chemicals identified in the above-ground plant tissue, submerged macrophyte, or invertebrate anlyses are significantly higher than background concentrations, and are moving up the food web and causing adverse impacts to wildlife; (4) if analyses of higher trophic level species indicates an adverse impact, affected areas will shall be remediated in one of the following manners: (a) the area can be isolated with levees, capped with clean sediment, and converted into a diked managed wetland; (b) the area can be treated in place [e.g., bioremediation for polycyclic aromatic hydrocarbons (PAHs)] and either retained as tidal marsh or leveed and converted to diked, managed marsh; (c) the area can be excavated to remove the affected sediment and place it in an open available cell for non-cover, or dispose of it at an appropriate disposal facility. The excavated area shall be filled with clean sediment and restored appropriately. (LS)

With revised project design and Applicant-proposed mitigation and monitoring measures, in combination with the implementation of the mitigation measures recommended above, the potential for adverse impacts to biological resources resulting from the potential release of contaminants into the environment would be considered mitigated to less than significance. (LS)

Ecological Value and Function

Impacts to vegetation and wildlife habitat on the Montezuma site could occur in two distinct phases of the Montezuma Project. These can be generally described as Project construction and Project implementation:

- *Project Construction.* While the Project is being constructed and dredged materials are being placed over the site, impacts would include the removal of existing vegetation, and the temporary to long-term loss of existing wetland and wildlife habitat resources.
- *Project Implementation.* After the dredged materials are placed on the site and all prerequisite mitigation and monitoring requirements established by permit conditions are satisfied, tidal circulation would be restored and vegetation and wildlife communities would become established. This process is the second main component of the Project. In the long-term, habitat and population losses could be mitigated to the extent that restoration meets the goals and objectives of the Project. Success is dependent on establishing appropriate elevations and channel dimensions so that tidal habitats and marsh vegetation develop as intended.

As in the preceding section, discussion of impacts that are less than significant or mitigated by previous EIR/S measures precedes the discussion of significant impacts and related mitigation measures.

IMPACTS THAT ARE LESS THAN SIGNIFICANT

Approximately 202 acres of non-jurisdictional habitat, primarily upland grasslands, would be filled and converted to tidal marsh. The Project site provides foraging habitat for upland-favoring species, including loggerhead shrike, white-tailed kite, ferruginous hawk, and golden eagle. Tidal marsh restoration has the potential to mitigate for loss of raptor foraging habitat by replacing existing foraging habitat, much of which is of marginal value due to heavy grazing pressure, with more highly productive habitat. During construction of the infrastructure (roads, levees, off-loading facilities, water return channels, etc.) and operation (filling of the cells), wildlife may be deterred from using portions of the area due to human and machine noise and activity. The project's impacts on non-wetland grasslands and associated wildlife are not considered significant because of the abundance of similar habitat in surrounding areas, including 380 acres that are part of the proposed upland-transition and buffer zone of the Project.

The revised Project design and previous EIR/S mitigation measures address some of the concerns voiced in the Draft EIR/S regarding the uncertain success of marsh plant establishment given physical attributes of the restored marsh. Numerous interacting factors influence plant colonization and community structure including salinity levels, sediment texture, elevation, distance from tidal channels and appropriate seed sources, and marsh age among others. The Draft EIR/S noted that delayed plant establishment could result from: (1) lack of available clean cover material; (2) time required for dewatering and settlement prior to introduction of tidal flooding; (3) creation of acid soil conditions if dredged material sulfides are oxidized under aerobic conditions; (4) cover material unsuitable for rapid plant colonization (e.g., problems such as predominantly mineral sand cover which is often the "cleanest" dredged material); and (5) creation of marsh elevations inappropriate for targeted marsh plants. Item (1) is addressed by mitigation measure P-BIO-1a. Item (2) is associated with potentially significant short-term impacts that are discussed under P-BIO-2a below, whereas item (4) is discussed under P-BIO-2c. Items (3) and (5) are discussed below.

Development of acidic soils within a tidal marsh is not likely to be a significant issue. In diked marsh situations subject to seasonal drawdown, acidic soils could develop. In general, elevations above MHHW,

especially elevations which would normally be expected to support pickleweed in salt marshes, would probably be most affected by persistent acid conditions and would require the longest period and/or most intense intervention to reverse the effects of acid formation. Therefore, the proposed high marsh (MHHW) has a somewhat greater potential to develop acid soils. However, since the high marsh area is expected to predominantly support pickleweed, a species that has been observed to be significantly more robust in potentially acid-forming diked marsh on dredged materials (e.g. Simmond's Island) than in fresh-brackish local marsh (e.g. Brown's Island), vegetation at the site is unlikely to be significantly affected by development of acidic soils.[40] Furthermore, this potential problem has been reduced by the lowering of marsh elevations in the revised project design.

The proposed low marsh elevations are likely to promote the establishment of *Scirpus acutus, S. californicus, S. americanus, Typha* spp., and *Phragmites australis*. Although plant community structure generally changes with distance from tidal channel, tules would predominate in the low marsh due to the proposed low elevations. Over time, sedimentation and differential subsidence may create topographic relief that would promote a more diverse plant community. The exact composition of the low marsh is not important as long as a naturally productive and biologically diverse tidal marsh community is established.

In contrast, plant composition is vitally important in the high marsh specifically because it is designed in part to support SMHM. The high marsh (MHHW) was designed by the Applicant to promote the establishment of pickleweed and other halophytes. The diked pickleweed marsh is likely to be successful in establishing high cover of pickleweed. However, creating such habitat in a brackish tidal marsh, such as in the proposed high marsh at the site, is unlikely. It is not certain that pickleweed would become abundant at that elevation in an otherwise unmanaged immature tidal marsh at the Project site where conditions are fresher than most of Suisun Marsh. The uncertain composition of the high marsh community at the project site is not an adverse impact, except insofar as it is correlated with the risk that non-native weeds, such as pepperweed, could become dominant, detracting from the value of the restored marsh. This is discussed below under P-BIO-2d.

Existing utility lines and poles, including both electric distribution and telephone lines, would be relocated to another above ground location (see Figure 4.2-3). The Project proposes relocating existing utilities from poles in existing wetland habitats that are within BCDC's primary management area and the Marsh Protection Zone of Solano County onto Fire Truck Road and the access road to the offloading/rehandling area; these areas are within the secondary management area and the Water-Related Industrial Zone (section 6.4). As such, the relocated poles are largely out of the marsh, in an alignment that is unlikely to impact local wildlife movements between wetland areas. The wires could still pose a risk of electrocution to raptors and other large birds. However, this potential impact is mitigated by the Applicant's proposal to use PG&E's "modified-raptor construction" specifications (wires six feet or more apart).

SIGNIFICANT IMPACTS

After consideration of the above impacts which are less than significant, remaining potentially significant impacts related to ecological value and function are as follows.

<u>Impact P-BIO-2a:</u> Construction of the Proposed Project would result in short-term losses of existing wetland habitats and associated ecological functions and values on the Montezuma site. (County-S, Corps-S)

40 Baye, Peter, U.S. Fish and Wildlife Service, Formerly USACE, Personal Communication, 1996.

Acres of expected habitat losses attributed to each Project phase are shown in Table 6.8.3-1.[41] The proposed replacement of these impacted areas by various "landscape elements" of the Project design is described in Chapter 4 (Table 4.2-1).

Table 6.8.3-1

Acres of Habitat Impacted from Montezuma Wetlands Project Dredged Materials Placement

Habitat	Total Acres	PHASE 1		PHASE 2		PHASE 3		PHASE 4		Total Acres/ Affected Habitat
		Acres Impacted	% of Phase	Acres Impacted	% of Phase	Acres Impacted	% of Phase	Acres Impacted	% of Phase	
Open Water	50	9	1.5	5	1.0	6	3.0	2	0.5	22
Brackish Marsh	30	2	0.5	7	2.0	8	3.0	8	1.5	25
Seasonal Pickleweed Marsh	290	15	2.5	31	8.0	69	29.0	148	25.5	263
Seasonal Salt Grass/Mixed Halophyte	282	9	1.5	105	27.0	31	13.0	122	21.0	267
Grassland	1,690	534	91.0	224	57.0	111	46.5	281	48.5	1,150
Brackish Pond	21	2	0.5	5	1.0	3	1.0	11	2.0	21
Alkali Wetlands (Vernal Pools)	5	1	0.5	0	0			0	0	1
Levees and Developed Land	65	18	3.0	17	4.0	10	4.0	7	1.0	52
Total	2,433	590	100.0	394	100.0	238	100.0	579	100.0	1,801

Project construction would initially eliminate vegetation and wildlife habitat within each phase up to the limits of wetland restoration. As indicated above and discussed elsewhere in connection with proposed Project phasing (e.g., Chapter 4, Table 4.2-2; previous P-BIO-1 discussion), impacts on the seasonally flooded areas (brackish ponds, pickleweed marsh, saltgrass/mixed halophytes) that are of greatest value to waterbirds and the SMHM would occur primarily during the later phases, after earlier phases have met various ecological and engineering requirements.

41 The calculated acreage of habitats (2,433 acres) was done for the DEIR/S and differs from the 2,394 acres proposed for Project development, chiefly because of the inclusion of open water habitat associated with McDougal Cut in the acreage calculations of Table 6.8.3-1; this is also shown in Figure 6.8-1. At one time, dredging and use of McDougal Cut was contemplated, but this is not part of the Project now proposed.

As described in previously in section 6.8.2.1, areas impacted by sediment placement, rehandling facility construction, and subsequent tidal restoration include approximately 1,634 acres of temporarily to semi-permanently flooded areas, including seasonal wetlands, that are subject to Corps of Engineers jurisdiction under Section 404 of the Clean Water Act (see also Appendix N). It is noteworthy that the revised Project design avoids placement of fill in about 60 acres of fluvial hollows that consist largely of seasonal wetland habitats.

The Project as proposed would result in a long-term net gain of wetlands, but would replace seasonal wetlands and other non-tidally flooded habitats with tidal wetlands plus a relatively small area of diked, managed pickleweed marsh. Existing on-site wetlands are generally brackish, with salinities that vary seasonally and over longer periods as a function of rainfall and drought. Project-restored wetlands would be tidal brackish wetlands, with salinities and cycles of inundation that are less variable than exist on the site at present. On-site wetlands support salt-tolerant grasses and other halophytes, such as pickleweed, that have been impacted by many decades of livestock grazing. These species are expected to reestablish on the upper edge of the restored marsh, e.g., in "seasonally wet depressions" and the diked pickleweed marsh. In contrast to existing conditions, however, most of the restored marsh would be expected to support the tules and cattails that typify tidal brackish marshes and permanently flooded ditches and impoundments in the vicinity.

In most respects, the functions and values of seasonal wetlands would be replaced and augmented over time by tidal wetland restoration. For example, constructed tidal open water, mudflat, and marsh habitats would provide shore- and waterbird habitat that should, especially in Phase I (Table 6.8.3-1), equal or exceed the quantity and quality of habitat lost. Shorebirds and waterfowl that currently use brackish seasonal wetlands and ponded areas on the site would in general be expected to use the brackish tidal habitats that would be reestablished by the Project. Tidal marsh restoration would provide additional ecological functions and values that are relatively uncommon in the area, in contrast to seasonal wetlands, which are relatively common in Suisun Marsh.

Wetland habitat losses associated with the time lag between initiation of a phase and levee breaching to restore tidal action would be partially offset by the wetland values provided by cells maintained for sediment placement (sediment and shallow water attractive to many waterbirds). Upon reintroduction of tidal circulation, tidal stream channels and the other elements of the project design would develop and be colonized by plant and animal communities. The shallow water and tidal mudflat habitats would be of immediate value to shore- and waterbirds and fishes, whereas the habitat functions and values associated with brackish marsh vegetation would develop more slowly.

The foregoing supports the conclusion that in most respects, the ecological functions and values of seasonal wetlands and other non-tidally flooded habitats on the site would, in the long term, be adequately replaced or offset by the creation of tidal wetlands, provided wetlands creation is successful. The Project re-design (Chapter 4) and EIR/S mitigation measures described previously under P-BIO-1 provide assurances of success with respect to physical and chemical criteria. Additional discussion of considerations affecting long-term biological success and the mitigation of impacts on special status species are provided below.

Short-term losses of wetland functions and values during Project construction, however, are still considered a potentially significant impact. Construction and filling of the cells in each phase would take 2 to 4 years. The actual duration of the sediment placement period (cell filling prior to tidal restoration of the phase) as a whole is not subject to control by the Project, which is a commercial venture, and depends on dredging projects outside its control for timing and volume of sediment. A shortage of dredged

material (e.g. dredge project cancellation, delay, reduction) or competition from less costly upland alternatives (e.g. parking lot fills, golf course fills) could cause delays in the schedule of cell filling and tidal marsh restoration. To mitigate short-term wetland losses, interim enhancement of on-site wetlands on unfilled portions of the Project site is recommended.

Impact P-BIO-2b: Construction of the Proposed Project could alter or eliminate vernal pool habitats and affiliated species on the site. (County-S, Corps-S)

Seasonally wet depressions previously mapped as alkali vernal pools (totaling 1.2 acres) would be filled with dredged material during Phase I. These pools provide habitat for the federally listed vernal pool fairy shrimp and are addressed under P-BIO-3d. Four other vernal pools are located east of the wetland restoration area. These could be impacted by infrastructure and construction-related activities, such as vehicular traffic. Alteration or loss of these sensitive habitats is considered significant but avoidable. A number of plant species affiliated with vernal pools also occur in seasonal wetlands on the site (Table 6.8.3-2 below).

Table 6.8.3-2
Montezuma Site: Native Vernal Pool-Affiliated Plant Species that may Occur within Sediment Placement Areas

Scientific Name	Common Name	Status	Notes
Astragalus tener var. *tener*	alkali milkvetch	CNPS 1B	To be avoided
Blennosperma nanum	common blennosperma	None	
Cressa truxillensis	alkali weed	None	
Downingia bicornuta	two-horned downingia	None	
Eryngium aristulatum	Jepson's coyote thistle	None	
Lasthenia chrysotoma	common goldfields	None	
Lasthenia glabrata	yellow-rayed lasthenia	None	
Lasthenia minor	woolly goldfields	None	
Lepidium dictyotum var *acutidens*	sharp-toothed peppergrass	None	
Lepidium latipes var. *latipes*	dwarf peppergrass	None	
Limnanthes spp.	meadowfoam	None	
Myosurus minimus var. *filiformis*	common mouse-tail	None	
Plagiobothrys stipitatus	stipitate popcorn- flower	None	
Plantago bigelovii	annual coast plantain	None	
Psilocarphus oreganus	Oregon woolly-marbles	None	

Impact P-BIO-2c: Using dredged materials that are excessively sandy could slow the establishment of wetland vegetation, which could also increase erosion and reduce the effectiveness of contaminant containment. (County-S, Corps-S)

Sediment physical properties related to plant production are important factors determining plant survival and community structure. Dredged material properties may be highly variable, depending on the sediment source, and the sediments used in wetland restoration are not expected to have the physical or chemical characteristics of soils in a mature wetland. The risks associated with excessively sandy soils have been reduced by the lowering of the marsh plain (which allows for greater contributions of natural sedimentation) and increasing the acreage of low marsh (which consists of species that rapidly colonize coarse sediments) in the revised Project design..

There are few data available on the rate at which tidal wetland vegetation and associated animal communities can be expected to establish on dredged sediments. A range of 3 to 10 years to approach the native cover and biomass values seen in natural reference wetlands may be anticipated, and certain attributes (development of nutrient pools, accumulation of organic matter in the soil, establishment of infaunal and other animal communities) are likely to take longer (Simenstad and Thom 1996; Thompson et al. 1995). Creating salt marsh harvest mouse (SMHM) habitat (dense stands of pickleweed) in diked marsh or other habitats is likely to require 3 to 5 years, and possibly longer. Additional mitigation is appropriate to minimize the potential impact of coarse sediments on marsh establishment

Impact P-BIO-2d: High marsh, seasonally flooded depressions, and the upland-transition zone could be invaded by pepperweed, reducing habitat values associated with tidal restoration. (County-S, Corps-S)

The proposed high marsh elevations, as well as conditions in other project design elements where tidal action is re-established, may also promote pepperweed (*Lepidium latifolium*) colonization. This introduced plant readily colonizes disturbed areas in tidal and diked marshes and competes successfully with native plants in brackish marshes. Dense, monotypic stands of *Lepidium latifolium* provide very little habitat value and its establishment in large sections of the high marsh and transition to upland in the Proposed Project would be a significant but mitigable adverse impact.

Impact P-BIO-2e: The attainment of restoration and mitigation objectives is uncertain without the development and implementation of a comprehensive monitoring plan that includes monitoring, reporting, and verification procedures, performance criteria, and contingencies. (County-S, Corps-S)

This impact is self-explanatory and is addressed by a corresponding mitigation measure below.

MITIGATION MEASURES

The following mitigation measures should be implemented to mitigate or reduce the potential loss of ecological value and function.

> Mitigation Measure P-BIO-2a: To offset temporary losses of wetland functions and values water management focused on providing interim wetlands enhancement in unfilled project phases shall be incorporated into the Project; Phase II areas shall be managed to provide shorebird and waterfowl habitat, and Phases III and IV shall be managed to provide SMHM habitat. Water management shall consist of operating existing pumps and drainage structures to control the extent and duration of seasonal flooding, and shall start during construction and continue during the period of sediment placement, but shall be terminated prior to construction within that phase. (LS)

Mitigation Measure P-BIO-2b: Prior to Project construction and implementation, the Project Applicant should prepare a detailed plan which shows how construction activities would avoid impacts on vernal pools outside fill areas. The plan must include detailed site drainage and buffer areas. If impacted, the vernal pools should be replaced at a 3:1 ratio, preferably near the upland boundary of the Project. To protect regional native plant diversity, native vernal pool-affiliated plant species within areas of dredged sediment placement shall be reestablished in appropriate seasonally ponded habitat within the upland buffer area. Reestablishment shall involve seed collection and propagation or individual transplantation of the plant species listed in Table 6.8.3-2. This mitigation measure may be implemented in conjunction with P-BIO-3d. (LS)

Mitigation Measure P-BIO-2c: To foster successful plant establishment and limit contaminant mobility, cover sediments placed above non-cover sediments should have a maximum sand content of 15%, while elsewhere on the site, the top 1 foot should include a maximum of 73 percent sand and 6 percent gravel. (LS)

Mitigation Measure P-BIO-2d: An exotic species control program focused on preventing the establishment of pepperweed in the high marsh and upland transition areas shall be incorporated into the Project. This program should be coupled with the Applicant's proposed experimentation on methods to enhance pickleweed establishment and growth in high marsh, seasonally wet depressions, managed fluvial hollows, diked marsh, and at the lower edge of the upland transition zone. These measures shall begin during construction and continue for the first three years of tidal restoration in each phase. To demonstrate the viability of habitat restoration, implementation of Phase II shall proceed only after the relative dominance of desirable hydrophytic vegetation in the initial colonization of Phase I landscape elements has been documented. (LS)

Mitigation Measure P-BIO-2e: A comprehensive monitoring plan shall be finalized with the approval of permitting agencies prior to project implementation. The monitoring plan shall include the methodology by which physical, chemical, and biological parameters shall be measured to establish the attainment of project goals. Biological parameters to be measured shall be compared with reference conditions in other Suisun Bay tidal marshes and shall include at a minimum vegetation structure and composition in the landscape elements that are part of the design; the use of constructed channel habitats by fishes; and bird use of constructed habitats. The plan shall include reporting and verification procedures and contingency measures and shall be implemented for the life of the project. (LS)

With implementation of these mitigation measures, impacts related to the loss of the functions and values provided by existing habitats on the site would be reduced to less than significant levels. (LS)

Special Status Species

As in preceding sections, the discussion of impacts considered less than significant or mitigated by previous EIR/S mitigation measures precedes the discussion of significant impacts and corresponding mitigation measures.

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IMPACTS THAT ARE LESS THAN SIGNIFICANT

Special Status Wildlife and Fishes

Areas of nesting habitat for the loggerhead shrike and horned lark would be lost in the dredged materials deposition areas, but this impact is small in relation to the abundance of habitat for these species in surrounding areas, including the 380 acres of upland-transition buffer habitat within the Project boundary. The effect on loggerhead shrike is small because of the association of this species with upland scrub and grassland habitats which are most common outside of the restoration area. The effect on nesting habitat of the horned lark is somewhat greater, because this species nests in open grassland and seasonal wetlands, but habitat for this species is also common in the region. Horned larks would also be expected to utilize the Project's upland-transition buffer zone. The two species, although reduced in abundance in parts of the U.S. in recent years, are not listed, proposed, or candidates for listing as threatened or endangered, and the Project would not significantly affect their abundance in the region.

Special status reptiles and amphibians, with the exception of the northwestern pond turtle, a species of concern, are not known or expected on the site, because of seasonally high salinities and poor quality of habitat.[42] No impacts are expected on the federally listed California red-legged frog and giant garter snake, the federal candidate California tiger salamander, or on the western spadefoot toad, a species of concern. Northwestern pond turtles are known to occur in three pump stations and adjoining drainage ditches. These locations would be eliminated early in the Project for water-return conveyance and off-loading and rehandling facilities, and the pond turtles onsite would be lost. However, the pond turtle occurs in the relatively fresh water in this section of Montezuma Slough and Sacramento River, and the Project, when completed, would create additional habitat for this species. The tidal marsh would also allow these pond turtles access to upland breeding sites. Long-term impacts of the project would be beneficial, whereas short-term impacts are considered adverse but less than significant.

The revised project design and EIR/S mitigation measures (see P-BIO-1 discussion) effectively minimize the likelihood of contaminant releases that could adversely affect special status fish species. The major areas of existing brackish tidal marsh on the outboard levee would not be directly impacted by the Project, although minor increases in turbidity could occur when levees are breached. Construction and operation of the sediment offloading facility would cause minor noise and turbidity. Temporary increases in turbidity would also be expected when tidal action is reestablished by levee breaching. These temporary impacts are considered less than significant. Certain other localized impacts are considered potentially significant but mitigable as discussed below. The overall effect on fisheries, including federally listed threatened or endangered Evolutionarily Significant Units (ESUs) of chinook salmon and steelhead trout; the endangered Delta smelt, the federally proposed Sacramento splittail, and the green sturgeon and longfin smelt (both species of concern) are considered beneficial because of the substantial areas of tidal marsh and channel habitats that would be created by the Project. In any case, the Corps will consult with the National Marine Fisheries Service regarding the possible need for additional measures to protect federally listed and proposed fishes.

SIGNIFICANT IMPACTS

After consideration of the above impacts which are less than significant, remaining potentially significant impacts on special status species are as follows.

42 Jennings, Mark. Herpetologist, California Academy of Sciences. Written communication, October 1997.

Impact P-BIO-3a: Sediment placement would eliminate up to 524 acres of habitat known or likely to support the endangered SMHM. The revised Project design would not provide sufficient quality and quantity of replacement habitat. (County-S, Corps-S)

There are 524 acres of SMHM habitat known or likely to support the SMHM within sediment placement areas (see Figure 6.8-4). Although not all of the acreage is known to be occupied by this species, it is likely to provide seasonal or occasionally suitable habitat, depending on recent conditions and SMHM population levels. Under the phased design of the Project, the least valuable areas in phases I and II are impacted first, and the restoration of potential replacement habitats is initiated, prior to impacting the most valuable areas in phases III and IV. Impact acreages would be as follows:

Phase Area	Poor Quality Acreage	Moderate Quality Acreage	High Quality Acreage	Total Acreage
I	17.6	4.7	0	22.3
II	115.6	15.6	0	131.2
III	74.7	22.9	0	97.6
IV	196.6	57.0	19.0	272.6
Total	404.5	100.2	19	523.7

The SMHM habitat onsite was created by levee construction and the area is not managed for SMHM. Periodic flooding has probably resulted in periodic local SMHM extinctions and subsequent recolonization of the site.

In response to input on the DEIR/S, the revised Project design has reduced the elevation and acreage of high marsh (Table 4.3-1). Design elements that potentially would support the SMHM now amount to about 255 acres, including 48 acres of diked pickleweed marsh and 18 acres of fluvial hollows that would be managed to support the SMHM; 145 acres of high marsh; and 43 acres of seasonally wet depressions (Table 4.2-1). The lower edge of the upland-transition buffer zone would also provide potential habitat at the upper limit of tidal influence, as would the margins of Clank Hollow. Under the Proposed Project, mice would be transplanted from Phase IV into Phase I restoration habitats (see Appendix Q and mitigation P-BIO-3a below for discussion).

In relation to existing habitats, Project design elements would likely provide replacement habitat as follows. High marsh and managed fluvial hollows would most likely provide low-quality habitat; seasonally wet depressions would likely provide medium-quality habitat; and the diked pickleweed marsh could provide high quality habitat.

The success of the Project design in providing replacement habitat is most dependent upon the successful establishment of pickleweed. However, it is not certain that pickleweed would become established at the proposed elevation in a tidal marsh at the Project site. For example, Wetlands Research Associates, Inc.[43] found no pickleweed in Sherman Island tidal marshes in the Collinsville vicinity. Rugyt also reported no pickleweed in emergent tidal vegetation patch types found along the outboard sides of levees surrounding the proposed Montezuma Project site.[44] Pickleweed has been reported from Brown's Island which is near

43 Unpublished data 1989.

44 Levine-Fricke 1992.

the Project site,[45] and is a component of tidal marshes in the Suisun Marsh system such as Hill Slough[46] and Rush Ranch,[47] but these marshes are in the western and more saline portion of the Suisun Marsh system. Wetlands Research Associates documented pickleweed's lower limit in 1990 at approximately 6 inches above MHHW, gaining dominance at 1 foot above MHHW, in Rush Ranch tidal marshes, which is located in upper Suisun Slough.

SMHM have been found in Suisun Marsh tidal marsh areas supporting dense halophytic vegetation with some pickleweed; however, they have not been shown to occur in the relatively freshwater environments adjacent to Montezuma Slough near the Sacramento River.[48] Trapping success data presented in the original Project SMHM Mitigation Plan (Levine-Fricke 1993n) show that capture efficiencies are extremely low in areas with less than 40 percent pickleweed and increase substantially in areas with 80 percent or more pickleweed, but that areas with as low as 5 percent pickleweed intermixed with other densely spaced halophytes have been found to support SMHM.

Of the 56 wetland plant species identified as currently occurring in the emergent tidal marshes bordering the Montezuma Project site, five species (saltgrass, rabbit's foot grass, salt marsh gum plant, peppergrass, and salt marsh sand spurry) are commonly found in the pickleweed dominated marshes of Western Suisun and San Pablo bays. The remaining 51 species (91 percent) are commonly associated with freshwater tidal marshes of the Sacramento-San Joaquin Delta. These species are not usually noted for supporting the SMHM.

Published accounts of SMHM habitat, including that in the SMHM Recovery Plan,[49] indicate that dense mixed halophytes of over 90 percent cover of which 80 percent or more is pickleweed provide suitable habitat for the SMHM. It is important to note that these criteria were developed for the central range of the species where salinities are much higher and tidal marsh is dominated by pickleweed.[50] These conditions are unlikely to develop in a restored, fully tidal high marsh at the Project site, but it is possible to develop these conditions by creating marshes with regular but restricted tidal exchange or longer term periodic flooding and drying cycles. Periodic flooding of diked wetlands has been successfully used by CDFG in the Suisun Marsh to create suitable SMHM habitat, and the project proposes to create a 48-acre area similarly managed for SMHM habitat. The Project's seasonally wet depressions would also provide conditions favorable to the establishment of vegetation that will support SMHM.

The revised Project design is responsive to concerns voiced in the DEIR/S and subsequently during inter-agency discussions regarding the Project's (then) emphasis on restored tidal high marsh (Table 4.3-1). The revised design, however, results in a substantial net loss of SMHM habitat that is partially, but not fully, offset by the creation of some areas of managed and tidal habitats that are more stable and productive than currently exist on the site, given reasonable assumptions about the ability of Project design elements to provide replacement habitat. Additional mitigation is recommended.

<u>Impact P-BIO-3b</u>: The Project would eliminate burrowing owl nest sites and could injure or kill nesting birds of this species. (County-S, Corps-LS)

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45 Atwater et al. 1979.

46 Atwater et al. 1979.

47 Wetlands Research Associates 1990.

48 B. Grewell, Department of Water Resources, personal communication.

49 USFWS 1984.

50 H. Shellhammer, personal communication.

Burrowing owls (*Athene cunicularia*) are a state and federal species of concern and are known to nest on the Project site (Appendix I). In surveys aimed at detecting burrowing owl populations at the site, five active burrow systems were located (Appendix I). The burrow systems are all located within Phase I and Phase II where levees and channels border low alkali flats, grasslands, and mixed halophyte marsh with a high percentage of bare ground. During implementation of the Project, all of these burrows would be eliminated. Project impacts to burrowing owl nesting habitat and nesting individuals are considered less than significant by the Corps because the burrowing owl is an upland species and is not recognized as threatened or endangered. From the County's perspective, these impacts are significant but mitigable by replacement of nesting habitat and implementation of measures to ensure that nesting birds and nestlings are not inhabiting the site during construction (see mitigation P-BIO-3b).

Impact P-BIO-3c: The Project could have localized short-term impacts on special status fish species. (County-S, Corps-S)

Risks of fish entrapment or entrainment are minimal for the Proposed Project, but fish screens should be installed wherever necessary to avoid the possibility of sensitive fish species becoming entrapped or entrained in pumps or water diversions. Construction along the perimeter levee could damage or eliminate limited areas of emergent vegetation that provides habitat for special status fishes, especially Delta smelt and Sacramento splittail.

Although there are potential negative impacts to special status fish species due to construction and operation of the Project, the restored wetland environment is likely to prove beneficial in the long run. In other respects, potential effects associated with completion of the Project would be generally beneficial and long-lasting and include increased spawning habitat and increased rearing and nursery habitat for special status fish. Delta smelt and Sacramento splittail could utilize the extensive tidal channels created by the Project during all phases of their life history, while chinook salmon could use the channels during downstream migration, smoltification, and fry rearing.

Impact P-BIO-3d: The Project would eliminate 0.39 acre of vernal pool habitat that supports the federally listed vernal pool fairy shrimp. (County-S, Corps-S)

Three federally listed species — conservancy fairy shrimp, vernal pool tadpole shrimp, and Delta green ground beetle — were not observed on the Project site. Therefore, these species are presumed to be absent from the Project site and will not be affected. Vernal pool fairy shrimp are present on the project site and would be affected. The inundated areas of pools 1, 2, and 3 (Figure 6.8-5) were estimated as 0.22 acre (900 square meters [m^2]), 0.10 acre (400 m^2), and 0.07 acre (300 m^2), respectively. Conversion to tidal salt marsh would, therefore, eliminate an estimated 0.39 acre of habitat for vernal pool fairy shrimp. Mitigation for this impact is suggested below and will be finalized through the Corps' section 7 consultation with USFWS. No other occupied habitat for vernal pool invertebrates is present; therefore, no other direct or indirect impacts on listed vernal pool invertebrates are anticipated.

Impact P-BIO-3e: The Project could eliminate individuals or local populations of special status plants, including the state-listed rare Mason's lilaeopsis. (County-S, Corps-S)

Mason's lilaeopsis (*Lilaeopsis masonii*) (state-listed rare) is on the southern and western perimeter of the site within the emergent tidal vegetation. Habitat and species loss could occur due to off-loading facility construction, marine traffic wake, walkway shade, or levee breaches. On the other hand, Mason's lilaeopsis readily colonizes disturbed areas and is shaded out by tules and bulrushes in natural wetlands; hence, some level of disturbance can benefit this species. Impacts to Mason's lilaeopsis can be minimized

through careful installation of necessary facilities, careful operation of heavy equipment, and by establishing physical buffers and setbacks from sensitive areas. Marsh restoration on the site could create potential habitat for the Mason's lilaeopsis (primarily composed of cohesive bare mud banks), and provide mitigation for potential impacts to this species.

In addition to the Mason's lilaeopsis, which is the only legally protected special status plant species found on the site, 13 other special status species are found on or adjacent to the site and could be impacted as follows.

- The delta tule pea (*Lathyrus jepsonii* ssp. *jepsonii*), Suisun marsh aster (*Aster lentus*), heart-leaved saltbush (*Atriplex cordulata*), and Parish's saltbush (*Atriplex depressa*) found in the emergent tidal vegetation and Northern California black walnut (*Juglans hindsii*), are all on the outboard levee and could be impacted by levee strengthening and breaching activities. The plants in the emergent tidal vegetation could be impacted by construction on the outboard slope of the perimeter levee for the offshore unloading facilities, wake from increased marine traffic, and shading from the walkways extending offshore to the pumpout facilities.
- Several individual San Joaquin saltbush plants (*Atriplex joaquiniana*) could be impacted by construction activity peripheral to dredged material placement during Phase I.
- Alkali milkvetch (*Astragalus tener* var. *tener*) occurs at the edge of an alkali vernal pool. These plants could be impacted by construction-related activities. Fragrant fritillary (*Fritillaria liliacea*) occurs in the uplands area outside of areas affected by dredged sediment placement. These plants could be impacted by construction-related activities. Limosella (*Limosella subulata*) occurs on the outboard side of the levee with Mason's lilaeopsis. Impacts to these plants would be the same as the lilaeopsis.
- A small colony of small spikerush (*Eleocharis parvula*) could be subject to impacts described for Mason's lilaeopsis.

Overall, tidal restoration would be likely to increase the potential habitat for most of these species in the long term, because of the extent and variability of any new brackish tidal marsh created.

MITIGATION MEASURES

Mitigation Measure P-BIO-3a: Mitigation requirements for the SMHM would be finalized by the Corps as part of Section 7 (Endangered Species Act) consultation with USFWS. The lead agencies would require the implementation of measures consistent with the following recommendations, which derive from the mitigation plan presented in Appendix Q.1.[51] The actual habitat acreages and performance criteria required as part of the mitigation would be as described in Appendix Q.1 or, if not, as required by USFWS to achieve the same goals.

To minimize the impacts to the SMHM of habitat conversion from diked seasonal to tidal wetland, four strategies should be employed:

1. Create a mosaic of wetland habitat types connected by corridors that will replace the quality and extent of the existing SMHM habitat.

51 The mitigation plan was developed by Elaine Harding-Smith, M.S. and Doctoral Candidate, U.C. Santa Cruz.

2. Use a phased habitat conversion approach that will allow for establishment of the appropriate vegetation and residence of SMHM prior to destruction of the habitat containing the major populations.

3. Translocate and monitor the SMHM using a phased, experimental strategy.

4. Actively manage of unfilled areas of the site (1) in phases III and IV to sustain viable populations while habitat restoration is underway in earlier phases; and (2) in the upland-transition zone adjacent to the restored wetlands to provide high-intertidal and above-tidal habitat for the species.

Additional detail on each of the above follows below.

Creation of Wetland Mosaic Habitat. The goal of the mitigation is to enhance the Montezuma Wetlands site SMHM population by providing a greater diversity of naturally occurring, permanent wetland habitats interspersed throughout the project area. However, to ensure that a viable SMHM population will continue to exist, this should include a managed, diked marsh to mimic the existing conditions of the site. Relative to the revised Project design (Chapter 4), the EIR/S recommends creation of a larger acreage of SMHM habitat, including expanded areas of diked marsh, high marsh, and/or seasonally wet depressions, to functionally replace the 524 acres of seasonal pickleweed marsh and seasonal salt grass/mixed halophyte vegetation that is considered salt marsh harvest mouse habitat. If the quality of replacement habitat exceeds that of the existing marsh, the replacement acreage can be less than the impacted acreage (Appendix Q.1). The majority of wetland vegetation, particularly the high marsh, will contain a low proportion of pickleweed, the SMHM's preferred vegetation, but it will represent the vegetative composition that is expected to persist regionally under the given tidal and salinity conditions. This would provide a less variable environment than currently exists at the project site, and the spatial distribution of the wetlands would facilitate dispersal between subpopulations.

Phasing of the Project. To minimize the taking of SMHM, directly or indirectly through habitat loss, the project will proceed in 4 distinct phases, which correspond to 4 areas at the site (Fig. 4.2-2). Phase I currently contains only 22.3 acres of poor to moderate quality SMHM habitat, the lowest amount in any phase area. This phase should create the largest amount of SMHM habitat, including expanded areas of diked managed marsh and high marsh (Appendix Q.1).

Before Phase II proceeds, vegetation in diked and high marsh should contain sufficient cover of pickleweed and other halophytes to support the SMHM. When these thresholds have been achieved, subject to final approval by USFWS, then mice can be translocated into each of the habitat types in Phase I and their populations monitored by trapping until capture efficiency (CE) data indicate that they have become established (e.g., as in Appendix Q.1). Measures such as weed or predator control to promote the successful establishment of translocated mice should continue while Phase II is being implemented.

Once a secure population has been established in Phase I, subject to final approval by USFWS, then Phase III can be initiated. Before proceeding with Phase IV, where the majority of the existing SMHM population exists, Phase II must meet the same criteria demonstrating successful establishment of the SMHM in newly created habitats that were met in Phase I,

while Phase III must meet the corresponding vegetation criteria. Finally, approval to proceed with Phase IV would be conditional on USFWS approval of CE data showing that sufficient acreage and quality of SMHM habitat in earlier phases has been successfully created, resulting in a population at a sustainable density in the diked marsh and at reasonable levels in the high marsh, seasonally wet depressions and fluvial hollows.

Translocation and Monitoring of SMHM. Once vegetation has been established according to the criteria for the Phase I area, SMHM should be translocated from other phase areas. These translocations should be considered experimental and therefore a conservative approach should be taken to ensure survival of the translocated animals. The timing of translocations and the composition of the small mammal community at the site are likely to be critical for success of the translocations. Therefore, three components of the SMHM translocation strategy should be: 1) translocate animals during peak populations of SMHM and low levels of other competing species (e.g., during February through April); 2) if possible, translocate animals from earlier phases rather than Phase IV; the Phase IV population should in any case be maintained at sustainable levels throughout phases I-III; and 3) monitor the short and long-term survival of translocated individuals. Appendix Q.1 provides recommendations on translocation and monitoring procedures, which are subject to USFWS review and approval as part of Section 7 consultation.

Management of Unfilled Areas. As in Mitigation Measure 2a, phases III and IV should be managed to sustain resident SMHM population(s) prior to the initiation of these phases. Disturbances incidental to marsh restoration should be avoided in unfilled areas known or likely to support the SMHM. Management should consist of trapping to confirm areas that currently support the SMHM and, in these areas, the implementation of weed and/or predator control, and control of drainage to ensure that these areas continue to support the SMHM and will provide a source of animals that can be translocated, or disperse naturally, into marsh restoration areas. Prior to construction in these areas, salvage trapping should occur to relocate animals into suitable areas of the site (Appendix Q). In each phase, the upland-transition buffer zone should be managed to support SMHM. Management should consist of weed and/or predator control, and the enhancement of halophytic vegetation that is most likely to support the SMHM.

The above measures are considered sufficient to mitigate impacts on the SMHM. (LS)

Mitigation Measure P-BIO-3b: To mitigate the loss of burrowing owl nest sites, the Applicant shall take measures to ensure that the burrowing owl nesting population on the project site remains at levels within or exceeding the range that has been historically observed. The following measures shall be implemented prior to the initiation of grading or fill placement in each phase of the wetland restoration:

(1) The extent of burrowing owl nesting throughout the project site shall be assessed annually during the May-July nesting season.

(2) Based on the most recent data available, artificial burrows in excess of the number of burrowing owls that be could be impacted in wetland restoration areas shall be constructed in upland-buffer portions of the project site, if possible in the vicinity of active ground squirrel colonies.

(3) A qualified biologist, as permitted by the CDFG, shall capture and relocate any burrowing owls residing in impact areas to the artificial burrow sites. Owl capture and relocation shall occur during early spring, when the owls normally return from migration and initially occupy burrows prior to nesting. The biologist shall confirm the absence of burrowing owls from impact areas and ensure that all sites that could be attractive to owls are collapsed or sealed to prevent future occupancy.

(4) As permitted by CDFG, owls may be captured and relocated to artificial burrows on the project site from burrows that are about to be destroyed in non-project areas such as in the Central Valley.

The above measures are considered sufficient to mitigate the impact on burrowing owls. (LS)

Mitigation Measure P-BIO-3c: Fish screens shall be provided at any intakes and outlets during construction and sediment placement phases of the project to reduce impacts to juveniles and adults of special status fish species per specifications of CDFG, NMFS, and USFWS. Levee breaches for each phase shall be sited to avoid well-developed stands of emergent vegetation that provide important habitat for special status fishes. (LS)

Mitigation Measure P-BIO-3d: Prior to impacting seasonally ponded areas that provide habitat for federally listed vernal pool invertebrates, the Applicant shall provide on- or off-site mitigation to preserve and create vernal pool habitats, according to acreage ratios and procedures approved by the USFWS. (LS; additional discussion is provided below).

Under the terms of the USFWS programmatic consultation, recommended mitigation for loss of habitat for vernal pool invertebrates is to preserve habitat at a 2:1 ratio (area preserved:area affected) and create habitat at a 1:1 ratio, in a mitigation bank approved by USFWS. Mitigation may occur on a nonbank site, but at ratios of 3:1 (preservation) and 2:1 (creation). No mitigation bank credits are currently available in Solano County, but the USFWS has set up an in-lieu-of-fee account into which funds may be paid in anticipation of mitigation bank credits becoming available at some future date (personal communication, Rienek). The current fee is $70,000 per acre of impact, with a refund given for the amount paid in excess of the actual costs. Fees would be assessed at the same ratio as an approved mitigation bank. The fee for mitigating loss of 0.39 acre of vernal pool fairy shrimp habitat on the Montezuma Wetlands site would be an estimated $81,900 ($54,600 for preservation and $27,000 for creation). Mitigation ratios may differ from those stated above if the Corps and USFWS develop a different mitigation requirement under consultation specifically for this project.

Mitigation Measure P-BIO-3e: Measures to protect and enhance populations of rare plants that may occur in areas of project impact shall be implemented as described in the *Rare Plant Resource Mitigation and Restoration Plan for the Montezuma Wetlands Project* (Fiedler and Zebell 1995), which is included in Appendix Q.3. (LS)

With successful implementation of these mitigation measures, impacts to sensitive species would be considered less than significant. (LS)

Mosquitos

Impact P-BIO-4: Placement of sediment would cover existing mosquito control ditches. Increased seasonal ponding could increase mosquito populations during Project construction and implementation. (County-S, Corps-LS)

Existing conditions on the Project site provide abundant suitable conditions for mosquitos. However, the site is presently ditched for mosquito control. Implementation of the Project would result in the presence of standing water onsite, within channels and ponds during construction and sediment placement project phases. The surface of each cell could vary considerably over time, given the potential for subsidence, and water could collect in uneven areas prior to restoration of tidal action. High mosquito populations could be sustained before tidal action is restored. Given that adult mosquitos can travel more than a mile from their larval habitats[52], the nuisance and potential health effects of uncontrolled mosquito populations would be significant at the local level.

If tidal circulation functions as designed, the Proposed Project would reduce mosquito populations after tidal flow is introduced in each phase. Once opened to tidal flows, the proposed low and high marsh habitats, with regular tidal flushing and good circulation, would probably diminish mosquito production below current levels. Reduced high marsh acreages and elevations (resulting in more frequent tidal inundation) in the revised project design have substantially reduced potential breeding habitats for mosquitos relative to the DEIR/S. Seasonally wet depressions, managed fluvial hollows, and the diked pickleweed marsh of the revised design may still provide breeding habitat for mosquitos.

The Solano County Mosquito Abatement District is responsible for controlling mosquitos to protect public health in Solano County. The District has developed comprehensive mosquito control criteria, which include policies for the management of drainage construction and maintenance, disposal site management, permanent water impoundments, water conveyance facilities, salt marsh restoration of exterior levee lands, and tidal marsh management. District criteria and policies[53] emphasize the provision of adequate tidal circulation, if necessary by constructing ditches, to limit prolonged ponding.

> Mitigation Measure P-BIO-4: To prevent nuisance and public health effects associated with mosquito production, final designs for each phase of the Project shall be reviewed by the Solano County Mosquito Abatement District. The District will also conduct periodic inspections of the site during construction and following tidal restoration. Based on the District's review, the Project design shall incorporate measures which are non-hazardous to fish and wildlife that are deemed sufficient by the District to limit mosquito production. The Applicant shall provide access and funding as necessary for inspections of mosquito control by the District. (LS)

Beneficial Impacts

In addition to the above described adverse environmental impacts, the successful restoration of the Montezuma site would have the following beneficial impact.

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52 Borror et al. 1989

53 The Solano County Mosquito Abatement District's criteria were provided in a letter dated November 7, 1991 in response to the County's Notice of Preparation for the Project

Impact P-BIO-5: The successful restoration of tidal shallow water, wetland habitats, and sensitive species habitats, with transitional upland and buffer areas as proposed, could provide significant ecological benefits to sensitive plants, and to fish and wildlife, including threatened and endangered Delta fishes, and to the Suisun Marsh system as a whole. (County-NA, Corps-S)

There is no mitigation required for a beneficial impact.

6.8.3.2 Alternative 1: Managed Wetland

Creation of a managed wetland from dredged materials placement would result in impacts similar to the Proposed Project in regard to potential release of contaminants to the environment, loss of ecological value and function, loss of habitat for special status species, and potential for mosquito breeding.

There would be a greater degree of predictability regarding the outcome with managed wetlands than with certain elements of the Proposed Project, notably high marsh, because managed wetlands are common throughout the Suisun Marsh system. Greater predictability, however, should not be confused with project "success," which hinges more on successful impact mitigation and the attainment of the Project's purpose.

Important factors in the proposed managed wetlands design include the following: final elevations for the managed wetland alternative are not as critical as for the Proposed Project because water levels are controlled; however, surface preparation of each cell is more critical than under the Proposed Project since there would be very little sediment delivery to these sites after a cell is filled compared to a fully tidal regime where tidal waters deposit sediments on each tidal cycle. The periodic drying of the ponds would promote acidification of the dredged spoils used in the surface layers and provide conditions for greater mobilization of contaminants compared to those in a well-flushed and frequently inundated tidal marsh. The net impacts to biological resources would differ because the nature of the wetlands that would be restored would be a diked managed marsh rather than a tidal marsh.

Impacts within each of the four major areas listed above are summarized below.

Release of Contaminants

By creating managed wetlands rather than tidal marsh, the potential exposure of non-cover sediments to wildlife differs since potential routes of exposure are different. The potential routes of exposure in tidal marsh are described in P-BIO-1. The difference in potential routes of exposure between tidal marsh and managed wetland are summarized below.

As described in P-BIO-1, plants may provide a conduit for contaminant transfer to higher trophic level organisms if plant roots penetrate into the non-cover material. There are significant differences in the probability of this occurring between alternative designs.

In managed wetlands, the top few centimeters would likely be encrusted with photosynthetic bacteria and subject to shallow burrowing by invertebrates, resulting in a thin oxidized layer at the surface. Below this layer, sediments would remain without oxygen until water depths were lowered enough to allow oxidization by either abiotic (e.g. chemical) or biotic (e.g. biological) mechanisms. As the water evaporates or is drained and the sediment surface becomes exposed, this top zone would have more oxygen. As the material continues to dry, the ability of the surface to bind contaminants may decrease. As a result, any unbound contaminants could be released into aerobic waters, such as runoff from rainfall, in a form available for organismic uptake.

In managed wetlands such as Alternative 1, the periodic drying of the surface would allow the top few centimeters of sediments (and more possibly) to become oxidized, resulting in a decreased ability of the surface to bind contaminants. As a result the unbound materials would be released into aerobic waters, such as runoff from rainfall, in a form available for organismic uptake.

Given the low concentration of contaminants in the cover material, it is unlikely that contaminants in the surface zone would increase to a level that would be a significant risk to biological resources in the Project area. However, the likelihood is greater in managed wetlands than in tidal wetlands, although still a less-than-significant risk.

Within the root zone, contaminants could become available for organismic uptake. Tidal marsh plants are capable of rooting to depths in excess of 3 feet in soils that are tidally, seasonally, or otherwise unsaturated at shallower depths, until they reach saturated soils at which point their growth is restricted by the waterlogged soil. Given the project design, non-cover material is isolated under 3 feet of cover material which should provide adequate isolation between the biosphere and non-cover sediments under saturated conditions. However, unsaturated conditions are more likely to occur in a managed wetlands, and rooting depths would be more likely to penetrate into non-cover material in excess of 3 feet could occur in the restored marsh at the Project site if unsaturated, aerobic conditions exist, even temporarily, in the overlying material.

The managed wetland alternative would create wetlands largely through a water management scheme using a pumping system. No tidal channel network will be established under this alternative. Hence, this potential route of exposure is highly unlikely.

SIGNIFICANT IMPACTS AND MITIGATION MEASURES

The significant impacts and corresponding mitigation measures previously described for the Proposed Project under P-BIO-1 would apply to this alternative as well, and therefore are not repeated here. Please refer to previous discussions in section 6.8.3.1.

Ecological Value and Function

This alternative would not restore the tidal habitat types which occurred historically prior to levee construction. Extensive managed wetlands currently occur in Suisun Marsh and additional acreage would be of less benefit to wildlife compared to an extensive tidal marsh, particularly with respect to potential benefits to special status wildlife, fish and plant species.

Success of plant colonization is one of the most important factors in the overall success of the Project as described in P-BIO-2. Development of acidic soils could negatively affect vegetation colonization if dredged material sulfides are oxidized under aerobic conditions. Development of acidic soils can be avoided by using dredged materials with a low acidic potential. Acidic development can be minimized by preventing aeration of dredged material or treating material with appropriate amendments (e.g., ground limestone). The applicant has suggested that a remedial action of treating the soil with limestone may be used to neutralize acidic soil, but use of this method over a large area may be impractical due to the large quantities that could be required. While acidic soil pH may eventually decline through natural leaching and/or buffering by tidal water, the lower the seawater content of the water, the lower its buffering capacity. In general, freshwater runoff has a relatively low buffering capacity. However, previous

evaluations of the acid-producing potential of dredged sediments for Port of Oakland have shown that this risk is low.[54] Development of acidic soils within a diked marsh is more likely than in a tidal marsh. This can be avoided by using dredged materials with a low acidic potential. Acidic development can be minimized by preventing aeration of dredged material or treating material with appropriate amendments (e.g., ground limestone), but this might prove impractical over large areas.

By utilizing various adaptable water schedules of the non-tidal managed wetland approach (Appendices B and C), the diversity of habitat could be enhanced over existing conditions. This alternative could benefit many of the sensitive bird species located on or in the vicinity of the Project site. However, tidal-dependent species, black rail, and Suisun song sparrow would not be provided for directly with this alternative.

While the primary objective of most managed wetlands is to increase waterfowl food production, this alternative would increase the habitat suitability for a majority of the special status species. The seasonally flooded ponds in the Fat-Hen and Alkali Bulrush schedules would enhance use of the site by the American white pelican, Suisun song sparrow, black crowned night-heron, and the American bittern. The Permanent Pond and Watergrass schedules could promote use by American white pelican, black-crowned night-heron, American bittern, California gull, yellow warbler, saltmarsh yellowthroat, and the tricolored blackbird. Ponds could also be managed to replicate seasonal saline basins for shorebirds.

The Fat-Hen schedule would be the most suited of the four water schedules to promote populations of SMHM within the managed wetland alternative. Several of the ponds could be managed using the methods developed and used successfully by the CDFG to provide SMHM habitat in diked wetlands of the Suisun Marsh. While even marginal SMHM habitat within the proposed tidal high marsh is uncertain, high quality SMHM habitat in the managed wetland can be created with a high degree of predictability based on prior successful habitat creation in the area by CDFG.

Impacts to fish under this alternative are associated with the diversion of waters from the Montezuma Slough into the Project site. Fish from the Montezuma Slough could enter the site during tidal flooding. When the tide lowers, the fish would be trapped behind the levees within the Project area. Diversion of water is the primary cause for the decline of several native fishes found in the project vicinity (i.e., winter-run chinook, Delta smelt, longfin smelt). There would be no benefits to fish species with this alternative.

In other essential respects, impacts and mitigations discussed under P-BIO-2 for the Proposed Project are applicable to this alternative.

SIGNIFICANT IMPACTS AND MITIGATION MEASURES

The significant impacts and corresponding mitigation measures previously described for the Proposed Project under P-BIO-2 would apply, with minor modifications, to this alternative as well, and therefore are not repeated here. Note, for example, that although the created habitats are different, the risk of pepperweed invasion (Impact P-BIO-2d) is high for managed wetlands as well as for tidal wetlands, and would require a control program similar to what is described in Mitigation Measure P-BIO-2d. Please refer to previous discussions in section 6.8.3.1.

54 Patrick, W.H., Jr., B.G. Williams, and J.T. Moraghan. 1973. A simple system for controlling redox potential and pH in soil suspensions. Soil Sci. Soc. Am. Proc. 37:331-333.

Special Status Species

In most respects, the impacts and mitigation measures previously described for the Proposed Project under P-BIO-3 in section 6.8.3.1 would apply to this alternative. The only major difference would be in the reformulation of Mitigation Measure P-BIO-3a for the SMHM to ensure adequate replacement of SMHM habitat quality and quantity under managed wetland conditions.

Mosquitos

Impact and mitigation measure P-BIO-4 described previously for the Proposed Project in section 6.8.3.1 are applicable to this alternative as well.

Beneficial Impacts

Impact 1-BIO-5: The enhancement of extensive seasonal wetlands could provide significant environmental benefits to wildlife, particularly waterfowl. (County-NA, Corps-S)

This is a beneficial impact and no mitigation is required.

6.8.3.3 Alternative 2: Combined Wetland

A combined tidal and managed wetland would displace the same habitat as the Proposed Project. This alternative would restore managed wetlands in Phase I and III and tidal wetlands in Phase II and IV. The environmental consequences of this alternative are a combination of those of Alternative 1 and the Proposed Project. In particular, this alternative could combine the overall higher ecological benefit of a fully tidal marsh with areas managed for high quality SMHM habitat. Impacts within each of the major areas of concern listed for the Proposed Project and Alternative 1 are summarized below.

Release of Contaminants

Impacts would be a combination of those described previously for the Proposed Project and Alternative 1. As for Alternative 1, impacts and mitigation measures listed for the Proposed Project would apply to this alternative as well, and therefore are not repeated here. Please refer to previous discussions in section 6.8.3.1.

Ecological Value and Function

The significant impacts and corresponding mitigation measures previously described for the Proposed Project under P-BIO-2 would apply, with minor modifications (as discussed under Alternative 1), to this alternative as well, and therefore are not repeated here. Please refer to previous discussions in section 6.8.3.1.

Special Status Species

In most respects, the impacts and mitigation measures previously described for the Proposed Project under P-BIO-3 in section 6.8.3.1 would apply to this alternative. The only major difference would be in the reformulation of Mitigation Measure P-BIO-3a for the SMHM to ensure adequate replacement of SMHM habitat quality and quantity under a mixture of tidal and managed wetland conditions.

Mosquitos

Impact and mitigation measure P-BIO-4 described previously for the Proposed Project in section 6.8.3.1 are applicable to this alternative as well.

Beneficial Impacts

Impact 2-BIO-5: The restoration of extensive transitional intertidal habitats and possible final restoration of tidal marsh could provide significant ecological benefits to fish and wildlife, and to the Suisun Marsh system. The enhancement of extensive seasonal diked wetlands also could provide significant ecological benefits to wildlife, particularly waterfowl. (County-NA, Corps-S)

No mitigation is required for this beneficial impact.

6.8.3.4 Alternative 3: The Bel Marin Keys Site[55]

The Bel Marin Keys site is less biologically sensitive than the Montezuma site due to its proximity to the Bel Marin Keys development, and to the smaller acreage of existing wetlands and potential special status species habitat onsite in the potential fill area. Seasonally wet grasslands in the area that would be excavated and filled are nevertheless of high value to migratory shore- and waterbirds during wet years (LSA 1996).

No rare, threatened, or endangered plant or animal species have been documented within the boundary levees at the Bel Marin Keys site. However, several special status species have the potential of occurring on the site. Potential habitat for the salt marsh harvest mouse (SMHM) also occurs in tidal marsh adjacent to the Bel Marin Keys site, however trapping studies found no SMHM present. Restored tidal wetlands at the Bel Marin Keys Site, as at other tidal marshes of San Pablo Bay, would be expected to support the endangered California clapper rail, the State-listed black rail, and SMHM populations. Restoration of the Bel Marin Keys site could contribute significantly to the recovery of these species by providing habitat linkages with extensive marshlands to the north and east.

Existing aquatic resources in the Montezuma Slough area are relatively more sensitive due to the presence of breeding and rearing habitat for sensitive brackish water fish species, the delta smelt (federally listed threatened; California species of special concern) and Sacramento splittail (federally proposed threatened; California species of special concern). The relatively constricted fish migration corridor in the Montezuma Slough area compared to San Pablo Bay increases both potential risks and benefits to special status fishes compared to Bel Marin Keys. Fish entrainment, however, including endangered and special status species, is more likely to occur from pumping San Pablo Bay water for making dredged sediment slurry. The waters of San Pablo Bay are designated as critical habitat for the winter-run chinook salmon. Water diversions have been identified as an activity that can affect critical habitat.[56] Finally, the restored marsh at the Montezuma site could provide significant habitat values for these special status fish, whereas the Bel Marin Keys site would provide habitat of lesser importance. Sensitive fish species, including Sacramento splittail and longfin smelt, have been found in the newly opened tidal embayment at Sonoma Baylands (COE and others 1996), and would similarly be expected at Bel Marin Keys. Tidal wetlands and

55 he following is based in part on the Draft EIR/EIS for Bel Marin Keys Unit 5, ESA 1993.

56 *Federal Register* No. 58:33212, June 16, 1993.

aquatic habitat on the Bay side of levees at both the Montezuma site and alternative sites are sensitive habitats.

The Bel Marin Keys site has characteristics similar to other successful marsh restoration sites around the Bay, with consistently high salinity levels, which result in greater predictability and less variability of vegetation establishment than in brackish marshes where freshwater and salt water mix. San Pablo Bay is known to have high rates of sedimentation, which would contribute to rapid marsh development with a high degree of predictability when tidal circulation is restored. Given similar designs, the Bel Marin Keys site differs from the Montezuma site in having a higher degree of predictability regarding the establishment of ecological functions and values that are locally associated with tidal wetlands in these two distinct regions of the San Francisco Bay Estuary. Generally, lower elevations in marsh restoration result in more certain outcomes, because natural sedimentation occurs over time to reach optimum marsh elevations. At Montezuma, the "natural" development of tidal wetland functions and values is less certain, but this uncertainty is largely overcome by project design and mitigation measures. In the Montezuma Project, higher elevations are designed by the Project Applicant to restore pickleweed habitat for the SMHM. Restoration of SMHM habitat is not required on the Bel Marin Keys site, since no SMHM has been documented onsite, and because pickleweed habitat for SMHM would probably dominate any high marsh in San Pablo Bay.

As for the Proposed Project, impacts and corresponding mitigation measures are grouped within certain key issue areas below.

Release of Contaminants

The applicability of impacts and mitigation measures previously described for the Proposed Project in section 6.8.3.1 is as follows (refer to section 6.8.3.1 for details):

- Impact and mitigation measure P-BIO-1a are directly applicable to this alternative.
- Impact and mitigation measure P-BIO-1b do not apply to this alternative because the design for the Bel Marin Keys site does not involve elements for which periodic drying out of the surface layers would be necessary.
- Impact and mitigation measure P-BIO-1c would be generally applicable, with provision for monitoring contaminants in locally occurring plants and invertebrates of northern San Pablo Bay.

Ecological Value and Function

Impacts differ in some respects from those that would occur at the Montezuma site. Impacts similar to P-BIO-2a, P-BIO-2c, and P-BIO-2e apply to the Bel Marin Keys site, and the reader is referred to discussions of these impacts in section 6.8.3.1 for additional detail. Impacts P-BIO-2b and P-BIO-2d for the Proposed Project do not apply to this alternative. Following are descriptions of the impacts and corresponding mitigation measures that would apply to this alternative.

Impact 3-BIO-2a: Tidal wetland restoration at the Bel Marin Keys site would result in losses of existing seasonal wetland habitats and associated ecological functions and values. (County-S, Corps-S)

Mitigation Measure 3-BIO-2a: To offset temporary losses of wetland functions and values water management focused on providing interim wetlands enhancement in unfilled project phases shall be incorporated into the Project. Unfilled areas shall be managed to provide seasonal wetland habitat values for shorebirds and waterfowl. Water management shall consist of operating existing pumps and drainage structures to control the extent and duration of seasonal flooding, and shall start during construction and continue during the period of sediment placement, but shall be terminated prior to construction within that phase. If necessary to mitigate seasonal wetland habitat losses, seasonal wetlands could be incorporated into a revised project design for this site. (LS)

Impact 3-BIO-2c: Using dredged materials that are excessively sandy could slow the establishment of wetland vegetation, which could also increase erosion and reduce the effectiveness of contaminant containment. (County-S, Corps-S)

Mitigation Measure 3-BIO-2c: To foster successful plant establishment and limit contaminant mobility, cover sediments placed above non-cover sediments should have a maximum sand content of 15%, while elsewhere on the site, the top 1 foot should include a maximum of 73 percent sand and 6 percent gravel. (LS)

Impact 3-BIO-2e: The attainment of restoration and mitigation objectives is uncertain without the development and implementation of a comprehensive monitoring plan that includes monitoring, reporting, and verification procedures, performance criteria, and contingencies. (County-S, Corps-S)

Mitigation Measure 3-BIO-2e: A comprehensive monitoring plan shall be finalized with the approval of permitting agencies prior to project implementation. The monitoring plan shall include the methodology by which physical, chemical, and biological parameters shall be measured to establish the attainment of project goals. Biological parameters to be measured shall be compared with reference conditions in other San Pablo Bay tidal marshes and shall include at a minimum vegetation structure and composition in the landscape elements that are part of the design; the use of constructed channel habitats by fishes; and bird use of constructed habitats. The plan shall include reporting and verification procedures and contingency measures. (LS)

Special Status Species

These impacts are specific to this alternative, as follows:

Impact 3-BIO-3: This alternative could result in adverse impacts to special status species, including SMHM and California clapper rail in tidal salt marsh outboard of the perimeter levee and special status fish species that may be entrained in pumps at the offloading facility. (County-S, Corps-S)

Dredged material disposal at Bel Marin Keys would not result in the loss of known SMHM or California clapper rail habitat. These species, however, are expected to occur in tidal salt marsh along the outboard perimeter levee slope that descends gradually to the Bay mudflat. They could, as a result, be impacted by levee breaching and excavation as may be necessary to ensure adequate tidal flushing of the restored wetland. Clapper rail breeding activities may also be disrupted if the slurry pumps are located in close proximity to active nests. Operation of the pumps at the offloading facility would entrain fish, including special status species that migrate through San Pablo Bay.

No plant candidate species (federal or state) have been documented within the potential fill area at Bel Marin Keys. Marsh gum plant (CNPS List 4) has been documented in the tidal marsh margin outboard of the boundary levees. This species is outside of the potential fill area, and is unlikely to be impacted.

> Mitigation Measure 3-BIO-3: Levee breaches and sediment pumps should be sited to avoid known clapper rail breeding territories and areas of high-quality salt marsh. During the construction and dredged sediment placement phases, fish screens shall be provided at intakes and outlets to reduce impacts to adults. Impacts to eggs, larvae, and juveniles shall be minimized to the extent practical by not pumping or diverting water during the spawning season. The design and operation of fish screens shall be in accordance with NMFS requirements. (LS)

Mosquitos

No impacts related to mosquito production have been identified for this alternative.

Beneficial Impacts

Impact 3-BIO-5: The successful restoration of extensive tidal mudflats and salt marsh would provide significant ecological benefits to fish and wildlife, including the endangered California clapper rail, black rail, and salt marsh harvest mouse, and to San Pablo Bay wetlands as a whole. (County-NA, Corps-S)

Beneficial impacts require no mitigation.

6.8.3.5 Alternative 4: The Hamilton Site

This alternative would be similar in environmental consequences to Alternative 3. With a smaller site, and fewer acres of jurisdictional wetlands, impacts would be reduced in magnitude. Up to 12 acres of wetland habitat on the airfield could be eliminated. An unknown area of existing tidal marsh could be affected, but it is assumed that the sediment transport pipeline and pumps would be located at the southern corner of the site, where existing marsh is minimal. Approximately 355 acres of upland grassland habitat would be displaced.

No rare, threatened, or endangered plant or animal species have been documented within the boundaries of the Hamilton site. The burrowing owl, a state species of special concern, is known to exist along the edges of the runway at the Hamilton airfield. In addition, several special status species have the potential of occurring at the Hamilton site. Tidal wetlands in the area are known to support both endangered California clapper rail and black rail populations. Restoration of the Hamilton site would contribute significantly to the recovery of these species. However, breaching of the outboard levees and dredging of the inlet channel could adversely affect these species, which were observed in the saltmarsh outside of the eastern levee (U.S. Army Corps of Engineers 1996).

Fish entrainment, including endangered and special status species, could occur from pumping San Pablo Bay water for making dredged sediments slurry. The waters of San Pablo Bay are designated as critical habitat for the winter-run chinook salmon. Water diversions have been identified as an activity that can affect critical habitat.

As for alternatives previously discussed, impacts and corresponding mitigation measures are grouped within certain key issue areas below.

Release of Contaminants

The applicability of impacts and mitigation measures previously described for the Proposed Project in section 6.8.3.1 is as follows (refer to section 6.8.3.1 for details):

- Impact and mitigation measure P-BIO-1a are directly applicable to this alternative.
- Impact and mitigation measure P-BIO-1b do not apply to this alternative because the design for the Hamilton site does not involve elements for which periodic drying out of the surface layers would be necessary.
- Impact and mitigation measure P-BIO-1c would be generally applicable, with provision for monitoring contaminants in locally occurring plants and invertebrates of northern San Pablo Bay.

Ecological Value and Function

Impacts differ in some respects from those that would occur at the Montezuma site. Impacts similar to P-BIO-2a, P-BIO-2c, and P-BIO-2e apply to the Hamilton site, and the reader is referred to discussions of these impacts in section 6.8.3.1 for additional detail. Impacts P-BIO-2b and P-BIO-2d for the Proposed Project do not apply to this alternative. Following are descriptions of the impacts and corresponding mitigation measures that would apply to this alternative.

Impact 4-BIO-2a: Tidal wetland restoration at the Hamilton site would result in losses of existing seasonal wetland habitats and associated ecological functions and values. (County-S, Corps-S)

> Mitigation Measure 4-BIO-2a: To offset temporary losses of wetland functions and values water management focused on providing interim wetlands enhancement in unfilled project phases shall be incorporated into the Project. Unfilled areas shall be managed to provide seasonal wetland habitat values for shorebirds and waterfowl. Water management shall consist of operating existing pumps and drainage structures to control the extent and duration of seasonal flooding, and shall start during construction and continue during the period of sediment placement, but shall be terminated prior to construction within that phase. If necessary to mitigate seasonal wetland habitat losses, seasonal wetlands could be incorporated into a revised project design for this site. (LS)

Impact 4-BIO-2c: Using dredged materials that are excessively sandy could slow the establishment of wetland vegetation, which could also increase erosion and reduce the effectiveness of contaminant containment. (County-S, Corps-S)

> Mitigation Measure 4-BIO-2c: To foster successful plant establishment and limit contaminant mobility, cover sediments placed above non-cover sediments should have a maximum sand content of 15%, while elsewhere on the site, the top 1 foot should include a maximum of 73 percent sand and 6 percent gravel. (LS)

Impact 4-BIO-2e: The attainment of restoration and mitigation objectives is uncertain without the development and implementation of a comprehensive monitoring plan that includes monitoring,

reporting, and verification procedures, performance criteria, and contingencies. (County-S, Corps-S)

Mitigation Measure 4-BIO-2e: A comprehensive monitoring plan shall be finalized with the approval of permitting agencies prior to project implementation. The monitoring plan shall include the methodology by which physical, chemical, and biological parameters shall be measured to establish the attainment of project goals. Biological parameters to be measured shall be compared with reference conditions in other San Pablo Bay tidal marshes and shall include at a minimum vegetation structure and composition in the landscape elements that are part of the design; the use of constructed channel habitats by fishes; and bird use of constructed habitats. The plan shall include reporting and verification procedures and contingency measures. (LS)

Special Status Species

These impacts are specific to this alternative, as follows:

Impact 4-BIO-3: This alternative could result in adverse impacts to special status species, including SMHM and California clapper rail in tidal salt marsh outboard of the perimeter levee, burrowing owls nesting around the abandoned airfield, and special status fish species that may be entrained in pumps at the offloading facility. (County-S, Corps-S)

Dredged material disposal at Hamilton would not result in the loss of known SMHM or California clapper rail habitat. These species, however, are expected to occur in tidal salt marsh along the outboard perimeter levee slope that descends gradually to the Bay mudflat. They could, as a result, be impacted by levee breaching and excavation as may be necessary to ensure adequate tidal flushing of the restored wetland. Clapper rail breeding activities may also be disrupted if the slurry pumps are located in close proximity to active nests. Operation of the pumps at the offloading facility would entrain fish, including special status species that migrate through San Pablo Bay.

No special status plant species (federal or state) have been documented within the potential fill area.

Mitigation Measure 4-BIO-3: Levee breaches and sediment pumps should be sited to avoid known clapper rail breeding territories and areas of high-quality salt marsh. The Project Applicant shall survey the site to confirm the presence or absence of nesting burrowing owls prior to initiation of any fill operations. If active nests are found within the fill area, impacts shall be mitigated as for the Proposed Project. During the construction and dredged sediment placement phases, fish screens shall be provided at intakes and outlets to reduce impacts to adults. Impacts to eggs, larvae, and juveniles shall be minimized to the extent practical by not pumping or diverting water during the spawning season. The design and operation of fish screens shall be in accordance with NMFS requirements. (LS)

Mosquitos

No impacts related to mosquito production have been identified for this alternative.

Beneficial Impacts

Impact 4-BIO-5: The successful restoration of extensive tidal mudflats and salt marsh would provide significant ecological benefits to fish and wildlife, including the endangered California clapper rail, black rail, and salt marsh harvest mouse, and to San Pablo Bay wetlands as a whole. (County-NA, Corps-S)

The above impacts are beneficial requiring no mitigation.

6.8.3.6 No-Project Alternative

The Montezuma Project site was once tidal marsh. The site is currently diked and heavily disturbed by cattle grazing and past land use practices. The site has been subject to, and will continue to be subject to, subsidence associated with the aerobic decomposition of peat. In the future, as subsidence continues, the site will require increasing effort to effectively drain and pump it, and is therefore not sustainable in the long-term.

The site currently provides some wildlife value, supporting SMHM, raptors, seasonal use by shorebirds, waterfowl, and passerines. None of these biological resources are managed and are therefore highly influenced by environmental changes and human impacts. In particular, SMHM are susceptible to local extirpation by flooding. However, the site has been inundated during extended heavy rainfall events, but SMHM populations apparently recolonize the area after such events. With this alternative it is likely that as the site subsides SMHM will be subject to increased periods of inundation. .

Benefits to wildlife species that would result from the Proposed Project and alternatives would not occur with the No-Project Alternative.

6.8.3.7 Cumulative Impacts

The cumulative impacts of the Proposed Project and the project alternatives would be generally the same except for effects on endangered species of tidal wetlands. The development of wetland restoration projects throughout the San Francisco Bay area has the potential to significantly increase tidal wetland habitat that has been largely eliminated over the previous 100 years. These conversions have resulted in loss of valuable wildlife habitat and ecological function and values associated with natural tidal wetlands. If successful, tidal marsh restoration projects would provide habitat for numerous threatened and endangered and special status plant, fish and wildlife species. However, because of the uncertainty of success in large marsh restoration projects and the potential for release of contaminants to the environment, significant cumulative adverse impacts could result for existing and future plant and wildlife populations if contaminants entered the food chain. Mitigating these impacts requires a comprehensive approach as has been developed for the Proposed Project, incorporating design features to minimize the release of contaminants, monitoring of potential contaminant pathways, and contingency measures. If losses of seasonal wetland habitat substantially diminished available habitat in the region for the species dependent on this habitat, there could be significant impacts.

The Novato alternatives (Bel Marin Keys, Hamilton) have relatively low risks and high potential benefits for two endangered species, the SMHM and California clapper rail. These benefits are further improved given the existence of additional habitat for these species in the vicinity of the alternative sites. By restoring tidal marsh habitat at the alternative sites, a large semi-contiguous habitat area could be created near the center of known range for these species. The Montezuma site alternatives have moderate to high

risks for SMHM, and if successful, provide habitat near the range boundary for this species. While the Montezuma alternatives have relatively high possible benefits for endangered winter-run chinook salmon, threatened delta smelt, and federally proposed as threatened Sacramento splittail, there are no tidal marsh restoration projects in the project vicinity from which to gauge the level of risk. Thus, the balance of cumulative impacts on endangered species differs among alternatives.

The relatively high number of successful restoration projects in the Novato area, coupled with the regional location relative to habitat distribution of two special status species, CCR and SMHM, suggest that wetland restoration projects in this area would provide a greater cumulative impact relative to recovery for these species. The proposed project, while likely to provide habitat for three special-status fish species in a region currently experiencing minimal appropriate habitat restoration projects, cannot draw upon data (as no relevant data exists) to confidently determine the risk associated with fish habitat restoration. Furthermore, while SMHM habitat restoration, if successful, would provide high quality habitat less prone to stochastic seasonal variability, this habitat would be at the range boundary, and thus relatively less valuable in the long-term for the species' recovery.

6.9 Cultural Resources

6.9.1 Affected Environment

6.9.1.1 The Montezuma Site

The following sections summarize the ethnography, history, and cultural resources (pre-historic and historic) associated with the Montezuma site. Refer to Appendix K for additional detail.

Ethnography

The Montezuma Project area was probably occupied at the time of historic contact by Spanish missionaries and explorers by the Bay Miwok peoples, specifically the *Ompin* tribelet of the Bay Miwok.[1] The Miwok spoke a language that is now considered one of the major subdivisions of the Utian language family. Their neighbors to the immediate north and west were the Wintuan-speaking *Patwin*. Although there is some controversy as to whether more than one group occupied the Montezuma Hills portion of the Project area,[2] the Bay Miwok appear to have held the territory within the past several centuries based upon analysis of historic Spanish ethnographic accounts and early maps.[3]

The Miwok comprised a group of people that were united by language but broken into tribelets that were independent political entities, each occupying defined territories over which they controlled access to natural resources. Although each tribelet had one or more permanent villages, their territory contained numerous smaller camp sites that were used as needed during a seasonal round of resource exploitation.

Principal villages in the Delta were established on natural mounds to elevate living areas above the general flood zones. The Bay Miwok village nearest the Montezuma Project area was *Ompin*, after which the tribelet is named, located along the Sacramento River between Collinsville and Rio Vista.[4]

The historic shoreline is located at about the current 10-foot contour elevation, with all the land below that elevation consisting of marsh. It is notable that several small islands of higher elevation are apparent in the southern portion of the Project area. It is these "islands" that would have been attractive to native populations as burial or occupational sites.

The arrival of the Spanish in the San Francisco Bay Area in 1775 led to the rapid demise of native populations in the Delta and surrounding areas. Diseases introduced by early expeditions and missionaries killed a large number of local peoples, exemplified by a mass burial of 18 individuals adjacent to the Hotchkiss Mound site.[5]

By the early 19th Century, the Indians were being forced to work for the Missions. With abandonment of the Mission system and Mexican takeover in the 1840s, numerous *ranchos* were established. What few Indians remained were then forced, by necessity, to work for the *ranchos*. The native lifestyle in the Delta area and much of northern California ceased to exist by the mid-19th Century, and most of the native population vanished with it.

1 Levy 1978:399.
2 Johnson 1978:351; Bennyhoff 1977:146.
3 Bennyhoff 1977; Levy 1978:399.
4 Bennyhoff 1977: Map 2.
5 Heizer, 1954.

History

The history of Northern California, Solano County, and the Project area in particular can be divided into several periods of influence. For the purposes of establishing a basis from which to assess the potential significance of historic sites in the Montezuma Project area, the various periods are defined below.

- Spanish Period (1542-1822)
- Mexican Period (1822-1848)
- American Period (1848-present)

Events associated with the Spanish and Mexican periods, and cultural remains from those periods, are not expected to be reflected in the Montezuma Project area. The various specific historic aspects of the American Period in the Montezuma Project area range from initial Anglo settlement, about 1846, to most recent use of the southern part of the Project area as a cattle stockyard.

Of great importance to the history of the southern portion of the Montezuma Project area was the development of a large livestock and ranching operation by Emery Upham, beginning in 1865. His ranching complex was located just north of Collinsville on both sides of Collinsville Road. Although most of the buildings associated with early development by Upham are no longer intact, by 1870 he held title to 6,500 acres of slough and hill property.

Upon Emery Upham's death in 1897, the majority of his land was divided and sold to individual Montezuma-area ranchers. A large parcel of Upham land was purchased by the Orphan Home of the Independent Order of Good Templars. This land was never utilized by the Order, with title changing to A.M. Merrill by 1912.[6] Merrill's ownership of the land proved to have additional, more significant effects on the landscape of the southern portion of the Montezuma Project area.

Construction of the Oakland-Antioch-Eastern Railroad line connecting Sacramento and Oakland permitted the previously "land-locked" Montezuma area, reliant on river steamer and overland carriage for transport, to have ready access to major markets for livestock, dairy and produce. The rail line, which became the Sacramento Northern Railroad in the 1930s, ceased its passenger service in 1940, but continued to haul livestock for McDougal Livestock Company until 1957. Two railway stations were located within or immediately adjacent to the Montezuma Project area: Molena Station, just north of Dinkelspiel Road, and Montezuma Station, in the middle of the Project area north of the Fire Truck Road.

Merrill's Montezuma Ranch, located adjacent to the original Upham Ranch, west of Collinsville Road and north of Stratton Lane (immediately south of Fire Truck Road), originally attempted to grow sugar cane and cotton, but yields were uneconomical, as were attempts to raise hogs. The ranch rapidly settled on beef cattle as a principal business, and became the site of a nearly 60-year-long succession of cattle stockyard and ranching operations.[7]

The names of the various cattle operations at Montezuma Ranch changed over the years: B.B. Company (1930s), Fontana Farms (part of the Miller and Lux cattle empire, 1930s), Baby Beef (1940s), and McDougal Livestock Company (1950s). Up to 50,000 head of cattle were penned annually at the

6 California Department of State, 1914.

7 TCR 1980:154.

Collinsville facility at its peak,[8] and the remains of the operation are visible throughout the area in the form of mostly collapsed buildings, feed and watering areas, cattle loading facilities at the rail line, and wood-rail fences.

It is reported that many of the local residents worked in some capacity for the cattle yard, and the cattle operation purchased locally-grown feed, in addition to importing feed. McDougal Cut was created as a means of off-loading cattle and feed from barges. Another, large man-made sump created to store sugar beets is visible today immediately north of McDougal Cut. The Cut is used today for material handling as part of Jerico Towing Company sand and oyster shell operations.

Cultural Resources

Cultural resource investigations conducted on the Montezuma site are described in Appendix K, which includes descriptions of the resources found in site surveys.

On July 6, 1992, a record search was conducted at the California Archeological Inventory's Northwest Information Center at Sonoma State University. All known archeological sites and previous cultural resource surveys within one mile of the Montezuma Project boundary were identified on topographic maps of the area. In addition, several sources were examined to determine if any County, state, or federal historic landmarks or National Register of Historic Places properties were located in the Project area.

Through the records search, it was found that only one prehistoric archaeological site (CA-SOL-34) was known to exist within the Project area. Numerous historic resources are recorded outside the Project boundary near Collinsville and adjacent to Collinsville Road from Bird's Landing south. Only two historic sites that exist within the Montezuma Project area were reported in the findings. These are the Molena Railroad Station and the Montezuma Railroad Station. An archaeological Site Record was prepared for the Molena Station, and it was assigned the permanent trinomial CA-SOL-290H. Neither an archaeological site record nor a trinomial was found for the Montezuma Station, although the survey report indicates it is a historic resource.[9] Appendix K provides additional detail.

An intensive field survey of portions of the Montezuma Wetlands Project area was conducted between July 10 and 20, 1992. The strategy was to conduct a 100 percent survey of all portions of the Project area that existed at or above the 0-foot contour elevation as shown on 1:400 scale (1985) photogrammetric survey-generated contour maps of the area provided by the Project Applicant. In addition, about 25 percent of the lowland portion of the Project area (lying at or below the 0-foot elevation), levee margins, and the locations of any structures depicted on historic maps were also surveyed.

Thirteen historic sites were discovered during the survey, as described in Appendix K. These sites include a variety of artifacts, such as pump houses, the rail depot and tracks, machinery, water pipe, glass, ceramics, cans, bottles and remnants of a structure with a hay baler and thrasher. Six of the historic sites date from the Upham Ranch period (ca. 1865-1897), four date from land reclamation and levee construction (ca. 1875-1930s), two date from the Montezuma Ranch (ca. 1929-present), and one is associated with the Oakland-Antioch-Eastern Railroad and Montezuma Station (1913-1927). The railroad depot (part of CA-SOL-377H) is part of the Oakland-Antioch-Eastern Railroad Company, which was extended to the site in 1913. These historic deposits include residential refuse (glass bottles and fragments,

8 Levine Fricke 1991.

9 TCR 1980:191.

ceramics, tin cans, bones), structural elements (pumphouse, wood, concrete pads, railroad tracks, trestles), and agricultural implements (hay baler, thrasher) that illustrate the changing land uses at the site over time.

The sites are associated with a major use of the area in the 20th century and are representative of a regional development during this time in the Sacramento Valley. Archival research would be required to determine whether these surviving remains are unique to the region. The subsurface extent of the archaeological sites is unknown. The sites are considered potentially significant under National Register of Historic Places criteria A, B, C, or D and CEQA Appendix G(j), and CEQA Appendix K (not to be confused with Appendix K to this document) criterion A that follow.

NATIONAL REGISTER CRITERIA

A significant cultural resource has integrity and contains one of the following qualities:

A. Is associated with events that have made a significant contribution to the broad patterns of history; or

B. Is associated with the lives of persons significant in the past; or

C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, posses high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Have yielded, or may be likely to yield, information important in prehistory or history.

CEQA APPENDIX K, ARCHAEOLOGICAL RESOURCES

An important, or significant, archaeological resource is one that:

A. Is associated with an event or person of:

1. Recognized significant in California or American history; or
2. Recognized scientific importance in prehistory.

6.9.1.2 The Bel Marin Keys Site

Ethnographic Resources

The site is situated within the former territory of the Coast Miwok who inhabited Marin and Sonoma counties about 5,000 years ago. These early inhabitants relied heavily on the resources associated with San Pablo Bay and associated marshes and estuarine environments. Several cultural sites associated with past use can be found within one quarter mile (and generally inland) of this site, most of which are situated above the historic marshlands. The Coast Miwok village of *puyuku* is situated within one mile of the site.

Historic Resources

It is presumed that the earliest Coast Miwok contact with Europeans began in the late 1500s with the voyages of Drake and Cermeno. Missionization beginning in the late 1700s forced Native Americans to convert to Christianity. This resulted in population displacement and cultural disintegration. Epidemics further reduced native populations. After Mexico gained its independence from Spain, a series of land claims were granted to the *Californioc* (California citizens of Mexican descent). Rancho San Jose, within

which the site is contained, was granted to Ignacio Pacheco. Livestock grazing associated with the rancho was the predominant agricultural pursuit at that time. With railroad development in the 1870s, Novato and Ignacio became viable agricultural communities. Levee construction and land reclamation of the 1890s increased agricultural options. When the California Packing Company (now Del Monte) took over the property in the late 1920s, agricultural use was pursued in earnest. Cal Packing raised sugar beets, peas, and other crops, and bred horses that were also used in farm work. Irrigation necessary for this large-scale operation was provided by on-site wells, which have since been abandoned due to salt water intrusion. Agricultural use of the property still occurs but is limited to dry farming of oat hay.

Several historic structures associated with agricultural use of the property are located over one mile from the wetland restoration site, including the main house on Headquarters Hill, built prior to 1876 and presumed to have been erected by the Pacheco family. Other structures are present within the site and some are still used for agricultural purposes, most having been constructed in the 1940s. The pumphouse near San Pablo Bay indicated on the USGS Petaluma Point quadrangle appears to be of an earlier vintage, and could be historic (over 50 years old). Implementation of Alternative 3 would require construction of a new diesel-fueled booster pump next to the pumphouse, which could involve the removal of the older facility.

6.9.1.3 The Hamilton Site[10]

Prehistoric Resources

According to data contained at the Northwest Information Center of the California Archaeological Inventory, there are no known archaeological properties within this area. The airfield, located in a floodplain of San Pablo Bay, has been surveyed and is of low archaeological sensitivity. The airfield has been leveled and paved numerous times since its initial construction. Those portions of the airfield near the Bay have been investigated by private contractors and Army Corps of Engineers staff and do not contain archaeological sites.

Historic Resources

Hamilton Army Airfield is part of the former Hamilton Air Force Base which was originally authorized in 1932, built in 1933-34, and dedicated in 1935. Hamilton Air Force Base was named after Lt. Lloyd Hamilton, the first American to fly with the British during World War I. The base was deactivated by the Air Force in 1974 and turned over to the General Services Administration (GSA) who administered it as surplus. In 1975, GSA transferred the family housing areas of the base, including the Post Exchange, Commissary, Theater, and other recreation facilities to the Department of Defense Housing (Navy). These areas are maintained as housing for active duty military and USCG personnel and their families. This left 1,653.5 acres of the original Base designated as surplus.

A number of studies have evaluated the cultural resources located on the airfield as part of the airfield closure environmental assessment (EA) (Jones and Stokes Associates 1991) and an EA prepared for the conveyance of outparcel properties to the New Hamilton Partners (COE 1995a). These studies have identified two periods of historical significance at Hamilton Field: between 1931 and 1935, when permanent airfield facilities were constructed and the air base was established as a strategic component of

10 Cultural resources information in this section is based on a report prepared by PAR Environmental Services (PAR 1989).

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west coast air defense; and between 1938 and 1946, when the air base was substantially expanded to serve as a staging area for World War II air transport and a post-war re-entry facility. Components of the air base constructed during these periods, including the airfield runway and adjacent structures, have been identified as the Hamilton Historic District that have retained to varying degrees integrity of location, setting design, workmanship and materials, and feeling or association with the time between 1931 and 1946 when they were constructed and used most intensively. As a result, they have been determined eligible for the National Register of Historic Places under 36 CFR 60.4 criteria.

The conveyance of outparcels to the New Hamilton Partners was considered to be an adverse effect on the Hamilton Historic District. A memorandum of agreement was executed between the Army and the State Historic Preservation Office (SHPO) in 1994 that includes numerous mitigations to reduce the adverse effect to less than significant levels, including historical documentation (video, written, and photographic), preparation of a Novato Historical Guild museum interpretive plan and display, and conducting interviews with key personnel formerly stationed at the air base (oral history) (COE 1995a).

6.9.2 Environmental Impacts and Mitigation Measures

6.9.2.1 Proposed Project

Prehistoric Resources

Evidence of prehistoric occupation within the Montezuma Project area is limited, but includes two documented sites. CA-SOL-34, recorded initially in 1956 (after its destruction), consisted of a low mound containing artifacts and human burials. SOL-ISO-20, recorded during surveys for the Montezuma Wetlands Project, consists of a single, isolated, serrated obsidian projectile point and associated nearby Tule Elk bone fragments.

The kinds of prehistoric artifacts and features that might be discovered in the Project area include flaked obsidian and cryptocrystalline stone tools and fragments, dietary shell and bone debris and artifacts, ground stone, fire-cracked rock, and midden (dark, organic soil laden with shell and artifacts indicative of intensive occupation). The fact that such materials were not observed during the field survey for the Project can be attributed to the following:

- A lack of occurrence in the area (although not likely);
- Vegetative cover (primarily introduced grasses); or
- The possibility that such resources are buried beneath varying amounts of fill resulting from manmade and natural causes over the intervening years since deposition of the cultural materials.

Impact P-CULT-1: Grading and excavation in areas of historic and prehistoric uplands have the potential to impact buried cultural resource sites. (County-S, Corps-S)

The Project no longer proposes a topsoil salvage program, and the extent of excavation in uplands is limited. The upland environment in the Project area is known to have been the historic edge of the tidal marsh. Lands below the 10-foot contour are likely to have been tidal marsh, with a concurrent low potential to contain significant cultural resources. It is well documented that marsh-edge habitat, especially sand mounds in such an environment, served as occupational and burial sites in prehistoric times. Such sites may have been covered with accumulations of soil due to natural and manmade conditions since the time of their original deposition; vegetative cover during survey also limited the amount of ground surface

visible at any time, thereby reducing the possibility of observation. Any prehistoric sites located in this setting have the potential to yield information of importance on settlement, subsistence, funerary customs, and other important aspects of prehistoric life.

> Mitigation Measure P-CULT-1: If potentially significant archaeological resources are identified, construction shall be temporarily redirected until the materials can be evaluated pursuant to state and federal guidelines. A Programmatic Agreement (PA) shall be developed between the Applicant, Solano County, and the Corps of Engineers that provides specifications of this process. The Corps' archaeologist shall make determinations regarding resource significance, and consult with the SHPO on appropriate mitigation. (LS)

Impact P-CULT-2: Given the high potential for cultural resources on the site, previously unidentified human remains could be discovered during construction of the Project. (County-S, Corps-S)

The Proposed Project has the potential to impact previously undiscovered cultural resources of the prehistoric period. Of the two known resources in the Project area, CA-SOL-34 was recorded to have been entirely destroyed during the 1940s and 1950s, and no indications of it were observed during the field survey. Isolate CA-SOL-20 was collected in its entirety.

> Mitigation Measure P-CULT-2: In addition to mitigation measure P-CULT-1, in the event that potential human remains are encountered, the materials shall be subject to section 7050.5(b) of the California Health and Safety Code and Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601; 104 Stat. 3048). The representatives onsite shall be members of the tribe most likely to have descended from those individuals prehistorically inhabiting the Project site.

Impact P-CULT-3: The construction of the proposed public access south of Fire Truck Road could disrupt buried artifacts. (County-S, Corps-S)

Archaeological reconnaissance has indicated that this area contains mounding characteristics of upland soils which are associated with buried Indian artifacts; construction of the access area could disrupt such artifacts if they exist.

> Mitigation Measure P-CULT-3: In addition to mitigation measure P-CULT-1, no grading or excavation shall be done to construct the access area. Fill shall be used to create a level public access area. Buried artifacts, if present, shall remain intact following the completion of construction, and thus will not be adversely impacted. A detailed public access plan which shows existing topography, proposed topography, and proposed improvements shall be prepared and submitted to the County for review and approval prior to commencement of any public access construction. (LS)

Historic Resources

The cultural resource survey undertaken in the Montezuma Wetlands Project area resulted in the discovery of 13 historic-era cultural sites (Appendix K). These sites vary in age and historic association.

Impact P-CULT-4: Use of the Project site would affect historical features that are considered potentially eligible for inclusion on the National Register of Historic Places and are potentially significant under CEQA Appendix K criteria. (County-S, Corps-S)

The following measure is based on the federal *Principles in the Treatment of Archaeological Properties* developed by the Advisory Council on Historic Preservation and CEQA Appendix K, Archaeological Resources, mitigation procedures.

> Mitigation Measure P-CULT-4: In addition to mitigation measure P-CULT-1, if avoidance of any prehistoric or historic site is infeasible, a Programmatic Agreement (PA) shall be developed among the Applicant, Solano County, and the Corps of Engineers. The PA shall incorporate relevant federal, state, and local guidelines for performing the phased data recovery of impacted cultural resources, including significant assessment, mitigation, and evaluation and treatment of unexpected resources encountered during construction. (LS)

6.9.2.2 Alternative 1: Managed Wetland

A non-tidal wetland on the Montezuma site would have essentially the same impacts on cultural resources as the Proposed Project. Please refer to the previous section for description of impacts and applicable mitigation measures.

6.9.2.3 Alternative 2: Combined Wetland

This alternative would have essentially the same impacts on cultural resources as the Proposed Project. Please refer to section 6.9.2.1 above for description of impacts and applicable mitigation measures.

6.9.2.4 Alternative 3: The Bel Marin Keys Site

Prehistoric Resources

Impact 3-CULT-1: Implementation of this alternative could have an adverse effect on previously undocumented archaeological or historical materials that could be discovered during construction. (County-S, Corps-S)

Though no documented cultural resources are located at the Bel Marin Keys site, the site has not been systematically evaluated by archaeologists. Construction on the site could disturb previously undisturbed cultural resources.

> Mitigation Measure 3-CULT-1: The site area shall be systematically investigated by a qualified archaeologist, and any cultural resources discovered shall be evaluated for potential significance. The Corps' archaeologist shall make determinations as to significance and shall consult with the State Historic Preservation Office (SHPO) regarding appropriate mitigations, which shall be incorporated into the project design. If potentially significant archaeological resources are identified, construction shall be temporarily redirected until the materials can be evaluated pursuant to state and federal guidelines. A Programmatic Agreement (PA) shall be developed between the Applicant, Marin County, and the Corps of Engineers that provides specifications of this process. The Corps' archaeologist shall make determinations regarding resource significance, and consult with the SHPO on appropriate mitigation. (LS)

Historic Resources

Impact 3-CULT-2: Demolition of the existing pumphouse would constitute a significant loss of historic resources, if these buildings are eligible for the National Register of Historic Places. (County-S, Corps-S)

There are no previously recorded National Register sites or California Historical Landmarks situated within or immediately adjacent to the site. However, the pumphouse adjacent to San Pablo Bay associated with agricultural land uses could be significant.

> Mitigation Measure 3-CULT-2: In addition to mitigation measure 3-CULT-1, The pumphouse shall be evaluated by a qualified architectural historian to determine if it is eligible for the National Register. The Corps' archaeologist shall determine the significance of the resource and consult with the SHPO regarding appropriate mitigation. Procedures to preserve any eligible resource shall be integrated into a Programmatic Agreement (PA) between the Applicant, Marin County, and the Corps of Engineers. (LS)

6.9.2.5 Alternative 4: The Hamilton Site

Prehistoric Resources

Impact 4-CULT-1: Implementation of this alternative could have an adverse effect on previously undocumented archaeological or historical materials that could be discovered during construction. (County-S, Corps-S)

There are no known archaeological or cultural resources on the site. While the site is already excavated and disturbed by remediation activities, construction on the site could disturb previously undisturbed cultural resources.

> Mitigation Measure 4-CULT-1: A Programmatic Agreement (PA) shall be developed between the Applicant, City of Novato, and Corps of Engineers specifying procedures to be followed in the event that cultural resources are encountered during construction. Construction crews shall be instructed by the Project Applicant through conditions placed in the primary construction contract as to the potential to uncover archaeological or historic materials as part of land clearing and excavation activities. Should cultural materials be discovered during construction activities, the construction supervisor shall halt work immediately (within 100 feet of the find) and contact the Corps archaeologist for a determination of resource significance. The Corps archaeologist shall consult with the SHPO regarding appropriate mitigation. (LS)

Historic Resources

Selection of this disposal site would impact a portion of the airfield runway that is considered an element of the Hamilton Historic District. While the runway is currently used to stockpile contaminated sediments, the district has been evaluated pursuant to the Section 106 process and is considered eligible for listing on the National Register of Historic Places.

Impact 4-CULT-2: Potential dredge disposal and wetland creation would result in a significant impact on the Hamilton Historic District airfield runway. (County-S, Corps-S)

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Mitigation Measure 4-CULT-2: The Applicant shall enter into a Programmatic Agreement (PA) with the Corps and City of Novato to coordinate appropriate mitigation to complement current measures addressing adverse effects to the airfield runway. The PA shall include measures such as contributing to public interpretation of the airfield (i.e., as part of the Novato Historical Guild Museum and Army's mobile interpretative display), historical documentation, and written and photographic documentation for submittal to the Library of Congress, Historic American Building Survey. (LS)

6.9.2.6 The No-Project Alternative

The No-Project Alternative would have no impact on cultural resources.

6.9.2.7 Cumulative Impacts

Cultural resource impacts occur on a site-specific basis. Mitigation of site-specific cultural resource impacts through relocation, preservation, and documentation would eliminate the potential for adverse cumulative impacts from marsh restoration projects, and it would increase knowledge of the cultural resources associated with historic tidelands of Bay/Delta estuary.

6.10 Traffic, Access, and Circulation

6.10.1 Affected Environment

6.10.1.1 The Montezuma Site

Regional Access

The site is located approximately 17 miles southeast of the City of Fairfield and approximately 14 miles southwest of the City of Rio Vista in Solano County, California (see Figure 4.1-1). The site lies at the end of a two-lane road, 12 miles south of the only east-west highway (Highway 12) in the vicinity which connects Fairfield and Rio Vista. Highway 12 is a California State highway, maintained and operated by Caltrans. It is a rural, two-lane highway with a maximum speed limit of 55 mph. It serves as primary regional access to the Project area. The Highway serves through traffic and traffic originating in or destined for Fairfield and Rio Vista, as well as local traffic. Shiloh Road is the access route used by travelers from Fairfield and points west. Birds Landing Road is used by travelers from Rio Vista and other points east.

Local Access

Shiloh Road is a paved, rural, two-lane road which runs south from Highway 12 for approximately 11 miles, turns into Collinsville Road where it crosses Birds Landing Road, and terminates in the town of Collinsville. Collinsville Road, the primary access to the site, runs in a north-south direction directly east of the Project site. It is an improved, paved, two-lane road with a maximum speed of 45 mph. Most of the users of Collinsville Road include local residents who live mainly at the end of the road; visitors to the Birds Landing Hunting Preserve and Sporting Clays just north of the Project site; visitors to the DWR Day Use Area next to the Montezuma Slough; farmers with slow-moving agricultural equipment; and trucks picking up material from the Jerico Towing Company.

Two paved roads, Dinkelspiel Road and Fire Truck Road, enter the site from Collinsville Road. A series of interconnecting unpaved ranching roads located on private property provide vehicle access within the site. These roads are used for ranching and hunting club activities and occasional levee maintenance. They generally run next to or on the perimeter levee and site drainage ditches.

- *Dinkelspiel Road.* Dinkelspiel Road extends west from Collinsville Road, crosses the Sacramento-Northern railroad tracks, and terminates within the Project boundaries. It is a narrow road with one structure on it outside the Project boundary.
- *Fire Truck Road.* Fire Truck Road extends west from Collinsville Road and terminates at the Department of Water Resources Day Use Area on the banks of the Montezuma Slough. It is a paved, two-lane road that provides access to the Day Use Area and to a building used for agriculture operations. The DWR Day Use Area has 18 parking spaces.

Recent and Planned Roadway Improvements

According to the Solano County Public Works Department, the following roadway improvements have recently been completed or are planned in the near future for the Project vicinity.

- A new overpass over the Sacramento-Northern railroad tracks was recently completed near the Western Railway Museum on Highway 12.[1] This new overpass has replaced a narrow overpass and has increased safety in the area. No other improvements in this area of Highway 12 are planned by Caltrans in the near future.
- Shiloh Road was recently resurfaced between Little Honker Bay Road and Birds Landing Road, both of which are north of the Project site.
- Collinsville Road will be resurfaced in the near future. However, no increased capacity improvements are planned in the area.

Existing Traffic Conditions

Average Daily Traffic (ADT) counts on major roadways in the Project vicinity are based on 1990 Caltrans information for Highway 12 and County-conducted 24-hour traffic counts for local roadways. Given the rural nature of the Project area and the low density of development, the daily volume of traffic is generally light. Rural roads such as the ones in the Project vicinity have a capacity of approximately 4,000 ADT.[2] All intersections in the Project vicinity currently have a Level of Service of A.[3] The various levels of service are defined in Table 6.10-1. The following roadways are shown on Figures 4.1-2 and 4.2-2 of this document.

- *Highway 12.* The highest traffic volumes on regional roads within the general vicinity of the site occur on Highway 12. In 1990, Highway 12 had a peak hour average daily traffic volume (ADT) of 2,950 vehicles at the Grizzly Road/Highway 12 junction, a peak hour ADT of 1,550 vehicles at the Scandia Road/Highway 12 junction, and a peak hour ADT of 1,550 vehicles at the Birds Landing/Highway 12 junction.
- *Shiloh Road.* Traffic counts taken in 1990 indicated an ADT of 307 vehicles on Shiloh Road south of Highway 12. There was an ADT of 250 vehicles taken in 1979 on Shiloh Road west of Collinsville Road, and an ADT of 225 vehicles taken in 1984 on Shiloh Road south of Little Honker Bay Road.
- *Birds Landing Road (Route 113).* Traffic counts taken in 1990 indicate a northbound ADT of 158 vehicles and a southbound ADT of 135 vehicles on Birds Landing Road south of Highway 12. There was an ADT of 202 vehicles taken in 1990 on Birds Landing Road east of Collinsville Road, and an ADT of 48 vehicles taken in 1982 on Birds Landing Road west of Collinsville Road.
- *Collinsville Road.* Collinsville Road is the closest main road to the Project site and would be used for every vehicle trip into and out of the site. There was a 1990 ADT of 303 vehicles taken in 1990 on Collinsville Road south of Birds Land Road, an ADT of 290 vehicles taken at the same time on Collinsville Road south of Dinkelspiel Road, and an ADT of 139 vehicles taken in 1982 on Collinsville Road south of Talbert Lane. Talbert Lane extends east from Collinsville Road just north of the Fire Truck Road/Collinsville Road intersection.

1 Kaj Malthe, Solano County Public Works Department, verbal communication, August 3, 1992.

2 Kaj Malthe, Solano County Public Works Department, verbal communication, August 3, 1993.

3 Level of Service (LOS) measures the amount of congestion on a roadway at a specific time and is determined by dividing the volume of traffic by the roadway's capacity.

Table 6.10-1
Level of Service and Operating Speeds

Level of Service (LOS) Description	Approximate Operating Speeds	
	Multi-Lane Roads	Two-Lane Roads
A Free flow, low volume, and high	50 mph or more	57 mph or more speed
B Stable flow, operating speeds beginning to be restricted somewhat by traffic conditions	48-49 mph	54-56 mph
C Stable flow, speed and maneuverability are more closely controlled by the higher volumes	44-47 mph or more	51-53 mph
D Approaching unstable flow with tolerable operating speeds being maintained, though considerably affected by change in operating conditions	40-43 mph or more	49-50 mph
E Unstable flow, low speed, capacity	30-39 mph or more	40-48 mph
F Forced flow, low speed	Less than 30 mph	Less than 30 mph

Source: Transportation Research Board, National Academy of Sciences, National Research Council Highway Capacity Manual, 1985.

Vessel Traffic

Tugs and barges would access the site by way of the Sacramento River. The deep-water ship channel adjacent to the site is an important thoroughfare, providing commercial shipping access for the Port of Sacramento. Shallow-draft barges operated by the Jerico Products Company use McDougal Cut on average about 3 times per month to offload sand and oyster shells at their facility[4]. The Sacramento River in the vicinity of the site is used for fishing, which takes place year-round along the perimeter levee that abuts both the Sacramento River and the Montezuma Slough. Small beaches used for boat landing are located intermittently along the north shore of the Sacramento River, and recreational boating also occurs on Montezuma Slough and McDougal Cut. Recreational uses of the river are infrequent, however, due to the relatively sparse population in the area.

6.10.1.2 The Bel Marin Keys Site

Regional Access

The Bel Marin Keys site is located in an unincorporated area of northeastern Marin County. Regional highway access to the site is provided by State Route 37 and the Ignacio Boulevard Interchange on Highway 101. Highway 101 is a major north-south freeway with eight lanes near Bel Marin Keys. State Route 37 is an east-west highway consisting of four lanes. Nave Drive is a two-lane, north-south arterial paralleling Highway 101 on the east which provides site access.

4 Ray Leach, Jerico Products Company (Rio Vista), verbal communication, April 16, 1998.

Local Access

Main local access to the Bel Marin Keys area is provided by Bel Marin Keys Boulevard and a 12-foot wide dirt road extending across the site from the eastern terminus of Bel Marin Keys Boulevard. Bel Marin Keys Boulevard is a north-south collector which curves at Frosty Lane and extends in an east-west direction. It consists of four travel lanes from the Ignacio Boulevard/Highway 101 intersection to Digital Drive. Bel Marin Keys Boulevard narrows to two travel lanes from Digital Drive to its terminus within the existing Bel Marin Keys community. Industrial and office development are located along the four-lane segment. The two-lane segment is generally undeveloped except for the existing Bel Marin Keys residential development located at the terminus of this road.

Commercial Boulevard is an east-west cul-de-sac which provides two lanes into an office/industrial park off Bel Marin Keys Boulevard. Digital Drive is an east-west cul-de-sac which provides two travel lanes into an office/industrial park off Bel Marin Keys Boulevard. Parallel parking is permitted on either side of this roadway.

Existing Traffic Conditions

Traffic counts were conducted at five study area intersections during September of 1991 and February of 1990.[5] The intersections studied generally exhibit acceptable levels of service during both the a.m. and p.m. peak hours. Resulting levels of service are shown in Table 6.10-2 for the signalized and unsignalized intersections. One signalized intersection, Ignacio Boulevard and the Highway 101 northbound ramp, is operating at an unacceptable LOS E during the p.m. peak hour due to heavy southbound traffic from the office and industrial land uses located along Bel Marin Keys Boulevard. Each study intersection is described in more detail below.

- *Digital Drive and Bel Marin Keys.* This intersection functions at LOS B during the A.M. peak hour and LOS C during the P.M. peak hour.
- *Commercial Boulevard and Bel Marin Keys Boulevard.* This intersection functions at LOS C during the A.M. peak hour and LOS D during the P.M. peak hour. The P.M. peak hour V/C level of 0.89 is near LOS E operation. This results from heavy southbound through traffic generated by the surrounding industrial/office land uses and a steady flow of westbound left-turn vehicles.
- *Ignacio Boulevard and Northbound Highway 101 Off-Ramp.* This intersection functions at LOS E during the A.M. peak hour and LOS F during the P.M. peak hour. The peak hour traffic congestion is due to high volumes traveling to and from the Bel Marin Keys Boulevard industrial/office area.
- *Ignacio Boulevard and Southbound Highway 101 On- and Off-Ramps.* This intersection functions at LOS D during the A.M. peak hour and LOS C during the P.M. peak hour. Again, both morning and evening peak hour LOS is borderline, with a.m. LOS close to E and p.m. almost LOS D.
- *Nave Drive and Northbound Highway 101.* Both the northbound left-turn movements and eastbound right-turn movements operate at LOS A during the A.M. peak hour and the P.M. peak hour.

5 Existing volumes and capacities are from Appendix E of the Bel Marin Keys Unit 5 EIR/EIS, by Wilbur Smith Associates.

Table 6.10-2
Bel Marin Keys: Existing Intersections Levels of Service

Signalized Intersections	A.M. Peak Hour		P.M. Peak Hour	
	V/C[a]	LOS[b]	V/C	LOS
1. Digital Drive and Bel Marin Keys	0.61	B	0.79	C
2. Commercial Blvd. and Bel Marin Keys	0.72	C	0.89	D
3. Ignacio Blvd. And NB US 101 Off-Ramp	0.90	E	0.99	F
4. Ignacio Blvd. And SB US 101 Ramps	0.88	D	0.79	C
5. Nave Drive and NB US 101 Off-Ramp	0.39	A	0.44	A

a V/C = Volume-to-Capacity Ratio
b LOS = Level-of-Service (see Table 6.10-1)
Source: Wilbur Smith Associates, September 1991.

Vessel Traffic

Novato Creek is on the northern boundary of this site. The waterway is a significant vessel thoroughfare for boats based in the Bel Marin Keys on their way to San Pablo Bay. This site's frontage on San Pablo Bay is not actively used for recreational or commercial traffic due to the shallow waters adjacent to the Bay edge.

6.10.1.3 The Hamilton Site[6]

Regional Access

Regional access to the Hamilton site is provided by Highway 101. Two existing freeway interchanges, Ignacio Boulevard and Alameda del Prado, connect Highway 101 to the local streets which feed into the site.

Local Access

All vehicular traffic with origins or destinations at the Hamilton site currently use Nave Drive. Both commercial and residential land uses are served by Nave Drive and parking is prohibited along this street. State Access Road provides access from Nave Drive to the Hamilton site. This is a two-lane roadway (one lane in each direction) with 25 mph speed limits. Egress from to Nave Drive is controlled by a stop sign.

6 The section is based on the Hamilton Field Project Subsequent EIR, which was prepared for the City of Novato by Environmental Impact and Planning Associates (EIP) in 1992.

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Existing Traffic Conditions

Traffic operations in 1992 at the intersections studied generally exhibit acceptable levels of service during both the a.m. and p.m. peak hours. Only one signalized intersection, Ignacio Boulevard/Highway 101 northbound ramps, operates at an unacceptable LOS F during the p.m. peak hour due to heavy northbound traffic originating from the office and industrial land uses along Bel Marin Keys Boulevard. These traffic conditions are described in more detail below.

- *Ignacio Boulevard and Northbound Highway 101 Off-Ramp.* This intersection functions at LOS E during the A.M. peak hour and LOS F during the P.M. peak hour.
- *Ignacio Boulevard and Southbound Highway 101 On- and Off-Ramps.* This intersection functions at LOS D during the A.M. peak hour and LOS C during the P.M. peak hour.
- *Nave Drive and Northbound Highway 101.* Both the northbound left-turn movements and eastbound right-turn movements operate at LOS A during the A.M. and P.M. peak hours.
- *Nave Drive and State Access Road.* This unsignalized T-intersection provides access to the Hamilton site. This intersection experiences light traffic and operates at Level of Service A for all critical movements during both the A.M. and P.M. peak hours.
- *Nave Drive and Main Gate Road.* This three-legged unsignalized T-intersection provides direct access to the Hamilton site. This intersection operates at Level of Service B or better for all movements during both the A.M. and P.M. peak hours.

Vessel Traffic

Access to the Hamilton Site would be directly from San Pablo Bay. Like the Bel Marin Keys site, the frontage to the Bay is not actively used for recreational or commercial traffic due to the shallow waters adjacent to the Bay edge. An off-loading facility would be located 3.6 miles off-shore and connected by a transport pipeline located within an existing off-shore pipeline corridor.

6.10.2 Environmental Impacts and Mitigation Measures

6.10.2.1 Proposed Project

The Proposed Project would result in increased local and regional traffic from employee, visitor, and construction vehicle trips. On-site traffic, including passenger vehicles and construction equipment, would be concentrated along existing roads, in areas of active sediment filling, and in the offloading/rehandling facility area adjacent to McDougal Cut and the Sacramento River. Project-related tug-and-barge traffic would occur along the Sacramento River, but not in McDougal Cut. A small boat launched from either McDougal Cut or Montezuma Slough (section 4.3.7) would be used occasionally for perimeter levee inspection or other monitoring[7]. These potential impacts are discussed below.

Traffic during Construction

Approximately 30 people per day would be employed on site during the construction (i.e., site preparation) phase of the Project. Assuming that all of these employees would drive to work alone, vehicle trips associated Project construction would increase local traffic by the addition of approximately 60 trips,

7 Doug Lipton, Levine-Fricke-Recon, verbal communication, April 15, 1998.

or 30 two-way trips. Traditional earthworking equipment such as bulldozers and scrapers would be used to construct the interior levees by removing the topsoil from the land and placing it where the interior levees are needed.

Traffic during Operation

During the approximate 10 to 15-year operation of the Project, between 20 and 46 people would be employed on site. Assuming that all of these employees would drive to work alone, vehicle trips associated with the operation of the Project would increase local traffic by up to 92 trips, or 46 two-way trips. Earthmoving equipment could operate on a regular basis at the rehandling facility, depending on the demand for rehandled sediments.

No vehicle trips would be generated from dredge operation employees. The normal dredging crew of approximately eight members lives and works on the tug boats for one week as the dredging and hauling operations occur.[8] Replacement crew changes would occur at the dredging site, and not from the Project site by automobile.

Recreational Visitor Traffic

As part of the Proposed Project, the recreation/public access areas would be constructed, consisting of a rustic, unimproved parking area, wooden boardwalk and viewing platform overlooking the restored wetlands south of Fire Truck Road. The access area would draw new visitors to the site, increasing the vehicle trips along public roadways. Given the sparse local population and the relative distance of the site from major population centers and roadways, the number of trips generated by these new visitors to the site would be relatively few and would not significantly impact the existing roadway network. The public access improvements proposed for the DWR Day Use Area would not result in a large increase in users or associated traffic.

Future Traffic Conditions

Given the relatively small number of employees who would drive to the site and the small amount of local traffic in the area, no significant impacts due to Project-generated traffic are anticipated. Collinsville Road, which has an existing ADT of approximately 303 and an LOS of A, would be used for every trip coming to and leaving the Project site. The addition of approximately 36 daily trips generated from the Project would bring the total daily trips on Collinsville Road to approximately 339. Since it would take an additional 2,101 average daily trips to decrease the LOS from A to B, the 36 trips generated from the Project would not adversely impact Collinsville Road's existing LOS.

Circulation and Access

Impact P-CIR-1: The Project would create circulation and possible safety conflicts with existing Jerico Towing Company, a water-related industry. Page 91 of the Solano County LUCE requires protecting surrounding uses from adverse impacts. (County-LS, Corps-LS)

8 Marvin Veyer, Dutra Dredging Co., verbal communication, January 21, 1993.

The Jerico Towing Company operates a commercial dredging facility in the southern portion of the Project area. The only access to the proposed Montezuma Wetlands Project offices traverses the Jerico facility. Increased truck, auto, and equipment traffic traveling through the Jerico site to the Project site would potentially conflict with the existing circulation at the Jerico facility. Due to the small size (3 permanent employees) of the Jerico operation and the fact that the Jerico facility is on leased land within the project boundary, this impact is considered insignificant, and no mitigation is required.

Construction Traffic

Impact P-CIR-2: Dump trucks transporting aggregate road base could result in damage to local road surfaces. (County-LS, Corps-LS)

Dump trucks would transport aggregate road base, gravel, and sand from local sources quarries to the Project site for placement on levee crests and construction of subdrain systems. All overweight or oversize loads transported on County roads would require a County Transportation Permit, and Encroachment Permits for all site access connections to County roads. Mitigation Measure P-CIR-2: Any pavement damage resulting from project activity shall be restored to the pre-construction condition to the satisfaction of the Solano County Transportation Department. (LS)

Vessel Traffic

Impact P-CIR-3: Project-related vessel traffic may cause temporary conflicts with recreational or commercial vessels using the Sacramento River and adjacent waterways (McDougal Cut and Montezuma Slough) near the Project site.(County-LS, Corps-LS)

Mitigation Measure P-CIR-3a: The Project contractor shall provide waterway markers along the transport route to warn or advise recreational and commercial boaters of hazards or equipment nearby, pursuant to Title 14 of the California Code of Regulations.

Mitigation Measure P-CIR-3b: The Project contractor shall post a "local notice to mariners" using standard navigational procedures including the U.S. Coast Guard, boating publications, notices, etc., to warn boaters of project-related vessel traffic. (LS)

6.10.2.2 Alternative 1: Managed Wetland

A managed wetland would have the same traffic impacts as the Proposed Project, as described in the preceding section.

6.10.2.3 Alternative 2: Combined Wetlands

A combined tidal and managed wetland would have the same traffic impacts as the Proposed Project, as described above.

6.10.2.4 Alternative 3: The Bel Marin Keys Site

Project-Related Traffic

The number of employee vehicle trips during construction and operation would likely be somewhat less than that of the Proposed Project because of the proportionately smaller volume of dredged material. Bulldozers, graders, and trucks would travel or be transported to the site initially. The earth-moving

equipment would remain on the site, resulting in little construction traffic resulting from movement of equipment.

Future Traffic Conditions

Impact 3-CIR-1: Alternative 3 would increase the level of service from LOS C to approaching LOS D at Bel Marin Keys Boulevard and Digital Drive, and from LOS D to approaching LOS E at Bel Marin Keys Boulevard and Commercial Boulevard. (County-S, Corps-LS)

Since some roads in the vicinity are congested during the peak hours, project-generated traffic could have a significant impact. These potential impacts are discussed below.

- *Bel Marin Keys Boulevard and Digital Drive.* Bel Marin Keys Boulevard has a P.M. peak hour intersection LOS C at Digital Drive, with a capacity of 1,400 vehicles per hour. The wetlands project would add 9 to 12 P.M. peak hour trips to this intersection, increasing the intersection's traffic volume from 1,105 to 1,123 vehicles per hour. This would increase the volume to capacity ratio to 0.797. Although this would only be a 1 percent increase in volume, it would result in a change in the level of service from LOS C to LOS D.
- *Bel Marin Keys Boulevard and Commercial Boulevard.* The intersection of Bel Marin Keys Boulevard with Commercial Boulevard also has a capacity of 1,400 vehicles per hour. Its current P.M. peak hour volume is 1,242 with a LOS D. An additional 12 trips could increase the volume to capacity ratio to 0.895, which would result in a level of service of slightly less than LOS E.

Mitigation Measure 3-CIR-1: The westbound right-turn lane shall be converted to a left-turn lane, and a second westbound left-turn lane and a third southbound through lane should be added to improve the intersection to LOS C during the p.m. peak hour. (LS)

Vessel Traffic

The off-loading facility located 3.6 miles off-shore and the transport pipeline have the potential to create navigational hazards for shipping. However, the pipeline and mooring facility can be easily identified for navigational purposes as has the existing pipeline. Additionally, it is not expected that the waters inland of the off-loading facility would be used for shipping and navigation due to the shallowness of the water. The off-loading facility and transport pipeline would require appropriate permitting through BCDC. Any additional necessary navigational and shipping requirements would be assessed by that agency at that time. There would be no vessel traffic along Novato Creek and hence no impact on recreational uses of the creek's waters.

6.10.2.5 Alternative 4: The Hamilton Site

Construction Traffic

The main access into the site is the Nave Drive/State Access Road and the Nave Drive/Main Gate Road. These intersections operate at LOS A and B. The minimal project-related traffic during construction and operation of the site would not reduce the LOS or cause congestion.

Vessel Traffic

Adverse but less than significant impacts associated with use of the off-loading facility and transport pipeline would be similar to the Bel Marin Keys alternative. No impacts are anticipated on recreational boating activity.

6.10.2.6 The No-Project Alternative

The No-Project Alternative would not involve construction and traffic to and from the site would remain unchanged. No significant impacts are anticipated.

6.10.2.7 Cumulative Impacts

Cumulative impacts of the Proposed Project and the Project alternatives would be generally the same. Since the traffic associated with marsh and wetland restoration projects is generally very small, the cumulative development of restoration projects is not expected to significantly affect local or regional traffic. Mitigation of site-specific circulation impacts would eliminate the potential for circulation impacts from cumulative development due to the relatively low traffic generation rates of wetland restoration projects. Cumulative traffic impacts would only be expected if the development of a marsh restoration project were to coincide with the development of a large traffic generator.

6.11 Air Quality

6.11.1 Regulatory Setting

Regulation of air quality is achieved through both federal and state ambient air quality standards and emissions limits for individual sources of air pollutants.

6.11.1.1 Federal Air Quality Regulation

The 1977 federal Clean Air Act (CAA) required the U.S. Environmental Protection Agency (EPA) to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. Air quality standards have been established for the six criteria air pollutants, which are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO_2), suspended particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb). Pollutant characteristics are described in Chapter 11, Glossary. The federal and state ambient air quality standards are shown in Table 6.11.1-1.

Table 6.11.1-1
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Primary Standard	State Standard
Ozone	8-hour	0.08 ppm	---
	1-hour	0.12 ppm	0.09 ppm
Carbon Monoxide	8-hour	9.0 ppm	9.0 ppm
	1-hour	35.0 ppm	20.0 ppm
Nitrogen Dioxide	annual	0.05 ppm	---
	1-hour	---	0.25 ppm
Sulfur Dioxide	annual	0.03 ppm	---
	24-hour	0.14 ppm	0.04 ppm
	1-hour	---	0.25 ppm
PM_{10}	annual	50 $\mu g/m^3$	30 $\mu g/m^3$
	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$
$PM_{2.5}$	annual	15 $\mu g/m^3$	---
	24-hour	65 $\mu g/ m^3$	---
Lead	30-day avg.	---	1.5 $\mu g/m^3$
	3-month avg.	1.5 $\mu g/m^3$	---

Ppm = Parts per million
— = Not applicable
$\mu g/m^3$ = Micrograms per cubic meter

The federal Clean Air Act requires states to monitor air quality and determine whether the federal standards are met in each air basin. Where the federal standards are not met, states are required to prepare

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a State Implementation Plan (SIP) that maps out the strategy for eventual attainment of the National Ambient Air Quality Standards.

Pursuant to the 1990 CAA Amendments, the EPA has classified air basins, or portions thereof, as either attainment or nonattainment for each criteria air pollutant, based on whether or not the NAAQS have been achieved. Pollutants in an area are designated as "unclassified" when there is a lack of data for the EPA to form a basis of attainment status. Attainment status has been designated for the San Francisco Bay Area Air Basin, where the site is located, for NO_2, O_3, Pb, SO_2, and CO (rural areas only). The basin currently has nonattainment status for CO (urban areas only) and is unclassified for PM_{10}.[1] Since no Bay Area monitoring station has recorded an exceedance of the national CO standard since 1991, the Bay Area Air Quality Management District (BAAQMD) has applied to the EPA for redesignation to attainment status for CO.

6.11.1.2 State Air Quality Regulation

The Air Resources Board (ARB), California's air quality management agency, regulates mobile emissions sources and oversees the activities of regional Air Quality Management Districts (AQMDs). The ARB regulates local air quality indirectly by having established state ambient air quality standards (SAAQS) and vehicle emission standards, by conducting research activities, and by planning and coordinating air-related activities.

California has adopted ambient standards that are more stringent than the federal standards for the criteria air pollutants. Under the California Clean Air Act, patterned after the federal act, areas have been designated as attainment or nonattainment with respect to the SAAQS. The nine-county Bay Area has been designated as nonattainment for O_3 and PM_{10}.[1]

6.11.1.3 Regional Air Quality Regulation

The Project and alternative sites are within the regulatory jurisdictions of the BAAQMD. The Bay Area 1994 Clean Air Plan (CAP) describes the Bay Area's current plans for meeting state clean air laws.[2] The goal of the CAP is to improve air quality through the 1990s through tighter industry controls, cleaner cars and trucks, cleaner fuels, and increased commute alternatives. The CAP encourages cities and counties to adopt measures in support of this goal. Identified measures include developing rules to reduce vehicle trips to major residential developments, shopping centers, and other indirect sources; encouraging cities and counties to plan for high density development; clustering development with mixed uses in the vicinity of mass transit stations; application of Best Available Retrofit Control Technology (BARCT) to existing stationary sources; and use of low-emission motor vehicles by vehicle fleet operators.

The CAP forecasts continued improvement in regional air quality. However, implementation of the CAP would not provide for attainment of the state ozone standard even by the year 1997. As a result, the BAAQMD will be required to update the CAP in 1997 to report on progress toward attainment of the state O_3 standard.

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1 Bay Area Air Quality Management District, *BAAQMD CEQA Guidelines — Assessing the Air Quality Impacts of Projects and Plans*, April, 1996.

2 Bay Area Air Quality Management District and Association of Bay Area Governments, 1994.

6.11.2 Affected Environment

The existing air quality conditions at the Montezuma, Bel Marin Keys, and Hamilton sites are discussed below.

6.11.2.1 The Montezuma Site

Air Pollution Climatology

The primary factors which determine air quality are the locations of air pollutant sources and the amounts of pollutants emitted. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants.

Wind records from nearby Pittsburg, located a few miles south of the Project site, show a strong predominance of westerly winds. Average wind speed is relatively high, at over 10 mph, and the frequency of calm winds is quite low.[3] These winds dilute pollutants and transport them away from the area, so that emissions released near the Project site may influence air quality in the Sacramento and San Joaquin valleys.

Sensitive Receptors

The Bay Area Air Quality Management District defines sensitive receptors as those facilities most likely to be used by the elderly, children, infirm, or persons with particular sensitivity to air pollutants. Agricultural crops, especially broad-leaved produce crops and cultivated flowers, are also sensitive to air pollutants such as O_3, NO_x and SO_2. The only sensitive receptors in the Project vicinity are scattered residences east of the Project site along Collinsville Road and Fire Truck Road.

Pollutant Sources

There are no major sources of air pollutants in the Project vicinity. There are several large industrial sources located several miles south of the Project site in Pittsburg and Antioch, but prevailing winds do not carry pollutants from these sources toward the site.

The existing site does have a few intermittent sources of fugitive PM_{10} emissions. Sand and gravel storage piles at the Jerico Towing Company operation at the southern end of site are a source of PM_{10} when loading and unloading occurs. Agricultural activities on the site and on neighboring properties are also a source of PM_{10} emissions during the dry months of the year.

Current Air Quality

The Project site is on the eastern edge of the nine-county San Francisco Bay Area Air Basin. The BAAQMD operates a network of air quality monitoring sites throughout the air basin. The two closest monitoring sites are Pittsburg, located directly across the Sacramento River from the site, and Bethel Island, located about 12 miles east of the Project site. A summary of air quality data from the these monitoring sites that pertain to the Project site is shown in Table 6.11.2-1. As shown in Table 6.11.2-1,

3 California Department of Water Resources, 1978.

the federal ambient air quality standards for most criteria pollutants are met, however, concentrations of ozone and PM_{10} measured at these sites do exceed the state air quality standards.

For local pollutants such as carbon monoxide, data from Pittsburg or Bethel Island would not be representative of site conditions. Carbon monoxide concentrations are generally determined by local automobile traffic volumes. Since traffic in the vicinity is relatively minor, concentrations of carbon monoxide at the Project site are expected to be very low.

Table 6.11.2-1
Montezuma Site: Regional Air Quality (1991-1995)

		Days Exceeding Standard					
Monitoring Station/Pollutant	**Standard**		**1991**	**1992**	**1993**	**1994**	**1995**
Pittsburg							
Ozone	Fed. 1-Hour		0	0	1	0	**0**
Ozone	State 1-Hour		0	3	4	3	**8**
Nitrogen Dioxide	State 1-Hour		0	0	0	0	**0**
Particulate Matter (PM_{10})	State 24-Hour		ND	ND	ND	ND	**ND**
Bethel Island							
Ozone	Fed. 1-Hour		0	0	0	0	**1**
Ozone	State 1-Hour		3	7	3	5	**6**
Nitrogen Dioxide	State 1-Hour		0	0	0	0	**0**
Particulate Matter (PM_{10}) [a]	State 24-Hour		17	7	10	5	**5**

Notes: ND: No data.

(a.) Data represents percent of days standard was exceeded.

Source: California Air Resources Board, California Air Quality Data, Annual Summary, Vols. XXIII-XXVII, 1992-1996.

6.11.2.2 The Bel Marin Keys and Hamilton Sites

Air Pollution Climatology

In winter, Marin County experiences winds primarily from the south, and in summer, it experiences winds primarily from the northwest. The annual summary from the Hamilton Field wind monitoring station shows that winds are predominantly northwesterly (21 percent) with an average speed of about 9 miles per hour.[4]

4 California Air Resources Board, *California Surface Wind Climatology*, 1984.

Sensitive Receptors

For these two alternatives, the sensitive receptors of concern would be the residents on the adjacent Bel Marin Keys Units 1-4 residential properties.

Pollutant Sources

There are no major sources of pollutants in the vicinity of either site. The existing sites do have a few intermittent sources of fugitive PM_{10} emissions. Agricultural activities on the sites and on neighboring properties are a source of PM_{10} emissions during the dry months of the year.

Current Air Quality

Table 6.11.2-2 presents a 5-year summary of highest annual criteria air pollutant concentrations collected at the San Rafael air quality monitoring station. The data collected are representative of the air quality in the Bel Marin Keys and Hamilton area. As shown in Table 6.11.2-2, ozone levels in San Rafael rarely exceed the state standard, carbon monoxide levels have not approached the state standard in the past 5 years, and exceedances of the state PM_{10} standard have occurred annually in San Rafael over the past 5 years.

Table 6.11.2-2
San Rafael: Regional Air Quality (1991-1995)

			Monitoring Data by Year[a]					
Pollutant	**Standard[b]**			**1991**	**1992**	**1993**	**1994**	**1995**
Ozone	1-hr.	0.09 ppm[c]		0.08	0.07	0.08	0.09	0.09
Carbon Monoxide	1-hr.	20.0 ppm		10.0	8.0	9.0	6.0	6.0
	8-hr.	9.0 ppm		5.7	5.0	4.0	3.0	3.3
Nitrogen Dioxide	1-hr.	0.25 ppm		0.09	0.08	0.08	0.08	0.06
Particulate Matter (PM_{10})	24-hr.	50 $\mu g/m^d$		115	63	69	72	74

Notes: a All data are from the San Rafael monitoring station, and represent the highest average recorded levels of identified pollutants.
b State standard, not to be exceeded.
c ppm = parts per million.
d $\mu g/m^3$ = micrograms per cubic meter.

Source: California Air Resources Board, California Air Quality Data, Annual Summary, Vols. XXIII-XXVII, 1992-1996.

6.11.3 Environmental Impacts and Mitigation Measures

Environmental consequences related to air quality can be separated into construction related impacts and operational impacts. These types of impacts are discussed below for the Proposed Project and each project alternative.

The BAAQMD considers PM_{10} to be the pollutant of greatest concern with respect to construction activities. Construction equipment does emit O_3 precursors and CO. However, these emissions are

included in the emission inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of O_3 and CO standards in the Bay Area.[5]

Construction emissions of PM_{10} can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce PM_{10} emissions from construction. The BAAQMD's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions.[6]

Odors could be emitted from dredged spoils exposed to the atmosphere due to the decomposition of organic matter. However, it is not expected that the project disposal/distribution activities would generate any significant odor impacts. For the Oakland Harbor deepening project, Port of Oakland staff made visits to several different dredged material disposal sites to investigate the possibility of odors associated with the drying process, including drying ponds at Port Sonoma-Marin, San Leandro, and the Port's own drying operations at Berths 30 and 40 in the Port of Oakland. No distinct odor was detected from active sediment discharge, recently deposited material, or partially dried material, and no odors whatsoever were detected at the edge of the property.[7] .

Impacts during the operational phase of the project would be associated with the combustive emissions from employee vehicles and equipment used to handle and distribute the sediment. Guidelines for the evaluation of project operational impacts issued by the BAAQMD consider an emission increase of 550 pounds per day of CO from vehicles to be significant, and emission increases of regional pollutants such as ozone precursors and PM_{10} to be significant if they exceed 80 pounds per day. Additionally, the project must come into compliance with the federal Clean Air Act of 1990, which has made substantial revisions to conformity procedures for federal actions.

The 1990 CAA provides that a federal agency cannot support an activity in any way unless the federal agency determines that the activity will conform to the most recent EPA-approved SIP within the region of the proposed action. This means that federally supported or funded activities will not (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any standard; or (3) delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area. In accordance with Section 176(c) of the 1990 CAA, the EPA promulgated the final conformity rule for general federal actions in the November 30, 1993 *Federal Register*. (The Conformity Determination for this project is included in Appendix P to the EIS/EIS.)

Significance Criteria

Based on the above considerations, the following criteria have been used to determine significant air quality impacts:

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5 Bay Area Air Quality Management District, *BAAQMD CEQA Guidelines - Assessing the Air Quality Impacts of Projects and Plans*, April, 1996.

6 Ibid

7 U.S. Army Corps of Engineers and Port of Oakland 1994

- Increase ambient pollutant levels from below to above the National Ambient Air Quality Standards (NAAQS) or California Ambient Air Quality Standards (CAAQS);
- Substantially contribute to an existing or projected air quality standard violation;
- Are inconsistent with emission growth factors contained in any of the following plans (inconsistent projects include those exceeding the land use and population forecasts that were used to generate emission forecasts in these plans):

  a) The 1994 Clean Air Plan (CAP),

  b) The 1993 Ozone Maintenance Plan, or

  c) The 1994 Carbon Monoxide Maintenance Plan; or
- Exceed the following thresholds that the Bay Area Air Quality Management District (BAAQMD) defines as significant under CEQA for project operation activities: total emissions greater than 80 pounds per day or 15 tons per year of reactive organic gases (ROG), oxides of nitrogen (NO_x), particulate matter less than 10 microns in diameter (PM_{10}), or PM_{10} precursors, such as sulfur oxides (SO_x) (BAAQMD 1996).

The BAAQMD has not identified thresholds of significance for emissions from construction activities. Construction-related emissions are generally short-term in duration, but may still cause adverse air quality impacts. PM_{10} is the pollutant of greatest concern with respect to construction activities. Construction equipment emits CO and ozone precursors, however, these emissions are included in the emission inventory that is the basis for regional air quality plans. These pollutants are therefore not expected to impede attainment or maintenance of the ozone and CO standards in the Bay Area (BAAQMD 1996).

The BAAQMD has identified a set of feasible PM_{10} control measures for construction activities. These control measures are listed below. If all control measures indicated below (as appropriate, depending on the size of the project area) will be implemented, then air pollutant emissions from construction activities would be considered a less than significant impact. If all of the appropriate measures indicated below will not be implemented, then construction impacts would be considered to be significant (unless the lead agency provides a detailed explanation as to why a specific measure is unnecessary or not feasible).

Basic Control Measures

The following controls should be implemented at all construction sites during dry conditions.

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose material *or* require all trucks to maintain at least 2 feet of freeboard (freeboard is the space between the top of the load and the top edge of the truck bed).
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.

- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

Enhanced Control Measures

The following measures should be implemented at construction sites that are larger than 4 acres.

- All "Basic" control measures listed above.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

Optional Control Measures

The following control measures are strongly encouraged at construction sites that cover a large area that are located near sensitive receptors, or which for any other reason may warrant additional emission reductions.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading and other construction activity at any one time.

6.11.3.1 Proposed Project

Construction Impacts

Construction activities at the start-up of the Project would be accomplished using many types of construction vehicles and equipment. Since the Project is phased, construction activities would occur at the beginning of each successive phase for a period of several weeks. The actual number of vehicles and equipment in use on a given day would vary greatly as work at different portions of the site progresses. Exhaust emissions from vehicles and equipment expected to be in use on the site during construction have been estimated using worst-case assumptions regarding number and usage, as shown in Table 6.11.3-1. Details of the emission calculations are contained in Appendix P.

Impact P-AIR-1: Construction would create fugitive dust (PM_{10}) which would elevate local levels of suspended particulates. Suspended particulates could reach unhealthful levels at nearby residences. (County-S, Corps-S)

Table 6.11.3-1
Peak Day Construction Equipment Emissions

	Daily Emission in Pounds/Day				
Equipment Type	**ROG**	**NO_x**	**CO**	**PM_{10}**	**SO_x**
3 Bulldozers	8.1	69.9	19.2	6.0	7.5
2 Compactors	1.2	12.8	6.0	0.8	1.0
1 Pile Driver	1.3	12.8	5.3	1.0	1.1
3 Water Trucks	3.0	42.9	18.6	2.4	4.8
2 Graders	0.6	8.8	1.8	0.8	1.0
4 Dump Trucks	14.0	200.2	86.4	11.9	21.9
1 Crane	0.9	8.5	3.6	0.7	0.7
2 Work Boats	4.3	8.4	3.5	0.6	0.7
32 Employee Vehicles	2.3	3.4	29.9	2.5	0.1
Total	35.6	367.7	174.3	26.6	38.8

ROG = Reactive Organic Gases
CO = Carbon Monoxide
NO_x = Nitrogen Oxides
PM_{10} = Particulate Matter less than 10 microns in diameter
SO_x = Sulfur Oxides

Note: These estimates assume concurrent activity by all equipment involved with construction of levees, access roads, the off-loading facility, and the rehandling facility. This would represent peak day activity rather than a typical day.

A substantial amount of fugitive dust would be generated during construction activities by vehicles and wind erosion of exposed earth surfaces. Clearing and grading activities comprise a major source of construction dust emissions, as would topsoil stockpiling activities. The highest potential for construction dust impacts would occur during the dry late spring, summer and early fall months when soils are dry.

The effects of fugitive dust would be increased dustfall and locally elevated levels of suspended particulates. Prevailing winds would tend to carry construction emissions toward existing residences along Collinsville Road. The level of suspended particulates at these residences could reach unhealthful levels.

Mitigation Measure P-AIR-1:

- Water all active construction areas at least twice daily. During dry weather, treat bare soil in construction area with hygroscopic stabilizers, such as magnesium chloride or calcium chloride) after watering.

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- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (e.g., distance between hauled material and top of truck).
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas.
- Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Replant vegetation in disturbed areas as quickly as possible.
- Suspend excavation and grading activity when winds exceed 25 mph.

If all of the above mitigation measures are implemented, the BAAQMD would consider the air pollutant emissions from construction activities a less than significant impact. (LS)

Operational Impacts

Sources of pollutants associated with the operation of the Proposed Project would include:

- Vehicle travel by Project employees;
- Diesel-powered pumps and a clamshell crane for sediment pumping and distribution; and
- A clamshell crane, bulldozers, tug, and secondary engine for sediment rehandling.

Emissions from these sources have been estimated as shown in Table 6.11.3-2.

Appendix P provides detailed emissions calculations. Emissions associated with employee travel have been estimated assuming each employee would generate two trips per day and the average one-way trip length to this isolated site is 20 miles. The resulting vehicle miles traveled were multiplied by emission factors for a 1995 Bay Area vehicle mix assuming an average 35 mile per hour trip speed.[8]

<u>Impact P-AIR-2:</u> Emissions from operation-phase activities (including rehandling facility operations) would exceed the BAAQMD standard of 80 pounds per day for ROG, NO_x, SOx, and PM_{10}. (County-S, Corps-S)

Dredged materials could be transported to the site from several locations within the San Francisco Bay and the Bay estuary. However, air emissions associated with sediment transport to the Montezuma site are not considered part of this project. All individual dredging projects are subject to separate environmental review, and these projects undergo specific air quality analysis. Tugboat emissions for transport of dredged materials are calculated as part of the specific analysis conducted for the individual dredging projects.

The sediment distribution system was assumed to be powered by three 1500-horsepower diesel engines, operating a maximum of 23 hours per day. Five smaller 50-horsepower diesel pumps were assumed to

8 Emission factors from California Air Resources Board's EMFAC7F model, Final Version 1.1, January 1994.

Table 6.11.3-2
Peak Day Operational Air Pollutant Emissions
at the Montezuma site

	Daily Emission in Pounds/Day				
Equipment Type	**ROG**	**NO_x**	**CO**	**PM_{10}**	**SO_x**
2 Clamshell Cranes	10.8	102.0	42.6	8.0	8.6
24 Employee Vehicles	1.8	2.5	22.4	1.8	0.1
3 Sediment Pumps	40.4	1,450.9	379.1	23.2	94.5
5 Water Pumps	13.4	143.6	30.9	9.7	9.4
2 Bulldozers	2.7	23.3	6.4	2.0	2.5
1 Tug Boat	55.6	516.4	89.0	40.1	36.1
1 Secondary Engine	11.5	122.8	26.5	8.3	8.1
Total	**136.1**	**2,361.5**	**596.8**	**93.2**	**159.5**

ROG = Reactive Organic Gases
CO = Carbon Monoxide
NOx = Nitrogen Oxides
PM10 = Particulate Matter less than 10 microns in diameter
SOx = Sulfur Oxides

Note: These estimates assume concurrent activity by all equipment involved with project operation. This would represent peak day activity rather than a typical day.

distribute water, with a daily usage of 120 hours. These usage rates were multiplied by hourly emission factors for industrial diesel engines to obtain pump emissions.[9]. A single clamshell crane was assumed to operate 4 hours per day at the rehandling facility. Emission factors for the crane were obtained from the EPA's AP-42 emission factor document.[9]

The diesel-powered pumps used for sediment distribution would be subject to the permitting authority of the Bay Area Air Quality Management District. Current District regulations would require the use of Best Available Control Technology (BACT) and emissions offsets for these sources.

The rehandling facility would process up to 400,000 cy of material per year for the 10- to 15-year life of the project. Two bulldozers would be used to move material at the facility, and a clamshell crane would be used to load material suitable for reuse at other sites. Emission factors for the bulldozers and crane were obtained from AP-42.[9] The reuse material would be transported in loads averaging 3,200 cy. The average time required to load, transport, and return a 3,200 cy capacity barge was estimated to be two

9 U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors*, AP-42, 1993.

days. Emission factors used for the tug and secondary engine associated with transport were obtained from a document produced by the California Air Resources Board.[10]

> Mitigation Measure P-AIR-2: Diesel engines shall meet BAAQMD standards and shall be properly maintained and regularly tuned according to the manufacturers' specifications to ensure efficient operation. (SU)

Emission offsets obtained as part of the BAAQMD permit process for the diesel-powered sediment pumps would eliminate any significant impact for emissions of PM_{10} and SO_x. The impact of ROG and NO_x emissions would remain significant after application of offsets and mitigation.

6.11.3.2 Alternative 1: Managed Wetland

Construction Impacts

Construction impacts of Alternative 1 would be similar to the Proposed Project, and the same mitigations would apply. Refer to the descriptions under P-AIR-1 in the previous section.

Operational Impacts

Emissions associated with the operation of the Managed Wetland would be similar to those estimated for the Proposed Project (Table 6.11.3-2), and the same mitigation would apply. Refer to the descriptions under P-AIR-2 in the previous section.

6.11.3.3 Alternative 2: Combined Wetland

Construction Impacts

Construction impacts of Alternative 2 would be similar to the Proposed Project, and the same mitigations would apply. Refer to the descriptions under P-AIR-1 in section 6.11.3.1.

Operational Impacts

Emissions associated with the operation of the Managed Wetland would be similar to those estimated for the Proposed Project (Table 6.11.3-2), and the same mitigation would apply. Refer to the descriptions under P-AIR-2 in section 6.11.3.1.

6.11.3.4 Alternative 3: The Bel Marin Keys Site

Construction Impacts

Short-term construction impacts of the Bel Marin Keys alternative would be similar to the Proposed Project, as summarized below.

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10 California Air Resurce Board, *Report to the California Legislature on Air Pollutant Emissions from Marine Vessels, Volume I.* Sacramento.

Impact 3-AIR-1: Construction would create fugitive dust (PM_{10}), which would elevate local levels of suspended particulates. Suspended particulates could reach unhealthful levels at nearby residences. (County-S, Corps-S)

Mitigation Measure 3-AIR-1:

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas.
- Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Replant vegetation in disturbed areas as quickly as possible.
- Suspend excavation and grading activity when winds exceed 25 mph. (LS)

If all of the above mitigation measures are implemented, the BAAQMD would consider the air pollutant emissions from construction activities a less than significant impact.

Operational Impacts

Sources of pollutant emissions associated with the operation of this alternative would be similar to those of the Proposed Project, with the following exceptions: (1) equipment used to load and transport reusable material from the rehandling facility to other reuse sites (one clamshell crane, one tug boat, and one secondary engine) would not be used since it is assumed that all rehandled material would be needed at this site and none would be available for loading or transport to other locations; (2) a total of six sediment pumps (rather than three) would be required to unload and distribute the sediment at this site because of the greater unloading distances involved (an average of 31,000 feet from the barge to the placement areas at this site, versus an average of 12,000 feet at the Montezuma site); and (3) for employee travel, the average one-way commute trip length is only 15 miles, 5 miles less than at the Montezuma site, because Bel Marin Keys is closer to population centers. In addition to these emission source differences, the total amount of material that can be accommodated at this site (17.1 million cy) is less than the amount that would be handled by the Proposed Project (20 million cy). The total amount of emissions which would occur at Bel Marin Keys would thus be reduced in proportion to the reduction in amount of time required to unload and distribute the material. Peak day emissions for this site are shown in Table 6.11.3-3.

Impact 3-AIR-2. Emissions from operation-phase activities would exceed the BAAQMD significance threshold of 80 pounds per day for ROG, SO_x, and NO_x. (County-S, Corps-S)

The diesel-powered pumps used for sediment distribution would be subject to the permitting authority of the Bay Area Air Quality Management District. Current District regulations would require the use of Best Available Control Technology (BACT) and emissions offsets for these sources.

Mitigation Measure 3-AIR-2. Diesel engines shall meet BAAQMD standards and shall be properly maintained and regularly tuned according to the manufacturers' specifications to ensure efficient operation. (SU)

Emission offsets obtained as part of the BAAQMD permit process for the diesel-powered sediment pumps would eliminate any significant impact for emissions of SO_x. The impact of ROG and NO_x emissions would remain significant after application of offsets and mitigation.

Table 6.11.3-3
Peak Day Operational Air Pollutant Emissions
at the Bel Marin Keys site

Equipment Type	Daily Emission in Pounds/Day				
	ROG	NO_x	CO	PM_{10}	SO_x
1 Clamshell Crane	5.4	51.0	21.3	4.0	4.3
24 Employee Vehicles	1.8	2.5	22.4	1.8	0.1
6 Sediment Pumps	80.9	2,901.7	758.2	46.5	189.2
5 Water Pumps	13.4	143.6	30.9	9.7	9.4
2 Bulldozers	2.7	23.3	6.4	2.0	2.5
Total	**104.1**	**3,122.1**	**839.2**	**64.0**	**205.5**

ROG = Reactive Organic Gases
CO = Carbon Monoxide
No_x = Nitrogen Oxides
PM_{10} = Particulate Matter less than 10 microns in diameter
SO_x = Sulfur Oxides

Note: These estimates assume concurrent activity by all equipment involved with project operation. This would represent peak day activity rather than a typical day.

6.11.3.5 Alternative 4: The Hamilton Site

Construction Impacts

Short-term construction impacts of the Hamilton alternative would be similar to the Proposed Project, as summarized below.

Impact 4-AIR-1: Construction would create fugitive dust (PM_{10}), which would elevate local levels of suspended particulates. Suspended particulates could reach unhealthful levels at nearby residences. (County-S, Corps-S)

Mitigation Measure 4-AIR-1:

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard.

- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas.
- Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Replant vegetation in disturbed areas as quickly as possible.
- Suspend excavation and grading activity when winds exceed 25 mph. (LS)

If all of the above mitigation measures are implemented, the BAAQMD would consider the air pollutant emissions from construction activities a less than significant impact.

Operational Impacts

Sources of pollutant emissions associated with the operation of this alternative would be similar to those of the Bel Marin Keys alternative (Alternative 3), with the following exception: a total of four sediment pumps (rather than six) would be required to unload and distribute the sediment at this site because of the shorter unloading distances involved (an average of 22,000 feet from the barge to the placement areas at this site, versus an average of 31,000 feet at the Bel Marin Keys site). In addition to this emission source difference, the total amount of material that can be accommodated at this site (6.4 million cy) is less than the amount that would be handled at the Bel Marin Keys site (17.1 million cy). The total amount of emissions which would occur at Hamilton would thus be reduced in proportion to the reduction in amount of time required to unload and distribute the material. Peak day emissions for this site are shown in Table 6.11.3-4.

Table 6.11.3-4
Peak Day Operational Air Pollutant Emissions at the Hamilton Site

Equipment Type	Daily Emission in Pounds/Day				
	ROG	NO_x	CO	PM_{10}	SO_x
1 Clamshell Crane	5.4	51.0	21.3	4.0	4.3
20 Employee Vehicles	1.8	2.5	22.4	1.8	0.1
4 Sediment Pumps	53.9	1,934.5	505.4	31.0	126.2
5 Water Pumps	13.4	143.6	30.9	9.7	9.4
2 Bulldozers	2.7	23.3	6.4	2.0	2.5
Total	**77.1**	**2,154.9**	**586.5**	**48.5**	**142.5**

ROG = Reactive Organic Gases
CO = Carbon Monoxide
NO_x = Nitrogen Oxides
PM_{10} = Particulate Matter less than 10 microns in diameter
SO_x = Sulfur Oxides

Note: These estimates assume concurrent activity by all equipment involved with project operation. This would represent peak day activity rather than a typical day.

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Impact 4-AIR-2: Emissions from operation-phase activities would exceed the BAAQMD significance threshold of 80 pounds per day for SO_x and NO_x, an ozone precursor. (County-S, Corps-S)

The diesel-powered pumps used for sediment distribution would be subject to the permitting authority of the Bay Area Air Quality Management District. Current District regulations would require the use of Best Available Control Technology (BACT) and emissions offsets for these sources.

> Mitigation Measure 4-AIR-2: Diesel engines shall meet BAAQMD standards and shall be properly maintained and regularly tuned according to the manufacturers' specifications to ensure efficient operation. (SU)

Emission offsets obtained as part of the BAAQMD permit process for the diesel-powered sediment pumps would eliminate any significant impact for emissions of SO_x. The impact of NO_x emissions would remain significant after application of offsets and mitigation.

6.11.3.6 No-Project Alternative

The No-Project Alternative would not involve dredging or construction. Air quality would remain unchanged under this alternative.

6.11.3.7 Cumulative Impacts

The Proposed Project and the project alternatives would generate NO_x emissions exceeding the BAAQMD daily significance threshold. On a regional basis these emissions would exacerbate ozone impacts when combined with ROG and NOx emissions from other projects occurring in the Bay Area Air Basin.

6.12 Noise

This section describes the noise environment and the environmental consequences of the Montezuma Project and the project alternatives. Mitigation measures to reduce identified impacts to a less-than-significant level are proposed. Fundamental concepts of environmental acoustics, including definitions of noise terminology, are included in Appendix L.

6.12.1 Affected Environment

6.12.1.1 The Montezuma Site

Noise-Sensitive Land Uses

The noise-sensitive land uses in the area include residences along Collinsville Road near the intersection with Fire Truck Road, approximately 2,000 feet from the Project, and Collinsville residences at the end of Collinsville Road adjacent to the Sacramento River, approximately 1,000 feet from the proposed rehandling facility. The Department of Water Resources Day Use Area is also located within the Project boundaries along Montezuma Slough at the end of Fire Truck Road.

Existing Noise Sources

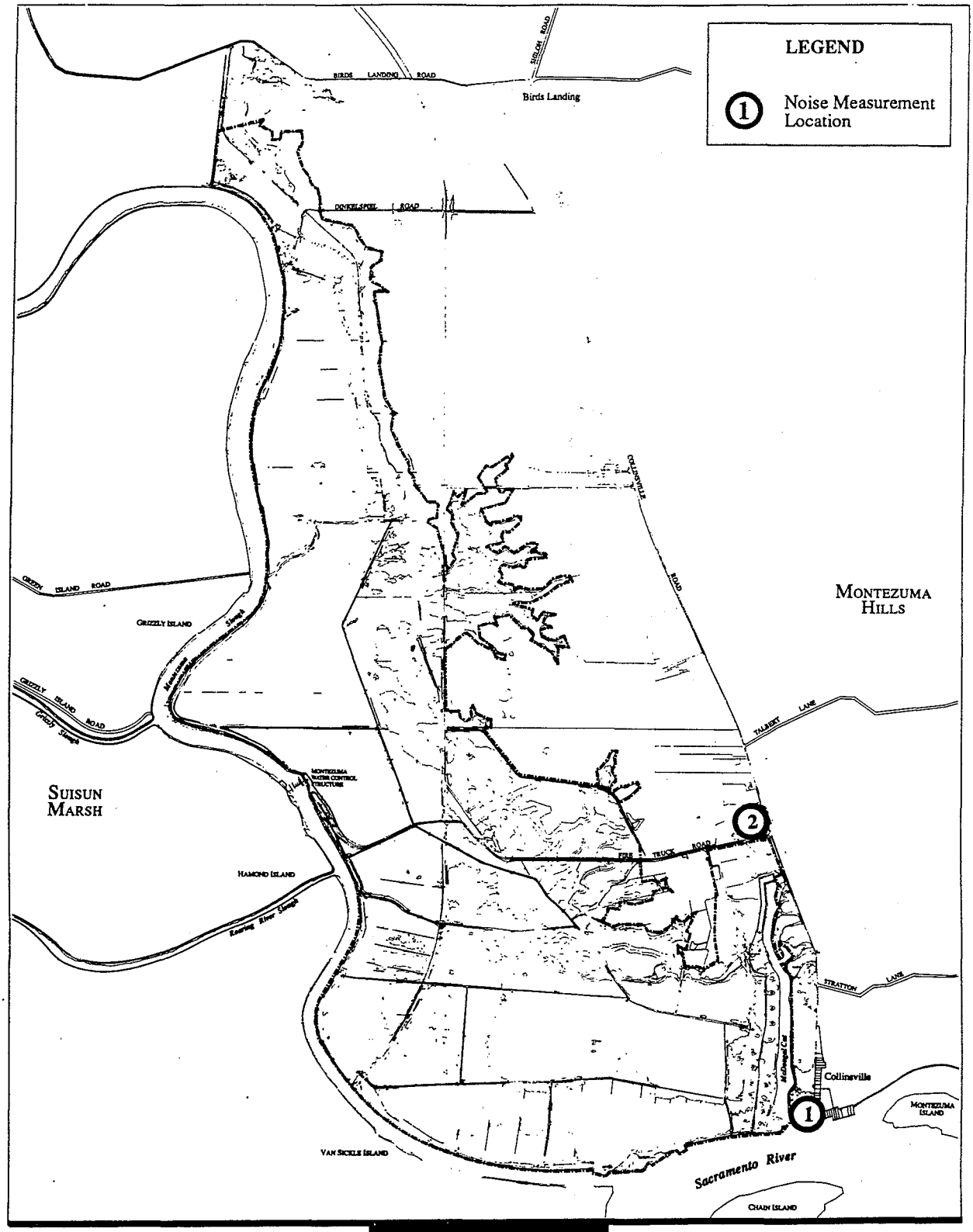
The only noise source of significance on the site is the Jerico Towing Company operation near the McDougal Cut. The major noise source associated with this activity is a tractor. The Jerico Towing Company operation is over 2,000 feet from the nearest noise-sensitive receptors.

Existing Noise Levels

Two short-term measurements were conducted by Illingworth and Rodkin, Inc. to quantify the noise environment at the Project site. The first measurement location was outside the residences in Collinsville and the second was outside farm homes located just north of Fire Truck Road, as shown in Figure 6.12-1. The average noise level (L_{50}) at these locations ranged from 41 to 44 dBA during the daytime. The background noise level, or the noise level exceeded 90 percent of the time (L_{90}), ranged from 36 to 38 dBA. The major noise sources at these locations are birds, wind in the vegetation, and distant air traffic. Aircraft associated with Travis Air Force Base were periodically audible at both locations. Noise levels generated by the aircraft did not exceed 48 dBA. Although Jerico Towing Company was operating during the measurements, the noise from this activity was not audible at either location.

Regulatory Setting

The Collinsville-Montezuma Hills Area Plan adopted by Solano County requires that uses in the western industrial subarea generate noise levels no greater than 60 dBA as measured at the boundary of the nearby Collinsville commercial recreation area. The General Plan Health and Safety Element requires that the introduction of a fixed point, permanent, non-residential noise emitting land use shall be prohibited if the projected noise emission level will exceed 50 dBA CNEL as measured at the boundary of a nearby residential zone (H&S, pg. 22). The Health and Safety Element also sets 45 dBA CNEL as the maximum interior noise level for residential land uses H&S, pg. 21). The EPA recommends that noise levels in sleeping areas not exceed an average level of 35 dBA.



Source: Brady and Associates (1994)

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Figure 6.12-1

Montezuma Site: Noise Measurement Locations

0' 1500' 3000' 6000'

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6.12.1.2 The Bel Marin Keys Site

Noise Sensitive Land Uses

Sensitive receptors would be residents of the Bel Marin Keys (BMK). The closest homes are located within 400 feet of the site. Residences up to 1,600 feet away along Bahama Reef and Bel Marin Keys Boulevard would be exposed to construction and operational noise disturbances.

Existing Noise Sources

Transportation-related noise sources, primarily automobiles, buses, and trucks, determine ambient noise levels over most of the Bel Marin Keys area. U.S. Highway 101 is the major local source of noise.

Existing Noise Levels

Ambient noise levels were measured in October 1991 at four locations in the area, and are provided in Table 6.12-1. These noise measurements indicate that the existing noise levels at the Bel Marin Keys site are below 55 dBA, L_{dn}.

Table 6.12-1
Bel Marin Keys Existing Noise Levels

Location	Duration (hr)	Measured Noise Levels, dBA[a]	
		L_{eq}	L_{max}
1. Center of the BMK-V site	0.25	48	62
2. Eastern tip of BMK-III site	0.25	47	58
3. Entrance to the siteb	0.30	55	74
4. At the property boundary	24	52c	80

Notes: a Noise was measured by ESA on October 1, 1991, between 4:00 P.M. and 6:00 P.M., using a Metrosonics db-308 Sound Analyzer, calibrated before and after each use.
b Noise was measured at a distance of about 15 meters from Bel Marin Keys Boulevard.
c The 24-hour noise level, in L_{dn}, was measured at the property boundary line between the proposed senior townhomes and Hamilton Field.

Source: Environmental Science Associates, Inc. October 1, 1991.

Regulatory Setting

The Marin Countywide Plan establishes a day-night outdoor sound level of 55 dBA L_{dn} as desirable for residential areas; however, the Plan states that areas where ambient noise levels are below 65 dBA L_{dn} are appropriate for residential development. Any development in residential areas where ambient noise levels exceed this would require an acoustical study and design features that would reduce interior noise levels to 45 dBA L_{dn}, or less.

6.12.1.3 The Hamilton Site

Noise Sensitive Land Uses

Over 400 acres of residentially developed land, including approximately 1,500 residential units, exist on base adjacent to this site. Although current plans call for the housing to be vacated in 1997, the U.S. Coast Guard, Merchant Marine Academy, and Department of Veterans Affairs have requested housing through the real estate screening process. Additionally, the proposed City of Novato General Plan Update is recommending no net loss of housing in this area (U.S. Army Corps of Engineers 1996). Approximately one-third of these residents are located within 1,600 feet from the proposed wetland restoration site.

Existing Noise Sources and Levels

Present activity at the airfield is limited to occasional use for training and support of the Pacific Strike Team. A H-60 helicopter generating sound levels of approximately 87 dBA at 500 feet is used once every 2 to 3 weeks, and a C-130 plane is used occasionally as support, generating noise of 100 dBA at 400 feet (U.S. Army Corps of Engineers 1996).

Regulatory Setting

The City of Novato Outdoor Noise Standards apply to the site. The purpose of these standards is to provide guidelines for the determination of acceptable noise levels near various types of land uses. Generally, the noise standards establish a 55 dBA L_{dn} as normally acceptable for residential areas. However, noise levels of up to 65 dBA L_{dn} can be conditionally acceptable for new construction, if acoustical analysis and installation of noise insulation takes place.

6.12.2 Environmental Impacts and Mitigation Measures

Community noise impacts of a project are determined on the basis of the absolute increase in noise levels due to the Project and on the relationship between the changed noise environment and local land use noise-compatibility guidelines. Generally, a project-induced increase of 5 or more decibels, or project-caused noise levels exceeding the noise compatibility standards contained in the applicable Noise Element, would be considered significant impacts. For the purpose of this document, noise compatibility standards established by Solano County (the Montezuma Site), Marin County (Bel Marin Keys) and the City of Novato (Hamilton) serve as the appropriate standards, and any noise level increase over and above the recommended community noise levels would be considered significant.

Estimates of noise attenuation (or reduction) as the distance from the source increases was estimated by applying the following standard: a 5 dBA reduction occurs with the doubling of the distance from the source. For example, a noise level of 90 dBA experienced 50 feet from the source will be reduced to 65 dBA when experienced 1,600 feet from the source.

6.12.2.1 Proposed Project

Construction Impacts

The first phase of the Project would involve construction of the sediment off-loading and rehandling facility, the sediment distribution pipeline, and the access road improvements. Noise generated during this phase would be relatively minor. The highest noise levels would be generated by the grading equipment

used to improve the access road to the off-loading area, and by trucks used to haul materials to the site. This portion of the Project would be of relatively short duration, probably 2 to 3 months.

Construction of Marsh

The construction of the marsh during each phase of the project would be a relatively quiet activity. Noise would be generated by bulldozers to construct the levees and place the sediment material in each cell area. Generally, this activity would be far from Collinsville. At the closest point, the activity would be about 2,000 feet away. At this distance, the maximum noise level would range from 50 to 55 dBA. The average noise level would be somewhat lower because this equipment would not be operating at this maximum noise output all the time. Since equipment would be moving around the entire site, engine noise should be muffled, as provided by the following mitigation measure.

Impact P-NOISE-1: Equipment, vehicles, and activities during grading and construction would increase noise levels temporarily for area residents and recreationists. (County-LS, Corps-LS)

Noise from vehicles driving to and from the site would be audible to residents along Collinsville Road, but this impact is considered less than significant because it would occur for relatively brief periods. The noise generated by the grading equipment along the access road would reach a maximum instantaneous level of up to 55 dBA at the nearest residences at Collinsville.[1] The noise associated with the construction of the off-loading and rehandling facility would be lower. The noisiest equipment used to construct the off-loading and rehandling facility would be diesel-powered and would have similar noise output to the grading equipment used to improve the access road. However, this activity, being on the west side of the access road along the perimeter levee, would be farther from Collinsville. Maximum instantaneous noise levels from activity at this location would range from 50 to 55 dBA and hence is not expected to exceed the 60dBA standard specified in the Collinsville-Montezuma Hills Area Plan. The noise of this construction activity would be audible at Collinsville during periods when the equipment is in its noisiest mode.

Mitigation Measure P-NOISE-1:

To reduce construction noise levels, intake and exhaust ports on power construction equipment should be muffled or shielded, and shrouds or shields used to reduce noise from impact tools. (LS)

Operational Impacts

The greatest potential for high noise levels would occur during Project operation. The barges would bring dredged materials to the unloading facilities and the dredged sediment would be pumped through the pipeline to the designated disposal area. It is assumed that barges would off-load one at a time and that each of these would be equipped with a 1,500 horsepower diesel-powered pump for pumping the slurry through the pipeline. Two additional booster pumps of 1,500 horsepower would be located along the pipeline. The first would be about 6,000 feet from Collinsville. These large diesel-powered pumps would be the noisiest pieces of equipment for the Project. Barges would also be loaded with rehandled sediments

1 Noise level projections are based on data and procedures contained in the lecture notes, "Noise Control for Buildings and Manufacturing Plants," authored by Layman Miller and copyrighted by Bolt, Beranck and Newman, Inc., 1981, and file data of Illingworth & Rodkin, Inc.

at the rehandling facility and remove these sediments from the site via the Sacramento River for use elsewhere.

Impact P-NOISE-2: Equipment, vehicles, and activities during operation would increase noise levels for area residents and recreationists. (County-S, Corps-S)

Typical diesel engines of the size proposed for the Project and equipped with standard mufflers generate noise levels of about 90 dBA at a distance of 50 feet. Noise levels at Collinsville during periods when the sediment pump and other types of equipment associated with the rehandling facility and other project activities, including tugs and/or barges using the rehandling facility, are operating simultaneously could exceed 60 dBA.

Sediment off-loading and rehandling activities could occur 24 hours a day, when dredged materials are available. If unmitigated, a significant impact could be expected on the residents of the 15 homes located in Collinsville (approximately 38 persons assuming 2.5 persons per household).

An outdoor noise level above 60 dBA CNEL would significantly interfere with the ability to carry on a conversation at a speaker-to-listener distance greater than about 5 to 6 feet (H&S, pg. 64). Since a building with the windows open typically reduces outdoor noise levels by about 15 dBA, outdoor noise levels above 60 dBA CNEL would result in indoor noise levels higher than 45 dBA CNEL, with the windows open. This could interfere with the ability to converse in a normal tone of voice indoors.[2] Since a building with the windows closed typically reduces outdoor noise levels by an additional 10 dBA, outdoor noise levels above 60 dBA CNEL would result in sleeping area noise levels higher than 35 dBA CNEL, with the windows closed.

Noise experts generally find that a 10 dBA increase in noise is subjectively heard as a doubling of loudness (H&S, pg. 65). Therefore, a level of 60 dBA CNEL in Collinsville would significantly exceed the existing 40 dBA daytime background noise level in the area, and would be experineced as more than a doubling of the existing loudness.

Mitigation Measure P-NOISE-2:

- The Project shall not cause outdoor noise levels in residential areas in Collinsville and along Collinsville Road to exceed 50 dBA CNEL as measured at the boundary of the residential areas, and/or 45 dBA CNEL as measured within the interiors of homes in these areas. Noise levels shall be monitored to confirm compliance with this requirement. If noise levels are exceeded, equipment and/or operations shall be modified as necessary to achieve compliance.
- Construction equipment used by the Project shall include mufflers or shields to reduce noise. Slurry pumps shall be equipped with "critical" grade silencers and enclosed.
- An acoustical engineer shall develop a noise reduction plan to minimize pump levels below noise standards specified in the Collinsville-Montezuma Hills Area Plan. (LS).

2 EPA, 1974.

"Critical" grade silencers used for hospital emergency engine generators would need to either totally or partially enclose the pumps, depending upon their distance from the town of Collinsville. Depending on how the enclosure is constructed, average reductions of 16-29 dB can be achieved.[3]

6.12.2.2 Alternative 1: Managed Wetland

A managed wetland would have the same noise impacts as the proposed tidal wetland, and the same mitigation measures would apply. These impacts and mitigation measures are described in the previous section, to which the reader is referred for details.

6.12.2.3 Alternative 2: Combined Wetland

A combined tidal and managed wetland would have the same noise impacts as the proposed tidal wetland, and the same mitigation measures would apply. Refer to the previous discussions in section 6.12.2.3.

6.12.2.4 Alternative 3: The Bel Marin Keys Site

Construction and operation would generate the same types of noise as the Proposed Project, but would be closer to existing residences on the Bel Marin Keys site.

Construction Impacts

Grading and excavation would require the use of some heavy construction vehicles on the site. This would generate high noise levels due to grading and excavation equipment operation.

Impact 3-NOISE-1: Equipment, vehicles, and activities during grading and construction would increase noise levels temporarily in the eastern portions of the Bel Marin Keys development along Bel Marin Keys Boulevard and Bahama Reef. (County-S, Corps-LS)

Construction equipment and operations would cause significant short-term noise increases of up to 75 dBA for some Bel Marin Keys residents. As the construction activity moves away from the property boundary, there would be less impact on existing residents. Assuming 90 dBA to be the maximum construction noise when construction activity is at the property boundary, residential units located within 1,600 feet of the Project in the eastern and southern portions of the existing Bel Marin Keys community, including over half of residences on Bahama Reef and houses at the terminus of Bel Marin Keys Boulevard, would be subject to significant noise impacts.

Mitigation Measure 3-NOISE-1:

- Muffle and shield all intake and exhaust ports on power construction equipment, and shroud or shield all impact tools.
- Where such equipment is available and feasible, use electric, rather than gas or diesel construction equipment. (LS)

Construction activity more than 1,600 feet away from homes would generate noise levels below 65 dBA Leq, and would not be significant.

3 CERL, 1975

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Operational Impacts

Diesel-powered pumps would be located on the perimeter levee along San Pablo Bay to pump dredged sediment through the pipeline to designated disposal areas. Typical diesel engines of the size proposed for this project and equipped with standard mufflers generate noise levels of about 90 dBA at a distance of 50 feet.

Impact 3-NOISE-2: Equipment, vehicles, and activities during operation would increase noise levels for area residents and recreationists. (County-S, Corps-S)

On-site pumps could operate 24 hours a day, when dredged materials are available. These pumps would be located over 6,400 feet away from the nearest sensitive receptors, residents on Bahama Reef. There would be a pump at the off-loading facility and another pump on the site. Noise levels experienced by these receptors would be approximately 55 dBA.

Mitigation Measure 3-NOISE-2:

- The Project shall not cause noise levels in residential areas of Bel Marin Keys to exceed 65 dbA (Ldn). Noise levels shall be monitored at appropriate locations to confirm compliance with this requirement. If noise levels are exceeded, equipment and/or operations shall be modified as necessary to achieve compliance.
- Install "critical" grade silencers and enclose each pump.
- An acoustical engineer shall develop a noise reduction plan to minimize pump levels below regulatory standards. (LS)

6.12.2.5 Alternative 4: The Hamilton Site

Construction and operation would generate the same types of noise as at the Bel Marin Keys site, but would be further from the existing Bel Marin Keys development at approximately 2,100 feet. Since construction activity would occur more than 1,600 feet away from homes, no significant noise impacts to the Bel Marin Keys Unit 1 to 4 development are expected. Noise levels would be below 65 dBA Leq, and would not be significant.

The Department of Defense (DoD) residential development located to the west of the airfield has included approximately 1,500 housing units for active duty military and USCG personnel and their families. These residences are as close as 1,000 feet to the airfield. The City of Novato General Plan Update preliminarily recommends no net loss of housing units in this area (U.S. Army Corps of Engineers 1996). If residential development is to continue at this site, or additional residential development is constructed to the west of the Project in the future, the construction and operation noise of the wetland project could reach adjacent residences. Necessary precautions during construction and operation and for construction workers should be required.

Impact 4-NOISE-1: Equipment, vehicles, and activities during grading and construction would increase noise levels temporarily in the DoD Housing Area. (County-LS, Corps-LS)

Mitigation Measure 4-NOISE-1:

- Muffle and shield all intake and exhaust ports on power construction equipment, and shroud or shield all impact tools.

- Where such equipment is available and feasible, use electric, rather than gas or diesel construction equipment. (LS)

Impact 4-NOISE-2: Equipment, vehicles, and activities during operation would increase noise levels for area residents and recreationists. (County-S, Corps-S)

Mitigation Measure 4-NOISE-2:

- The Project shall not cause noise levels in adjacent residential areas to exceed 65 dbA (L_{dn}). Noise levels shall be monitored at appropriate locations to confirm compliance with this requirement. If noise levels are exceeded, equipment and/or operations shall be modified as necessary to achieve compliance.
- Install "critical" grade silencers and enclose each pump.
- An acoustical engineer shall develop a noise reduction plan to minimize pump levels below regulatory standards. (LS)

6.12.2.6 No-Project Alternative

The No-Project Alternative would have no effect on existing noise levels at the site.

6.12.2.7 Cumulative Impacts

The Proposed Project and the project alternatives would generally have the same cumulative noise impacts. By generating noise from construction, operations, and traffic, the projects would add incrementally to existing noise levels. The cumulative impact of several such projects would be to raise ambient noise levels, primarily within the vicinity of restoration sites. However, these noise levels are not expected to exceed existing standards for acceptable noise levels. Mitigation of site-specific noise impacts would eliminate the potential for cumulative noise impacts.

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6.13 Recreation

6.13.1 Affected Environment

6.13.1.1 The Montezuma Site

Birds Landing Hunting Preserve and Sporting Clays

The Hunting Preserve and Sporting Clays leases a 1,017-acre site from Catellus Corporation. The Preserve is located between Montezuma Slough and Collinsville Road, as shown in Figure 6.13-1. The area is used primarily for the seasonal hunting of pheasant and chukar (partridge), and the year-round shooting of sporting clays. It contains numerous duck blinds scattered about the property. Hunting season is open from September through May. Approximately 10,000 to 15,000 people per year, both local residents and visitors use the Preserve for hunting and sporting clay purposes. The facility is open for sporting clays on Wednesdays and weekends, from 9:00 A.M. to 5:00 P.M.

Approximately 360 acres of the Preserve's leased site are within the Project boundary. Dredged materials would be placed on 245 acres. Approximately 115 acres of the Preserve site are uplands and would remain undisturbed.

Department of Water Resources Day Use Area

The Department of Water Resources (DWR) Day Use Area is located along the Montezuma Slough at the end of Fire Truck Road, within the Project boundaries. The Day Use Area contains a parking lot for 18 vehicles, including one handicapped space. The recreational facilities include a small fishing pier which can also be used as a temporary boat dock for loading and off-loading passengers, tree-shaded picnic tables, and a short path, approximately 100 feet long, on the top of the perimeter levee. Toilet facilities are also available near the parking lot. The Day Use Area was built along with DWR's salinity control structure to satisfy the BCDC.

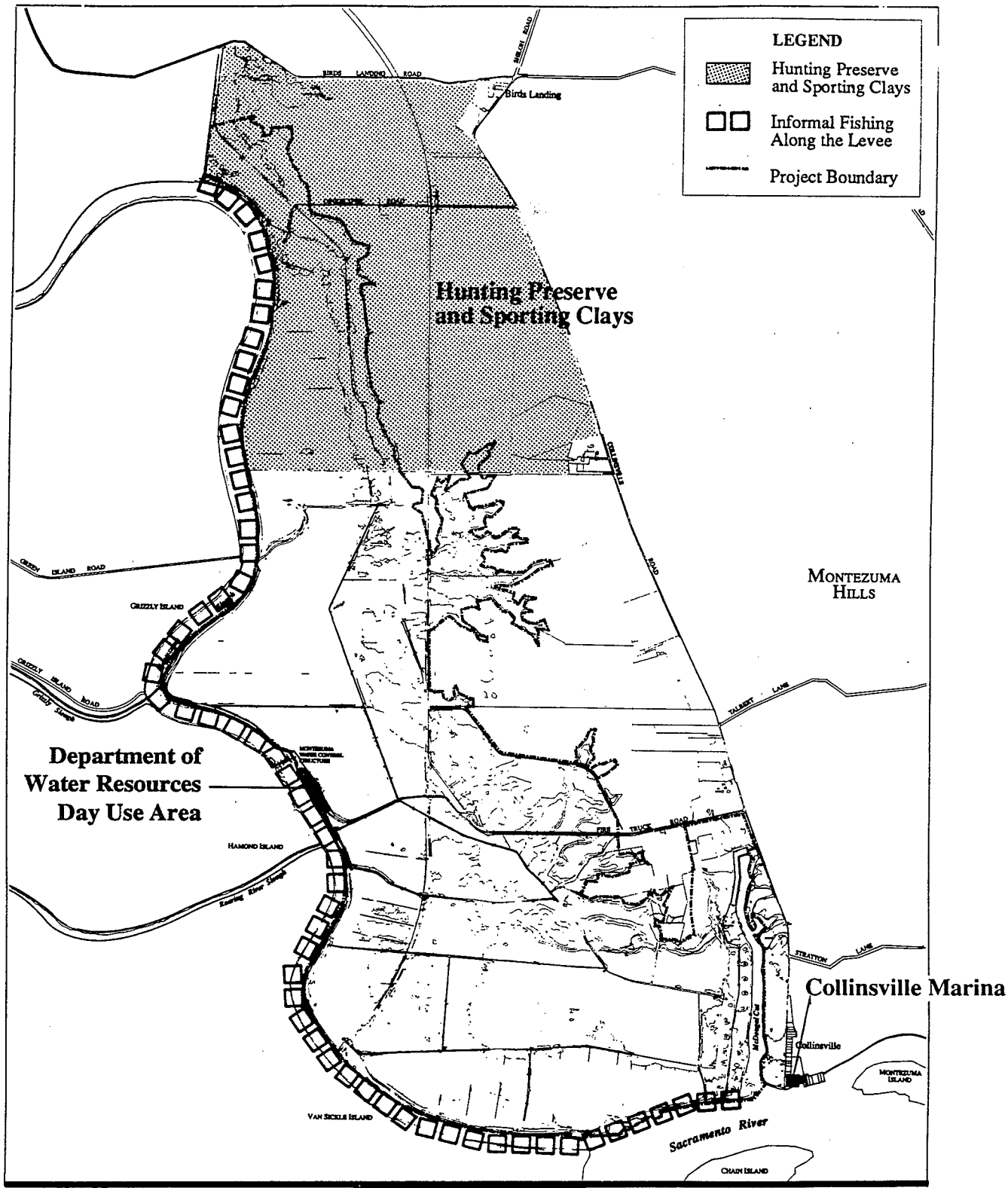
The DWR Day Use Area is used primarily by local residents who come to fish off the pier and use the area for picnicking. Approximately 600 to 700 people use the area each year.

Collinsville Marina

The Collinsville Marina, located on the Sacramento River east of the Town of Collinsville, is an important recreational center for residents of the Collinsville-Montezuma Hills area. The small facility provides a boat launch and limited space for campers and mobile homes.

General Recreation and Public Access

The areas along the Sacramento River and Montezuma Slough are used primarily for hunting and fishing purposes. Duck hunting takes place during hunting season along the marsh areas lining the Sacramento River which can be accessed at the end of Collinsville Road. Although the Project site is privately held, the perimeter levee which abuts both the Sacramento River and the Montezuma Slough is used for fishing all year-round. Small beaches used for boat landing are located intermittently along the north shore of the Sacramento River. These recreational uses are infrequent due to the relatively sparse population in the area.



Source: Brady and Associates (1994)

MONTEZUMA WETLANDS PROJECT
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Figure 6.13-1

Montezuma Site: Recreation Areas

0' 1500' 3000' 6000'

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Regulatory Setting

Recreation and public access in the San Francisco Bay Area are governed by a variety of regional and local policies. The policies of particular concern for the Montezuma Project include those of the San Francisco Bay Conservation and Development Commission (BCDC) and land use and recreation policies of Solano County.

THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION. The McAteer Petris Act and San Francisco Bay Plan policies require that maximum feasible public access be provided with each new waterfront development. The Bay Plan policies for public access encourage access to natural areas to permit study and enjoyment of these natural environments. However, some wildlife may be sensitive to human intrusion. For this reason, BCDC directs that projects in such areas be carefully evaluated in consultation with appropriate agencies to determine the appropriate location and type of access to be provided.

LOCAL RECREATION POLICIES. The use of Suisun Marsh for recreational purposes such as hunting is encouraged in the Solano County Local Protection Plan (LPP), which is a compilation of Solano County General Plan, Area Plan, and zoning requirements. The Local Protection Plan states that the vast open expanse of the Suisun Marsh is the location of many recreational activities. The Marsh is well known for waterfowl hunting in California. In addition, several other forms of recreation, including fishing, upland game hunting, and water sports, are also popular. In addition, there are opportunities for a greater diversity and amount of public recreation in the Marsh.

The recreation values of the Marsh, particularly for duck hunting, have been a significant factor in its preservation. Private duck clubs and public agencies, such as the Department of Fish and Game, have made considerable contributions to the improvement of the Marsh habitats for waterfowl as well as other wildlife.

Recreational uses in the Suisun Marsh should be guided through the following LPP policies:

1. *Additional land should be acquired within the Suisun Marsh to provide for increased public duck hunting recreational use and additional refuge areas for waterfowl during the hunting season. Acquisition priority should be given to those lands not now operated as managed wetlands.*

2. *Land should also be purchased for public recreation and access to the Marsh for such uses as fishing, boat launching, and nature study. These areas should be located on the outer portions of the Marsh near the population centers and easily accessible from existing roads. Improvements for public use should be consistent with protection of wildlife resources.*

6.13.1.2 The Bel Marin Keys Site

There are no recreational facilities on or in the vicinity of the Bel Marin Keys site.

6.13.1.3 The Hamilton Site

There are no recreational facilities on or in the vicinity of the Hamilton site.

6.13.2 Environmental Impacts and Mitigation Measures

6.13.2.1 Proposed Project

Birds Landing Hunting Preserve and Sporting Clays

Impact P-REC-1: Approximately 245 acres of area leased to the Birds Landing Hunting Preserve and Sporting Clays would be converted to tidal marsh, eliminating about 60 acres that now provide hunting for game such as pheasant, rabbit and snipe, which depend on dry grassland habitats. The Hunting Preserve's recreational use would be disrupted during construction. (County-LS, Corps-LS)

Approximately 245 acres (or one-third of the total acreage) of the Hunting Preserve would be converted to wetlands in Phase III of the Project, thus eliminating some recreational uses over several years. Only 60 acres of this area are currently used for recreational purposes, as much of the area is unvegetated or supports variable pickleweed areas not used by hunters.

Although the amount of land and hunting opportunities would not diminish by a large acreage, Solano County policies call for an increase in public hunting areas, particularly of lands not operated as managed wetlands.

Given that there are over 200 duck and pheasant clubs in the Suisun Marsh, hunters would have a number of alternative clubs in the area to choose from. Additionally, construction effects of the Project would be temporary and hunting game would eventually return to the area. The recreated wetland environment would eventually draw hunting fowl such as ducks to the area, having a potentially beneficial effect for the Preserve in the long run. The habitat for pheasant, rabbits and snipe would be permanently lost at this location. Additional habitat land is available from Catellus Corporation, and could be leased for hunting use.

Other hunting clubs of the Suisun Marsh are directly across Montezuma Slough from the Project. These clubs are heavily used and provide recreational opportunities for citizens of the Bay and Delta areas. Lights from the facility are likely to have an effect on wildlife in the immediate vicinity of the off-loading facility, but would probably not adversely affect hunting on the clubs in the marsh.

Department of Water Resources Day Use Area

Day Use Area users are likely to be adversely affected during the construction phases of the Project because a major attraction of the Day Use Area is its isolation, solitude and quiet.

The Day Use Area would be improved as part of the Project design. The improvements would include additional parking, viewing platforms which take advantage of the enhanced wetlands, and extended nature trails along the perimeter levee south from the DWR Day Use Area to the Phase II levee breach. Existing access to the DWR Day Use Area would be maintained during construction and following Project completion along Fire Truck Road.

Impact P-REC-2: Project construction activities would adversely affect access to the recreational activities at the DWR Day Use Area on Montezuma Slough. (County-LS, Corps-LS)

Access to the site and the nature of the public access experience could be affected during the construction phases of the Project. The access road would pass through the restoration areas identified as Phase I and

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Phase II and would be directly adjacent to the proposed secondary holding pond, which would be used as back-up for the makeup water pond located in the southern area of Phase IV. The holding pond would have a less attractive appearance than the existing grazing area during the construction period. The restoration sites would be the scene of dredged materials disposal and heavy equipment activities for the period of construction. Construction traffic and activity could interfere with visitors going to the day use area as both types of traffic would need to use Fire Truck Road.

> Mitigation Measure P-REC-2: Access should be provided to the Day Use Area during construction. Any short-term temporary road closures should be reviewed and approved by the County. (LS)

Though general recreational use of the DWR Day Use area would be disrupted during the construction phases of the Project, public access would be improved in the long-term by extending the nature trail southward along the levee to the Phase II levee breach. Once construction is completed, the improvements would be a benefit to the area and to recreational users in general by providing passive recreational use and educational use for students.

Collinsville Marina

The Collinsville Marina is located approximately one-half mile east of the Proposed Project's off-loading facilities. The Collinsville area is also designated for commercial recreation use in the Solano County and BCDC plans. The maneuvering of tugs and activity could interfere with existing and proposed recreational boat use. However, the County and State plans provide for water-related industrial uses at the Project sites. The Project would be no more disruptive than industrial/port uses.

General Recreation and Public Access

The general recreational uses in the area, such as hunting and fishing along the Sacramento River and Montezuma Slough, would be disrupted during Project construction and continuous access would be disrupted by levee breaches. Recreational activities (primarily fishing), which occur on an informal basis along the levees, would be restricted near the off-loading facility. However, successful marsh restoration could serve as a nursery area for fish, thereby indirectly enhancing recreational fishing opportunities over the long term.

The Project Applicant has proposed to construct a public access area off of Fire Truck Road as part of Phase IV of the Project. However, archaeological reconnaissance has indicated that this area contains mounding characteristics of upland soils which are associated with buried Indian artifacts; construction of the access area could disrupt such artifacts if they exist. The potential impact resulting from construction of this access area is discussed in Section 6.9 (Cultural Resources). A public access area could be provided so long as no excavation or grading is done. A detailed public access plan which shows existing topography, proposed topography and proposed improvements should be prepared. Access improvements would be reviewed for consistency with the BCDC policies by the BCDC Design Review Board. The Project would have an overall benefit for public access for day uses and fishermen.

6.13.2.2 Alternative 1: Managed Wetland

The impacts and mitigation measures for the Managed Wetland Alternative would be similar to those identified for the Proposed Project, as described above.

6.13.2.3 Alternative 2: Combined Wetland

The impacts and mitigation measures for the Combined Wetland Alternative would be similar to those identified for the Proposed Project, as described above.

6.13.2.4 Alternative 3: The Bel Marin Keys Site

No recreational areas would be affected by wetlands restoration on the Hamilton site. The San Francisco Bay Plan policies requiring public access to bayfront development would also apply to this site. An access trail along the levees to a point access area would be provided in this alternative. No recreation or public access impacts are anticipated.

6.13.2.5 Alternative 4: The Hamilton Site

No recreational areas would be affected by wetlands restoration at the Hamilton site. The San Francisco Bay Plan Policies requiring public access to bayfront development would apply to these sites as well. An access trail along the levees to a point access area would be provided in this alternative. No recreation or public access impacts are anticipated.

6.13.2.6 No-Project Alternative

Existing recreational use of the site would continue unchanged under this alternative. The No-Project Alternative would have a beneficial impact on hunting fowl enthusiasts and would be consistent in the short-term with County policies to provide recreational opportunities. In the long-term, opportunities for expanded public access for viewing and studying wetland habitats and restoration would be foregone.

6.13.2.7 Cumulative Impacts

Cumulative impacts of the Proposed Project and the project alternatives are generally the same. Though several other marsh restoration projects are proposed in the San Francisco Bay Area, they are not expected to significantly affect recreation resources. Infrequent recreational fishing and bird watching occurs in these areas, but most of the sites are not used or leased for recreational hunting. The cumulative impact of wetland restoration projects on recreational uses or activities would not be significant.

6.14 Population, Housing, and Employment

6.14.1 Affected Environment

6.14.1.1 The Montezuma Site

Population

The Montezuma Wetlands Project is located in Solano County, which had an estimated population of 340,421 in 1990 according to the U.S. Census. The County's population rose by approximately 45 percent since 1980 when the population was 235,203. Between 1995 and 2015, population is expected to increase by 40 percent, from 379,350 to a total population of 531,700.[1]

Housing

There are no homes within the Project boundaries. Most of the residences in the Project vicinity are located along Collinsville Road, which lies to the east of the Project boundary. Scattered farms and farmhouses lie along Collinsville Road, Shiloh Road and Birds Landing Road; however, most of the residences in the Project vicinity are clustered in the Town of Collinsville where the road dead-ends near the Sacramento River. There are 15 homes located in the town of Collinsville and eight homes located in the town of Birds Landing. Three isolated homes are located along Shiloh Road east of the Sacramento-Northern railroad tracks and three homes are located along Collinsville Road. Assuming an average of 2.5 persons per household, as recommended by the Association of Bay Area Governments (ABAG), the permanent population in the Project vicinity is about 73 persons.

Residential development in the area is predominantly rural single-family housing — typically farmhouses with associated clusters of farm buildings, such as barns, silos and sheds. The residential area in Birds Landing is zoned Residential Estate (RE-1) and the residential area in the town of Collinsville, which was zoned after construction of the homes, is zoned Exclusive Agricultural (A-20).

Employment

Aside from the Jerico Towing Company, which has three employees at the Montezuma site, there are no employment opportunities on the Project site and very few in the Project vicinity. The only businesses in the Project vicinity occur in the town of Birds Landing. They include three commercial uses, which are a small retail outlet, the Birds Landing Hunting Preserve and Sporting Clays office, and a surplus sales lot leased from the Rio Vista Farm Bureau.

According to ABAG estimates, in 1990 there were approximately 119,440 jobs in Solano County and approximately 50 percent of the residents were employed. Between 1985 and 1990, the number of jobs added in Solano County was more than double that of the earlier five-year period. Between 1995 and 2015, ABAG estimates that the number of jobs in the County will increase by about 100,260, from 104,870 to 205,130. Significant future job growth in the County is expected in all the major economic sectors.

Military establishments such as Travis Air Force Base in Fairfield and U.S. Navy Mare Island facility in Vallejo employ as many as 15,000 civilians in Solano County. Almost 20 percent of total personal income

1 Association of Bay Area Governments, Projections `96.

in the County comes from governmental employment, and almost 75 percent of that number is military-related.

According to the Labor Market Information Division of the California Employment Development Department, there was an unemployment rate of 8.8 percent in Solano County as of February 1996, compared to 8.2 percent for the state of California.

Jobs/Housing Balance

According to ABAG projections, the County has an adequate jobs/housing balance. In 1995, the ratio was 0.63 job per employed resident; the ratio is projected to be 0.80 in 2015.

6.14.1.2 The Bel Marin Keys Site

Population

The Bel Marin Keys site is in Marin County, which had an estimated population of 230,096 in 1990 according to the U.S. Census. Marin County's population increased 3.4 percent from a 1980 population of 222,568. Between 1995 and 2015, Marin County's population is expected to increase by 13.3 percent, bringing the total population from 245,600 to 278,150.[2]

Housing

As of 1991, there were five permanent residences on the Bel Marin Keys site. They occupy seven acres of land in the northwestern corner of the site on Bel Marin Keys Boulevard. Assuming an average household size of 2.5 persons, the site population can be estimated at 13. Bel Marin Keys Units 1-4 with 700 residential units are located just north of the site. Bel Marin Keys Unit 5 is a proposed development **of the site,** consisting of 1,596 acres, of which 784 acres would become a tidal wetland. **Under the Unit 5 project,** wetland restoration at this site is intended by the owners of the property to mitigate the impacts of residential development of 796 dwelling units on 146 acres west of the area intended for wetland restoration. A 1,190-unit housing project was originally proposed for Bel Marin Keys Unit 5 but was denied by the Marin County Board of Supervisors.

Home values in the County are extremely high, although average home values for single-family homes in Novato tend to be at approximately 90 percent of the average home values for the County of Marin as a whole. Other nearby counties (including Sonoma and Napa) have had traditionally lower housing costs, and this trend is expected to continue with faster housing growth in these areas. The home value-to-income ratio for Novato has increased considerably in 20 years (from 2.48:1 in 1960 to 5.43:1 in 1980), making it even more difficult for individuals working in Novato to live there. One apparent result of high home ownership costs in Novato is the relatively high proportion of renter-occupied units, estimated at 40 percent of total units. This percentage reflects the inability of many people to pay the high ownership costs.

2 Association of Bay Area Governments, Projections `96.

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Marin County household growth is expected to lag behind most other counties in the region between 1985 and 2000, yet Novato is projected to have a greater growth rate than the County as a whole.[3]

Employment

A few seasonal workers are employed by the oat hay farming operation on the site. A commercial, office and industrial area is located along Highway 101 south of Bel Marin Keys Boulevard.

There were 103,030 jobs in Marin County in 1990, and 55 percent of the residents were employed. The number of jobs increased 32 percent from 1980 to 1990. Between 1995 and 2015, ABAG projects an increase of 14,080 jobs in Marin County, from 121,890 to 135,970, respectively.

The unemployment rate in Marin County for February 1996 was 4.0 percent, according to the California Labor Market Information Division, compared to 8.2 percent for the state.

Jobs/Housing Balance

The ratio of jobs to employed residents in Marin County was 0.95 in 1995 and is projected to be 0.90 in 2015.

6.14.1.3 The Hamilton Site

Population

The Hamilton site is in Marin County, which had an estimated population of 230,096 in 1990 according to the U.S. Census. The population characteristics of the County are the same as the Bel Marin Keys site described above.

Housing

No army personnel reside on the Hamilton site. However, a development project with residential units is proposed adjacent to the airfield.

Housing characteristics of the County are the same as for the Bel Marin Keys site described above.

The Novato General Plan directly addresses the lack of affordable housing, and has designed programs and set goals to increase construction (and renovation) of affordable units.[4]

Employment

A commercial, office and industrial area is located along Highway 101 south of Bel Marin Keys Boulevard. The regional employment characteristics are the same as those described for the Bel Marin Keys site.

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3 EIP 1986b.

4 Novato Community Development Department 1981.

Jobs/Housing Balance

The ratio of jobs to employed residents in Marin County was 0.95 in 1995 and is projected to be 0.90 in 2015.

6.14.2 Environmental Impacts and Mitigation Measures

6.14.2.1 Proposed Project

Population

The Project would employ an average of 30 people during site preparation, and a maximum of 46 people during operations. These numbers include construction and operation of the rehandling facility[5]. Because the Montezuma Project would not employ a large number of people compared to the existing civilian labor force and the number of unemployed workers, and because the County's unemployment rate currently exceeds the state total, population immigration is expected to be negligible. There would thus be no significant changes in the County's population characteristics.

Housing

Since population immigration from the project would be negligible, there would not be a significant increase in the demand for housing in the Collinsville area or Solano County as a whole.

Employment

According to the Project Applicant, an average of 30 people per day would be employed on site during the construction phases of the Project. These people would include project managers, construction managers, inspectors, helpers and equipment operators. Construction activities would include initial start-up, which would include construction of the off-loading area, sediment pipeline, makeup water supply, and levee, channel and surface contouring at the beginning of each phase.

During operation of the Project, it is estimated that a maximum of 46 people would be employed on site for the 10 to 15-year life of the Project. The 46 employees would reflect periods when 24-hour operation of the project would occur. At other times, 20 employees would work 8-hour shifts. The number of shifts per day would depend on the rate of sediment delivery, which varies according to seasonal dredging restrictions and the schedules of regional dredging projects. People employed during the operation of the Project would include surveyors, shore crew, superintendent, shift foreman and crew, and lab personnel. Operations activities would include overseeing the sediment off-loading, placement and pumping operations, and monitoring and testing of the sediments. The additional jobs and related payrolls, and purchases of goods and services, would be a **non-significant** benefit to the economy of the County.

6.14.2.2 Alternative 1: Managed Wetland

Like the Proposed Project, the Managed Wetland alternative would not displace or create a significant demand for housing, and would employ an average of 30 construction workers and up to 46 operations

5 Roger Leventhal, Levine-Fricke-Recon, verbal communication 4/24/96.

personnel. This would not have a significant effect on population. Increased employment levels and related payrolls and purchases would benefit the economy of the County, **but this would not be significant**.

6.14.2.3 Alternative 2: Combined Wetland

Like the Proposed Project, the Combined Wetland alternative would not displace or create a significant demand for housing, and would employ an average of 30 construction workers and up to 46 operations personnel. This would not have a significant effect on population. Increased employment levels and related payrolls and purchases would benefit the economy of the County.

6.14.2.4 Alternative 3: The Bel Marin Keys Site

Population

Like the Proposed Project and the other alternatives, Alternative 3 would not employ a large number of people; therefore, there would be no significant changes in the County's population characteristics.

Housing

Impact 3-HOUS-1: The Bel Marin Keys alternative would preclude the development of housing on the site. This would be inconsistent with County zoning, which allows one dwelling unit per two acres on the site, and would hinder the County's efforts to meet its housing needs (County-S, Corps-LS)

Converting the entire Bel Marin Keys site to wetlands would preclude residential development on the Bel Marin Keys Unit 5 property. According to the 1991 EIR/EIS for Bel Marin Keys Unit 5, data from the Association of Bay Area Governments (ABAG) for Marin County shows that the County is in need of an estimated 6,560 dwelling units through 1995. Projected growth in housing units, however, is only 4,285 dwelling units over the same period, leaving an unmet demand for 2,275 dwelling units. Unincorporated Marin County is estimated to need 641 dwelling units, with 122 units needed in the "very low income" range.

The subject property is zoned to allow 805 dwelling units, and has been the subject of a development proposal that would include 80 below-market-rate units.

> Mitigation Measure 3-HOUS-1: A portion of the site shall be reserved for housing development. (LS)

Employment

Employment on the Bel Marin Keys site would be similar to the Proposed Project. A few seasonal agricultural workers would be displaced, but more marsh restoration workers would be employed. The number of workers on the site would not be large enough to significantly affect employment in the surrounding area.

Jobs/Housing Balance

The Bel Marin Keys site is located in the City-Centered Corridor, one of three environmental corridors identified by the Marin Countywide Plan, which is designated for urban development. Directly east of

Highway 101, a mixed-use office, light industrial, and commercial development has recently been developed. To the extent that the 101 Corridor is a growing employment center, the location of additional housing in close proximity to this corridor would contribute to a reduction in trip lengths for intra-county commutes. Use of the Bel Marin Keys site for wetland restoration would reduce the potential for locating jobs and housing in close proximity in this part of Marin County. This impact overlaps 3-HOUS-1 above, where appropriate mitigation is identified. (LS)

6.14.2.5 Alternative 4: The Hamilton Site

Although the entire airbase is zoned for planned development, proposals have not been made on the airfield and antenna field parts of the base, which are the sites considered for this alternative. Therefore, wetlands conversion of the Hamilton site would not have a significant impact on housing. Like the Proposed Project, the Hamilton alternative would employ up to 46 workers during operations. This would not have a significant effect on population and employment levels in the surrounding areas.

6.14.2.6 No-Project Alternative

The No-Project Alternative would have no impact on housing, population, and employment.

6.14.2.7 Cumulative Impacts

Cumulative impacts of the Proposed Project and the project alternatives are generally the same. The relatively small number of construction and operation personnel who would be employed by wetland restoration projects would be a very small percentage of the total population of the Bay Area. Although several dredge disposal projects have been proposed around the Bay, the number of employees is so small in each project and the projects are so dispersed that no significant region-wide nor specific City or County impacts on population, housing, or employment are anticipated.

6.15 Visual Resources

6.15.1 Affected Environment

This section describes the visual environment and identifies the primary public views of the Montezuma site, the Bel Marin Keys site, and the Hamilton site. Public planning policies that apply to each site are also discussed.

6.15.1.1 The Montezuma Site

Visual Environment

The Montezuma site is bounded by the rolling Montezuma Hills on the east, the waters of the Sacramento River to the south, the low dikes of Montezuma Slough and Suisun Marsh views to the west, and the hills to the north.

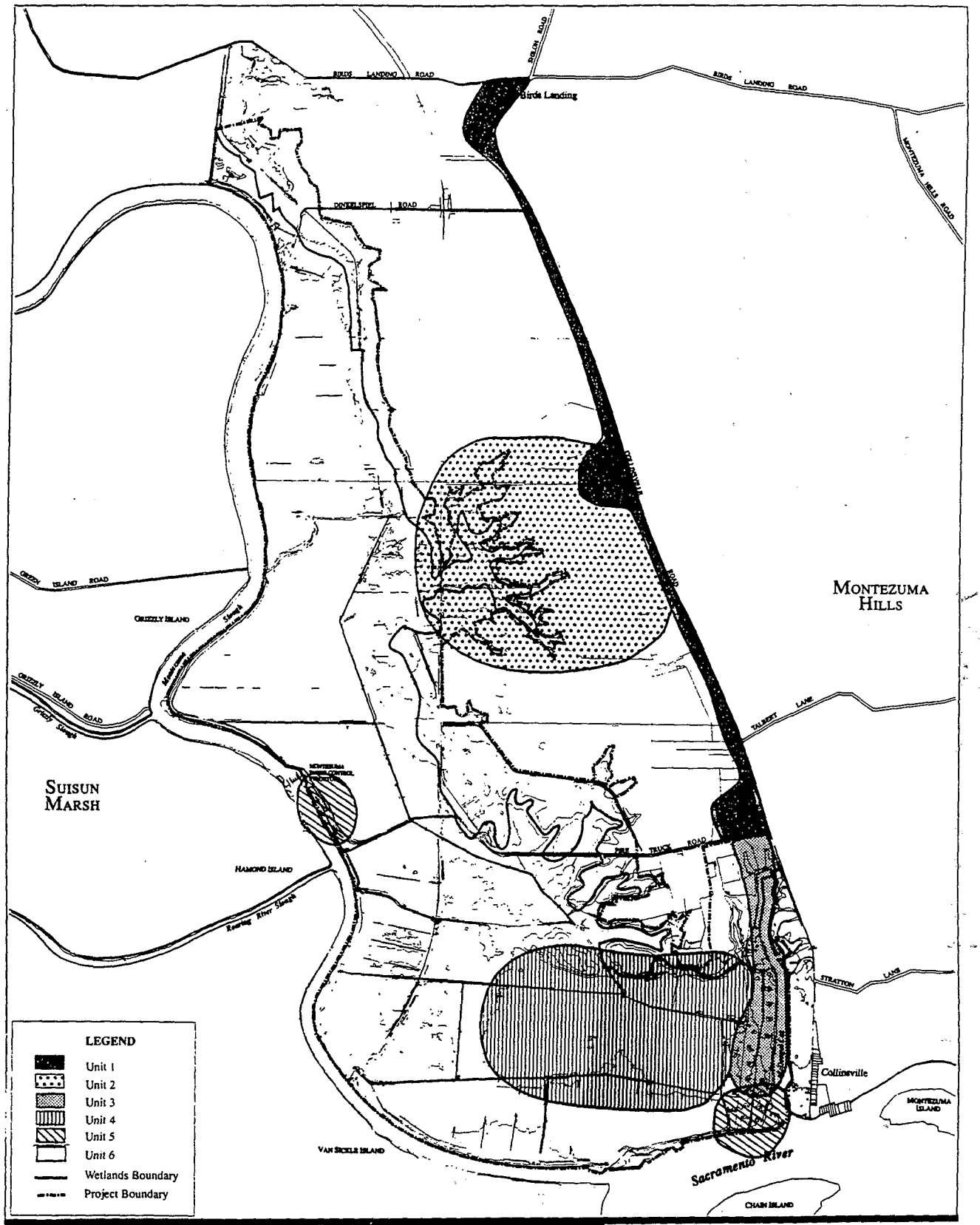
The most striking quality of the site is its homogeneity. The 2,394-acre site has very little relief or change in elevation. The site slopes gradually from its inland boundaries (Collinsville and Birds Landing Roads) to the low dikes at Montezuma Slough and the Bay. The change is so gradual so as not to be evident to the viewer.

The site also has little variety in texture or color. In the summer and dry seasons, the ground in the uplands is golden brown; occasional patches of green seasonal marsh dot the landscape. In winter, the ground is primarily green with brown patches.

Because of homogeneity in elevation and in texture and color, vertical elements provide a strong contrast. The few trees, fence lines, railroad trestles, and utility poles stand out prominently in this flat landscape.

The landscape units comprising the site are shown in Figure 6.15-1 and are described below.

- *Landscape Unit #1.* The first landscape unit runs along Collinsville Road. This unit is characterized by scattered residential settlements surrounded by trees that serve as windbreaks. The road is separated from the flat landscape by fences and in some places is lined with trees which give a strong vertical sense and direct the viewer's attention straight ahead.
- *Landscape Unit #2.* One area on the site with some variation in topography is Clank Hollow. The creek drains a watershed to the east and runoff has created several gullies in the landscape. Although not visible from a great distance, the relief created by the gullies is evident in the immediate vicinity.
- *Landscape Unit #3.* At the southeast corner of the site is McDougal Cut, a dredged inlet off the Sacramento River. Immediately west of the cut is a small industrial facility and piles of oyster shells. Utility lines run to this facility. The variety of colors, heights and materials in this landscape unit makes it visually interesting. The activity of grading machines and trucks entering, leaving and crossing the unit add to the sense of variety and activity.



Source: Brady and Associates (1994)

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Figure 6.15-1

Montezuma Site: Landscape Units

0' 950' 1900' 3800'

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- *Landscape Unit #4.* Just to the south and west of the industrial area is the approximately 275-acre Emmington Marsh. The lush green of the marsh against the stark golden brown of the surrounding cattle-grazing area is pronounced during dry seasons, less so during the rainy seasons.
- *Landscape Unit #5.* At the extreme southeast corner of the site is a small grove of trees and offshore tule marsh. This small cluster of vegetation is isolated at the corner of the site. A similar landscape with the same characteristics can be found around the Day Use Area. There is a grove of trees along the levee which shades the picnic tables and boat dock area. *Landscape Unit #6.* One of the largest landscape units is #6. Unit 6 is comprised of the upland areas above the 10-foot contour line. The land is slightly rolling and used for grazing. The upland is green in winter and golden in summer. A railroad corridor cuts through the northern half of Landscape Unit #6.
- *Landscape Unit #7.* Landscape Unit #7, the largest unit, is comprised of the low-lying areas below the 10-foot contour line. The majority of this unit would be filled with dredged materials for the creation of wetlands. The area is presently seasonal wetlands. Much of the wetland vegetation is green or green/brown year-round. Some large barren spots are interspersed throughout the vegetated area.

Views

The location and direction of six important viewpoints are shown on Figure 6.15-2. Photographs taken from these viewpoints are shown in Figures 6.15-3 through 6.15-5.

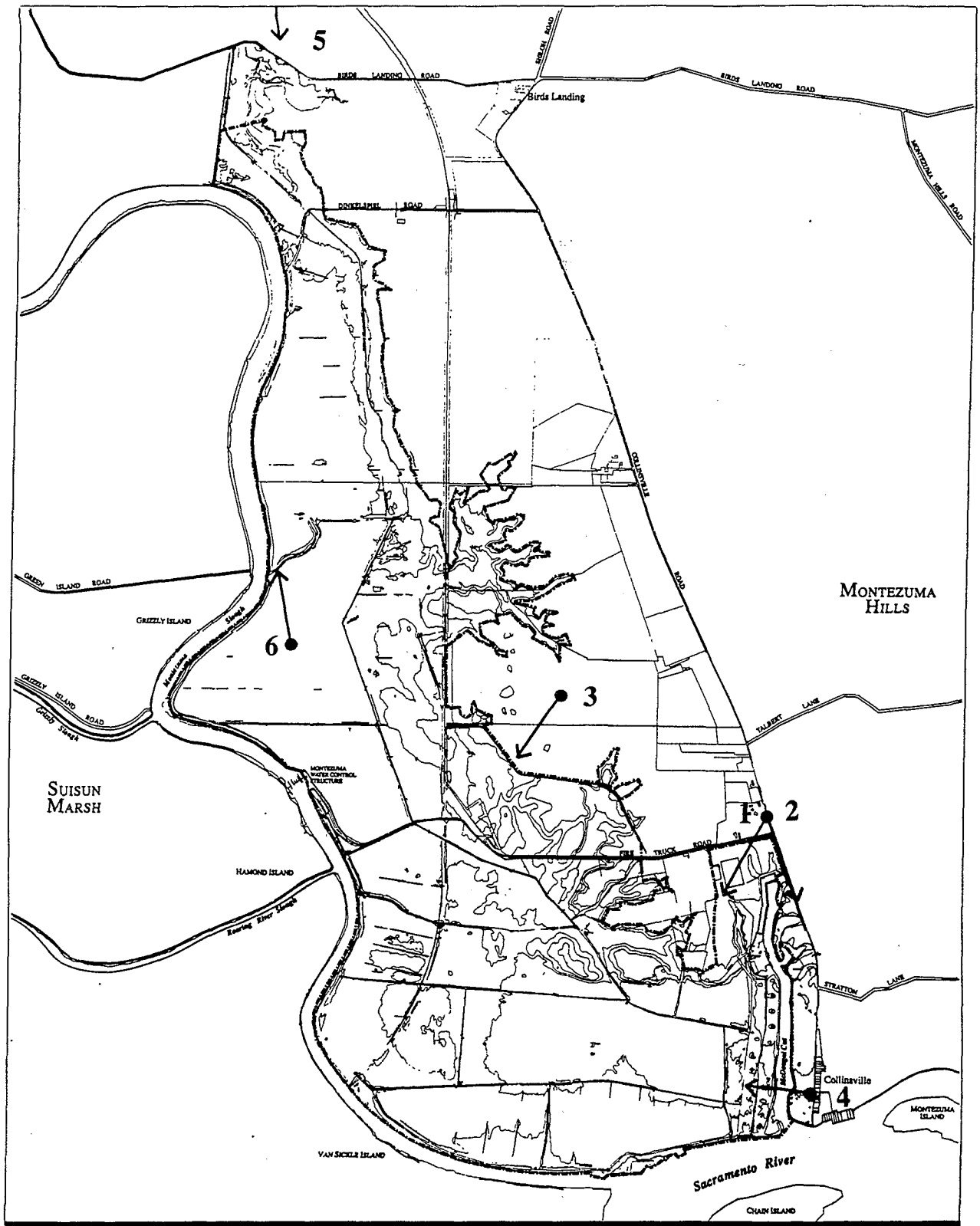
Views of the site are available from Birds Landing Road. The road is a dead end, thus the number of potential viewers is limited. From Collinsville Road, Landscape Units #1 and #6 can be seen across the grazed uplands except where blocked by residential clusters or eucalyptus trees.

Views of the site from Collinsville Road are long distance, extending to the Sacramento River and the Contra Costa Hills beyond. The site is in the middle- to long-distance in views from this roadway. Several residences along Collinsville Road also have views into and across the site. Views from residences in Collinsville are blocked by an existing embankment. The site can also be seen from the Sacramento River.

Recreational viewers using the DWR Day Use Area, coming to Collinsville, or using the facilities of the Birds Landing Hunting Preserve and Sporting Clays represent the largest group of viewers. Visitors to the area come for its peaceful and serene quality and to enjoy nature as part of a hunting or fishing excursion. The residents of the area, farmers, and residents of Collinsville represent another sensitive viewer group. The tranquillity and isolation of the landscape are qualities highly valued by the residents. Public Policy

The following is a brief discussion of the public policies which regulate the visual setting of the Montezuma Site.

COLLINSVILLE-MONTEZUMA HILLS AREA PLAN. The Collinsville-Montezuma Hills Area Plan recognizes the visual quality of the Suisun Marsh, particularly the importance of the isolated eucalyptus stands and the uniqueness of Birds Landing and Collinsville as focal points. However, the Plan does not include any



Source: Brady and Associates (1994)

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Figure 6.15-2

Montezuma Site: Location of Photo Viewpoints

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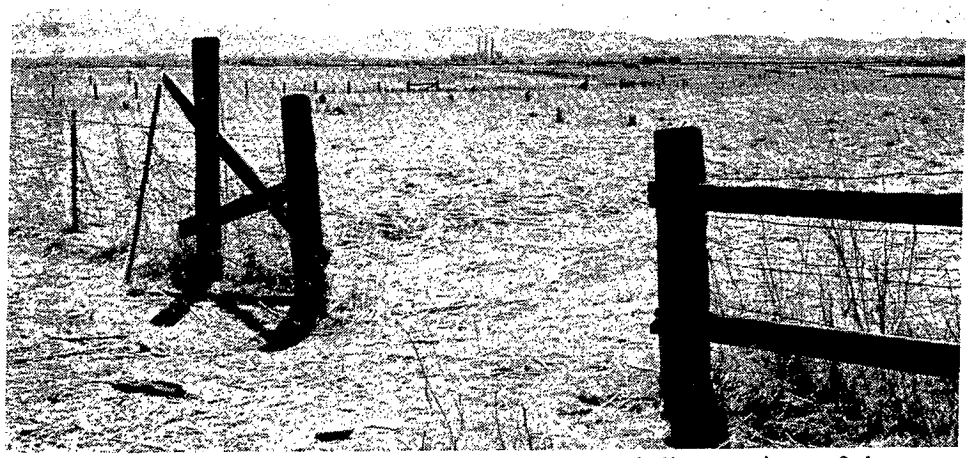

1. View Showing homogeneity of landscape and distant view of the PG&E power plant at Pittsburgh

2. View from Collinsville Road toward McDougal Cut

Source: Brady and Associates (1994)

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Figure 6.15-3

Montezuma Site Photographs: Views 1 and 2

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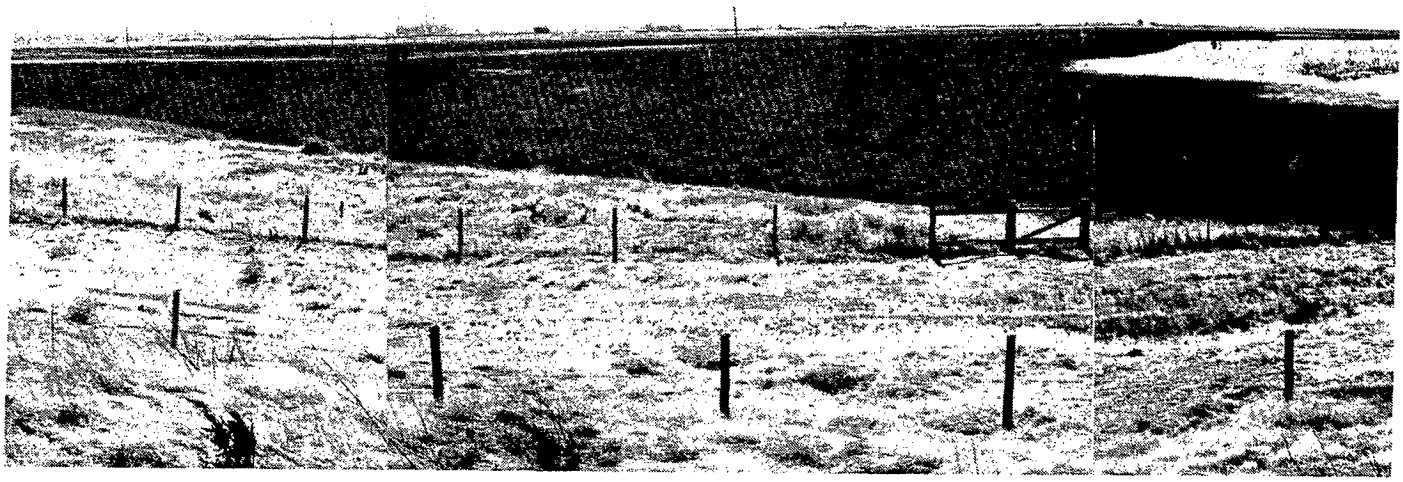

3. View from Fire Truck Road looking south

4. View from Collinsville looking toward site

Source: Brady and Associates (1994)

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Figure 6.15-4

Montezuma Site Photographs: Views 3 and 4

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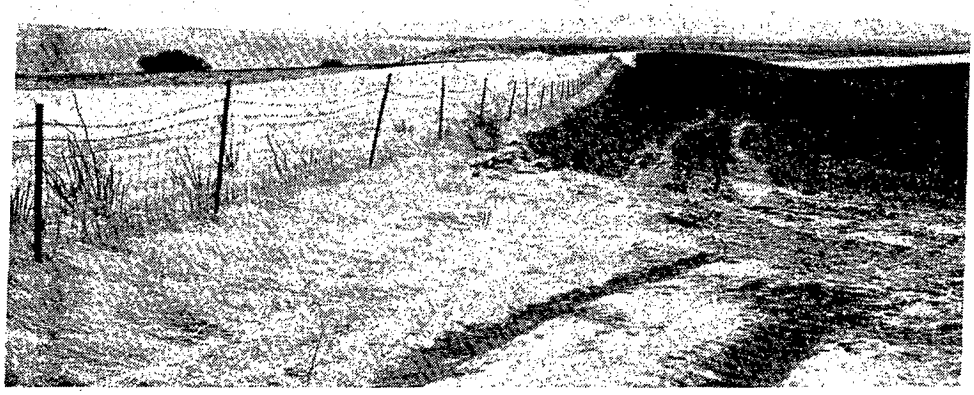
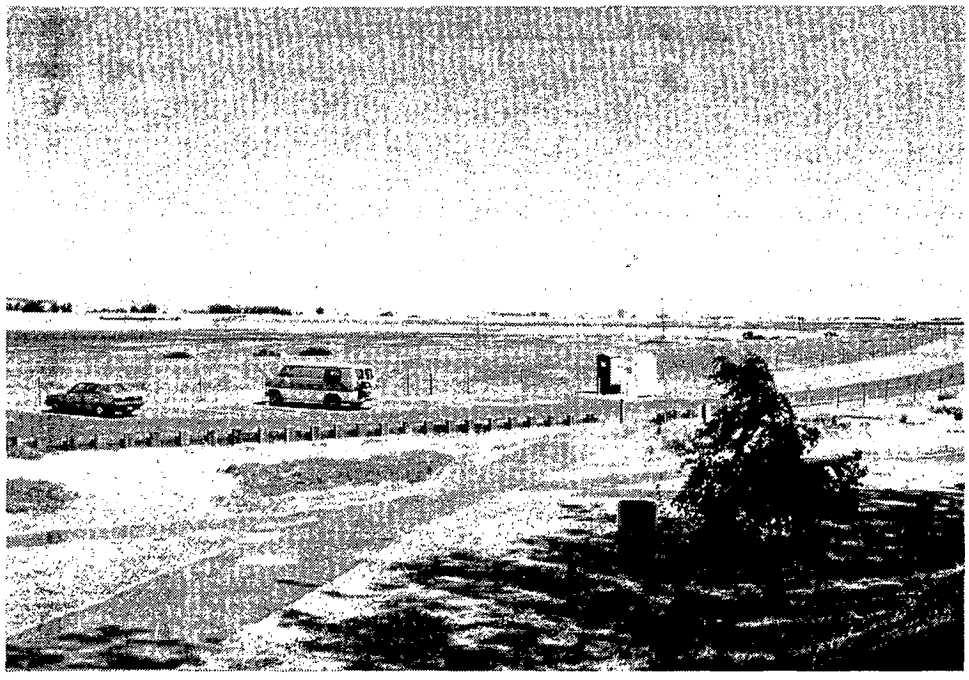


5. View from Shiloh Road



6. View of Day Use Area

Source: Brady and Associates (1994)

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Figure 6.15-5

Montezuma Site Photographs: Views 5 and 6

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0' 1500' 3000' 6000'

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specific policies which address the creation of a marsh enhancement project on this site. The Plan does state that the visual impacts of water-dependent industrial uses should be determined on a case-by-case basis and mitigated if necessary. The Plan recommends planting Lombardy Poplars as a screen to provide a transition in scale and demarcation from adjoining wetland habitat.

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION (BCDC). The Appearance, Design, and Scenic Views component of the San Francisco Bay Plan specifically addresses the visual quality of the Bay. Policies under this section of the Bay Plan focus on the visual and physical quality of the bayshore, the importance of maintaining unencumbered vistas of the Bay for the public to enjoy, and the contribution the Bay makes to the visual diversity. For the purposes of this analysis, "the Bay" includes the portion of the Sacramento River adjacent to the Montezuma site. The following policies are relevant to this site:

- *To enhance the visual quality of development around the Bay and to take maximum advantage of the attractive setting it provides, the shores of the Bay should be developed in accordance with the Public Access Design Guidelines.*

- *All bayfront development should be designed to enhance the pleasure of the user or viewer of the Bay. Maximum efforts should be made to provide, enhance, or preserve views of the Bay and shoreline, especially from public areas, from the Bay itself, and from the opposite shore.*

- *Structures and facilities that do not take advantage of or visually complement the Bay should be located and designed so as not to impact visually on the Bay and shoreline. In particular, parking areas should be located away from the shoreline. However, some small parking areas for fishing access and Bay viewing may be allowed in exposed locations.*

- *Shoreline developments should be built in clusters, leaving open area around them to permit more frequent views of the Bay. Developments along the shores of tributary waterways should be Bay-related and should be designed to preserve and enhance views along the waterway, so as to provide maximum visual contact with the Bay.*

- *"Unnatural" debris should be removed from sloughs, marshes, and mudflats that are retained as part of the ecological system. Sloughs, marshes, and mudflats should be restored to their former natural state if they have been despoiled by human activities.*

- *In order to achieve a high level of design quality, the Commission's Design Review Board, composed of design and planning professionals, should review, evaluate, and advise the Commission on the proposed design of developments that affect the appearance of the Bay in accordance with the Bay Plan findings and policies on Public Access; on Appearance, Design, and Scenic Views; and the Public Access Design Guidelines. City, county, regional, state, and federal agencies should be guided in their evaluation of bayfront projects by the above guidelines.*

- *Local governments should be encouraged to eliminate inappropriate shoreline uses and poor quality shoreline conditions by regulation and by public actions (including development financed wholly or partly by public funds).*

- *Views of the Bay from vista points and from roads should be maintained by appropriate arrangements and heights of all developments and landscaping between the view areas and the water.*

6.15.1.2 The Bel Marin Keys Site

Visual Environment

The Bel Marin Keys site is bordered on the east by San Pablo Bay, to the south by the former site of the Hamilton antenna field, to the southwest by Pacheco Ponds (the proposed location of Bel Marin Keys Unit 5), to the northwest by the established community of Bel Marin Keys Units 1-4, and to the north by Novato Creek.

The topography and vegetation of the site are fairly homogenous. Most of the site is flat and open with scattered eucalyptus groves. The agricultural fields form rectangular patterns over much of the site. Farmed and fallow fields next to marshy areas provide a contrast of texture and color. Two farm structures are located in the northern portion of the site, and farm equipment and hay bales dot the landscape. Levees lined with rock and concrete separate the site from a lagoon. The bay side of the eastern levee is lined with riprap.

Views

The locations of three important viewpoints are depicted on Figure 6.15-6. The views from viewpoints 1 and 2 as shown in the photographs in Figure 6.15-7 are panoramic views from levees built to contain the Bel Marin Keys Units 1-4 waterways. These views show existing site topography and the relationship of existing homes to the site. Viewpoint 3 in Figure 6.15-7 shows the proposed access to the site.

Residents and visitors to Bel Marin Keys Units 1-4 would be the most likely viewers of the site. The primary viewers now are joggers or walkers along the levees that bound the Bel Marin Keys community and the site.

Public Policy

The site is designated in the Marin Countywide Plan as Bayfront Conservation Zone. The visual policies of the zone are as follows:

- *Protect visual access to the bayfront and scenic vistas of water and distinct shorelines through its land use and development review procedures. This viewshed protection is essential for the preservation of Marin County and San Francisco Bay identity, for the enhancement of aesthetic qualities, and for visual and psychological relief from adjacent urban environments.*
- *Protect and enhance views in the bayfront and waters of the Bay. View corridors and low profile should be maintained on sites adjoining these locations.*
- *Design waterfront development for openness and permit optimal views for public enjoyment of bayfront lands.*

In addition, the Appearance, Design, and Scenic Views component of the San Francisco Bay Plan specifically addresses the visual quality of the San Francisco Bay. For a more specific discussion of these policies, please refer to the summary provided for the Montezuma site.

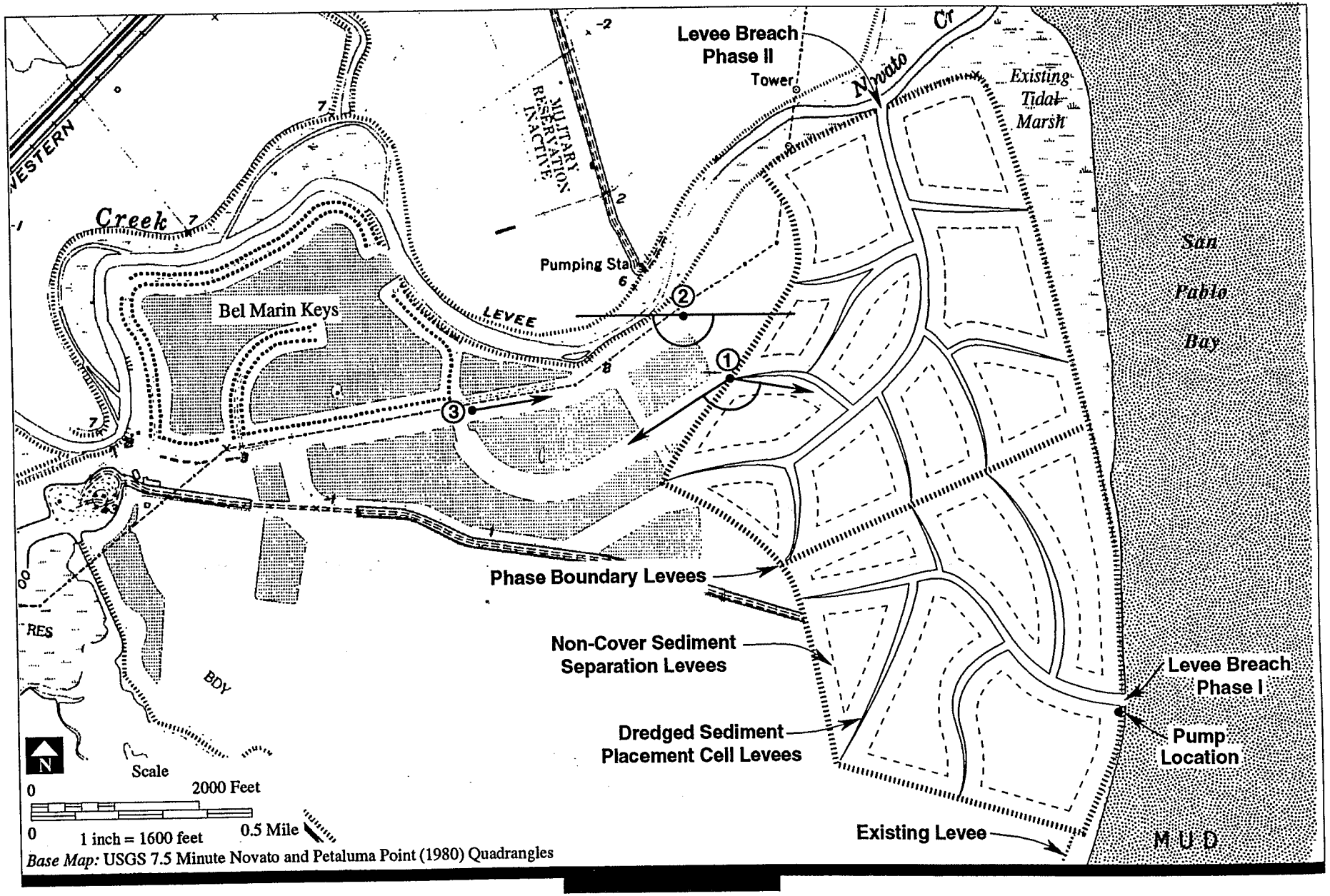

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Figure 6.15-6

Bel Marin Keys Alternative Viewpoint Locations

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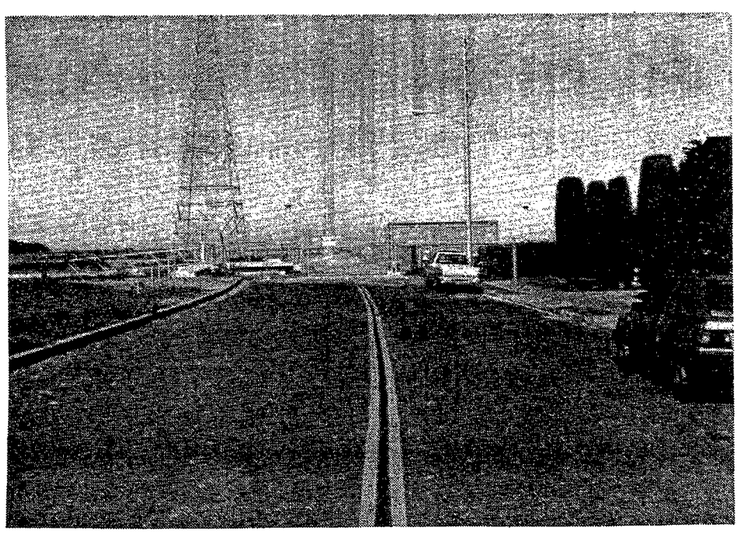
1. View of the site looking east from a location east of Bahama Reef Lagoon in Bel Marin Keys Units 1-4.

2. 180° panorama from a northwestern corner of the site, due east of Bel Marin Keys Boulevard.



3. View east of proposed access to the Bel Marin Keys Alternative Site at terminus of Bel Marin Keys Boulevard

Figure 6.15-7

Bel Marin Keys Site Photographs: Views 1, 2, and 3

Source: Brady and Associates (1994)

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6.15.1.3 The Hamilton Site

Visual Environment

The Hamilton site is bordered by approximately 1,500 acres of undeveloped land south of the property, which is mostly used for grazing and hay production. Other surrounding visual elements Department of Defense Housing, Hospital Hill, Airport Hangers, Reservoir Hill, and Ammo Hill. Most of these surrounding land uses have the general characteristics of a military base. In addition, the Los Robles Mobile Home Park abuts the base's northwest property line. The Bel Marin Keys site, which is currently cultivated with oat hay and has scattered eucalyptus groves, is located to the north of the site.

The site is flat and at or below sea level. Large portions are covered by grasses and other low-growing vegetation. The airfield is paved and surrounded by grassland. Pacheco Hill forms a physical and visual barrier between the Hamilton site and the Bay plain located south of the property.

Views

Views of the site prior to abandonment and remediation activities are shown in Figure 6.15-8. At present, few viewers can see the site, but the number of viewers would increase in the future with the proposed development on the remainder of the Hamilton base.

Public Policy

The Novato General Plan guides development of property within the City of Novato, including the Hamilton site. Because the site is currently under the jurisdiction of the federal and state government, the city has only an advisory role. The Novato General Plan does not contain any specific design criteria or guidance for the site. It is anticipated that more specific planning will be developed in conjunction with a master plan for the site.

In addition, the Appearance, Design, and Scenic Views component of the San Francisco Bay Plan specifically addresses the visual quality of the San Francisco Bay. For a more specific discussion of these policies, please refer to the summary provided for the Montezuma site.

6.15.2 Environmental Impacts and Mitigation Measures

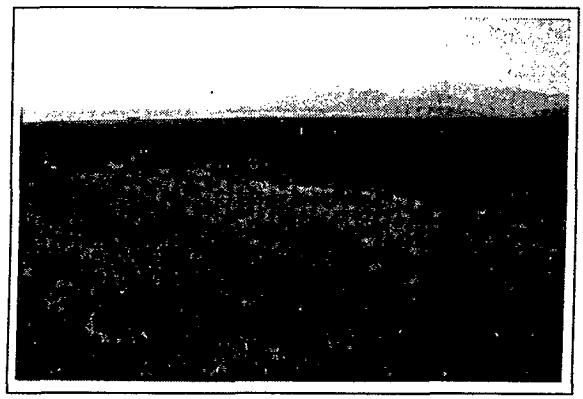
This section describes the potential impacts on the visual character and the conformance with visual policies for the proposed project and each alternative. Mitigation measures are recommended where appropriate.

6.15.2.1 Proposed Project

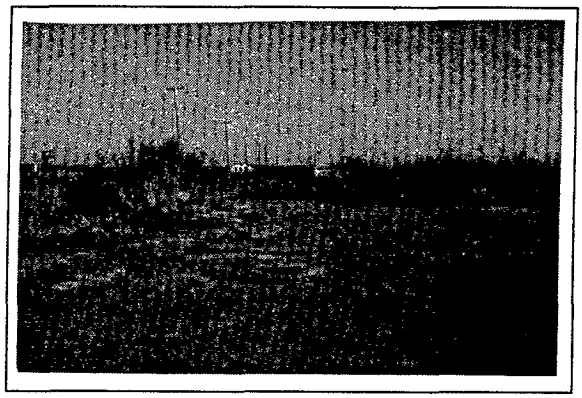
Visual Character

<u>Impact P-VIS-1:</u> The Proposed Project would change the visual character of the shoreline area from natural open space and marsh to industrial use, for approximately 10 to 15 years. (County-LS, Corps-LS)

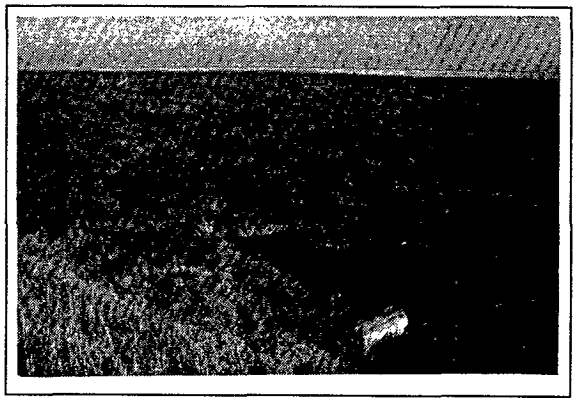
The docking facility and rehandling facility would introduce new industrial looking elements to undeveloped areas along the shoreline. The off-loading facility, dock facilities, pumping plants, pipelines,



A View west toward hangar facilities



B View from south end of runway



C View east toward San Pablo Bay

Source: Brady and Associates (1994)

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0' 1500' 3000' 6000'

Figure 6.15-8

Hamilton Site Photographs

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fuel storage tanks, and sediment containment cells with 7 to 8 feet high levees would be visible from both the Sacramento River and from land.

The Project would also create visual impacts on the open space quality of the views from Collinsville and Sacramento River. Recreational users of the river would see the off-loading facility, with the 72-foot high off-loading suction pipe, which would be visible for several thousand feet on the Sacramento River. Landscape Unit #7 would be gradually changed over a period of years from a grazed seasonal wetland to a tidal marsh. During the period of time between the placement of material and the establishment of marsh vegetation, large areas would be dredged materials, sediment containment cells and holding ponds. The natural character of the area would be diminished for approximately 10 to 15 years.

Although the operational facilities would be a dramatic change from the current peaceful setting of the riverfront environment, these facilities are relatively limited in area and size, and are consistent with the County's water-related industrial use designation for the site.

The restored tidal marsh would result in a beneficial change over the long-term, replacing an area of grazed filled and diked seasonal wetlands with a landscape type more in character with the larger Suisun Marsh. Public access to the shoreline and the Suisun Marsh would be increased, consistent with the requirements of the San Francisco Bay Plan.

> Mitigation Measure P-VIS-1: Improvements proposed along the river shall be designed to blend with the surroundings as much as possible. A paint scheme shall be developed for the pumping facilities, the off-loading suction pipe, fuel storage tank, and ancillary buildings, which is compatible with the natural setting. (LS)

Impact P-VIS-2: Contrary to Solano County and BCDC policies, relocated electric distribution and telephone lines are proposed to be placed above ground, resulting in a potential adverse impact on visual resources. Wires would be at least 6 feet apart to protect birds from electrocution. (County-LS, Corps-LS)

Existing above-ground electric distribution and telephone lines would be relocated along the shoreline of McDougal Cut and along Fire Truck Road (see section 6.16.2.1). The Solano County Resource, Conservation, and Open Space Element states that electric and telephone lines "...should be installed underground unless undergrounding would have a greater adverse environmental affect on the marsh than above-ground construction, or the cost of underground installation would be so expensive as to preclude service." In general, BCDC policies also discourage, but do not forbid the placement of overhead utility lines.

The relocation of existing utility lines within the Project site would not significantly degrade the visual character of the site and is accordingly considered a less-than-significant impact on visual resources. The costs versus benefits of underground placement still need to be considered, however, because of the policies that encourage undergrounding.

The costs of underground installation are estimated by PG&E as approximately $150 per linear foot, which is higher than the $40 to $50 per foot that had been previously estimated by the Applicant. In comparison, the cost of locating lines aboveground is only $10-15 per linear foot[1]. Given that there are would be a

1 Jim Redman, PG&E (Rio Vista), verbal communication, April 17, 1998

need to install approximately 21,300 feet of utility line, the costs of undergounding the lines could range from $1-3 million, roughly 10 times what it would cost to install the lines aboveground. Utility lines would have to be relocated early during project implementation to support activities associated with Phase I and the rehandling facility. The Applicant has stated that these costs make undergrounding utility lines infeasible; the expense would preclude the Applicant's ability to carry out the Proposed Project[2]. Underground lines would also be less reliable, and more costly to maintain, because of corrosion and soil instability associated with seasonal and tidal flooding[3].

For the above reasons, undergrounding utility lines is not recommended. (LS)

Impact P-VIS-3: The off-loading and rehandling facilities would require night lighting during periods of 24-hour operation. (County-LS, Corps-LS)

Night lighting of the off-loading and rehandling facilities for safety and security would be obvious and potentially objectionable to users of this part of the Bay and to local residences. This visual impact would cease with completion of the Project in 10 to 15 years.

> Mitigation Measure P-VIS-3: All night lighting shall be designed to direct light onto work areas and to prevent unnecessary direct exposure of lights to adjacent areas. (LS)

Visual Policy Conformity

Except for the proposed extension of overhead utility lines (see Impact P-VIS-2), the Montezuma Wetlands Project would be in general compliance with Solano County General Plan and BCDC policies, as long as facilities are designed, painted, and located to be as compatible as possible with the existing landscape. The proposed public access trail system, viewing platform, and expansion of the Day Use Area would increase physical as well as visual access to the Project area and the Sacramento River and associated marsh areas.

6.15.2.2 Alternative 1: Managed Wetland

The managed wetland alternative would have the same visual impacts and corresponding mitigation measures as described above under the Proposed Project.

6.15.2.3 Alternative 2: Combined Wetland

The combined wetland alternative would have the same visual impacts and corresponding mitigation measures as described above under the Proposed Project.

6.15.2.4 Alternative 3: The Bel Marin Keys Site

Visual Character

In the long term at Bel Marin Keys, the restored tidal marsh would replace fields of oat hay, a neutral visual change. During the 10 years of on-going restoration, equipment and stored dredged materials in the

2 Doug Lipton, Levine-Fricke-Recon, verbal communication, April

3 Jim Redman, PG&E (Rio Vista), verbal communication, April 17, 1998

active phases of the project would have an adverse, although not significant visual impact, especially on views from existing and future residences in the Bel Marin Keys Units 1-4, and on joggers and walkers on the levees.

Impact 3-VIS-1: The off-loading and pumping facilities in the Bay would have a minor visual impact on views from the shoreline and from the Bay. (County-LS, Corps-LS)

The off-loading facility would be located approximately 3.6 miles offshore in San Pablo Bay. An existing pumphouse that was used to provide jet fuel to Hamilton Air Force Base is currently located where barges would dock to off-load and pump sediment slurry material. The facility would add temporary industrial forms to San Pablo Bay for as long as the project is in operation, an estimated period of 10 years.

These facilities would not figure prominently in views from the shore; however, they would be obvious to users of this part of the Bay, including watersport recreationists, fishermen, and sightseers. The docks, barges, 72-foot-high suction pipe, and ancillary operations and maintenance structures associated with the off-loading facility would introduce a strong vertical element in the Bay at this location. During the construction period when the off-loading facility and the pipeline from this facility to the shore is being built, working barges and equipment in the Bay would affect both views from the Bay and more distant views from upper elevations on the shore.

> Mitigation Measure 3-VIS-1: Improvements shall be designed to blend with the surroundings as much as possible. A paint scheme and design shall be developed for the pumping facilities, the off-loading suction pipe, fuel storage tank, and ancillary buildings which are compatible with the Bay setting. (LS)

Impact 3-VIS-2: Contrary to BCDC policy, new electric distribution and telephone lines are proposed to be placed above ground, resulting in an adverse impact on visual resources. Wires would be at least 6 feet apart to lessen potential imapcts on birds. (County-LS, Corps-LS)

New electric distribution and telephone lines would be constructed above ground (see section 6.16.2.4). BCDC policies discourage, but do not forbid the placement of overhead utility lines. As for the Proposed Project, aboveground placement of utility lines is considered a less-than-significant impact. Below-ground placement would probably be prohibitively expensive at this site as well. No mitigation is required.

Impact 3-VIS-3: The off-loading facility would require night lighting during periods of 24-hour operation. (County-LS, Corps-LS)

Night lighting of the off-loading facility for safety and security would create a negative visual focus during the night. This lighting would be obvious to users of this part of the Bay, and to local residences. This visual impact would cease with completion of the project in 10 years.

> Mitigation Measure 3-VIS-3: All night lighting shall be designed to direct light onto work areas and to prevent unnecessary direct exposure of lights to adjacent areas. (LS)

Visual Policy Conformity

Except for the proposed extension of overhead utility lines (see Impact 3-VIS-2), Alternative 3 would be in general compliance with Marin County General Plan policies and BCDC policies concerning public views and access.

Alternative 3 would further the policies of the Marin County General Plan's Bayfront Conservation Zone, and would provide new and improved views from public access trails to the shoreline, consistent with BCDC's San Francisco Bay Plan policies on public access and views.

6.15.2.5 Alternative 4: The Hamilton Site

Visual Character

Current occupants of the base do not have direct views of the airfield. Based on project proposals for development, future occupants could have direct views of the project site; however, this is not anticipated to be a significant impact. The project would be phased over a 10-year period and restoration would commence upon completion of each phase.

Impact 4-VIS-1: The off-loading and pumping facilities in the Bay would have a minor visual impact on views from the shoreline and from the Bay. (County-LS, Corps-LS)

The off-loading facility would be located approximately 3.6 miles offshore in San Pablo Bay. These facilities would not figure prominently in views from the shore; however, they would be obvious to users of this part of the Bay, including watersport recreationists, fishermen, and sightseers.

> Mitigation Measure 4-VIS-1: Improvements shall be designed to blend with the surroundings as much as possible. A paint scheme and design shall be developed for the pumping facilities, the off-loading suction pipe, fuel storage tank, and ancillary buildings which are compatible with the Bay setting. (LS)

Impact 4-VIS-2: Contrary to BCDC policy, new electric distribution and telephone lines are proposed to be placed above ground, resulting in an adverse impact on visual resources. Lines would be at least 6 feet apart to lessen impacts on birds. (County-LS, Corps-LS)

New electric distribution and telephone lines would be constructed above ground (see section 6.16.2.4). BCDC policies discourage the placement of overhead utility lines. As for the Proposed Project, aboveground placement of utility lines is considered a less-than-significant impact. Below-ground placement would probably be prohibitively expensive at this site as well. No mitigation is required.

Impact 4-VIS-3: The off-loading facility would require night lighting during periods of 24-hour operation. (County-LS, Corps-LS)

Night lighting of the off-loading facility for safety and security would create a negative visual focus during the night. This lighting would be obvious to users of this part of the Bay, and to local residences. This visual impact would cease with completion of the project in 10 years.

> Mitigation Measure 4-VIS-3: All night lighting shall be designed to direct light onto work areas and to prevent unnecessary direct exposure of lights to adjacent areas. (LS)

Visual Policy Conformity

Alternative 4 would provide new and improved views from public access trails to the shoreline, consistent with BCDC's San Francisco Bay Plan policies on public access and views.

6.15.2.6 No-Project Alternative

The No-Project Alternative would have no visual impacts.

6.15.2.7 Cumulative Impacts

The cumulative development of wetland creation and dredged materials disposal projects in the Bay Area would increase the amount of associated industrial equipment adjacent to the Bay. These visual elements would generally alter the natural setting of the restoration sites during project implementation and wetland creation. However, the long-term visual quality of the shoreline environment could be improved, if the restoration projects are successful, by providing significant wildlife viewing opportunities.

6.16 Utilities and Public Services

6.16.1 Affected Environment

This section describes utilities and public services available at the proposed site (Montezuma) and at the two off-site alternatives (Bel Marin Keys and Hamilton). Utilities described in this section include power supply, telephone service, water supply, wastewater disposal, and solid waste disposal. Public services described in this section include police protection, fire protection, and ambulance service.

6.16.1.1 The Montezuma Site

Power Supply

The Montezuma site is located within the Pacific Gas & Electric Company (PG&E) service area. The area is served by two PG&E electrical substations, the Peabody substation in Vacaville and the Cordelia substation in Cordelia. Electricity is distributed via 12-kilovolt (kV) over-head transmission lines. East of the Montezuma site, a transmission line runs the entire length of Collinsville Road and terminates near the Sacramento River. In the northern portion of the site, a transmission line runs from Collinsville Road along Dinkelspiel Road and ends near an existing pumping station and small boat launch ramp on the eastern edge of Montezuma Slough. In the southern portion of the site, similar transmission lines run from Collinsville Road to the Jerico Towing Company. The transmission lines then continue along the perimeter of the Sacramento River and Montezuma Slough approximately 200 to 700 feet from the water's edge and terminate at the DWR Day Use Area. Transmission lines also run east from the DWR Day Use Area along Fire Truck Road for approximately 900 feet.

Telephone Service

The Montezuma site is located in the Citizen's Utility Company telephone service area. A telephone line runs along Collinsville Road on the same utility poles used by PG&E. The telephone company provides service to the Jerico Towing Company and Birds Landing Hunting and Sporting Clays, as well as to the residents of Collinsville and Birds Landing.

Water Supply

The Montezuma site is not served by a municipal water purveyor, hence no water supply pipelines are located on site. Water for livestock is available from wells.

Wastewater

Individual septic tanks are used to treat wastewater generated in the local area. Municipal sewer service is not available.

Solid Waste

The Solano Garbage Company currently services the local area. Solid waste collected in the Project area is disposed at the Potrero Hills Landfill, which has many years of remaining capacity.

Police Protection

The Montezuma site is located in an unincorporated area of Solano County, which receives law enforcement services from the County Sheriff's Department and the California Highway Patrol (CHP). The department closest to the scene would respond to a call.

COUNTY SHERIFF. The County Sheriff's Department located in Fairfield provides one resident deputy based in Rio Vista who covers the Project area. The deputy provides an 8-hour-per-day, flexible shift, Monday-through-Friday law enforcement patrol coverage for the area. Night and weekend protection is provided through the Fairfield office; however, the resident deputy is available at these times as well. The estimated response time for a patrol unit from Rio Vista to reach the Project area is 10 to 12 minutes. The response time from Fairfield is approximately 15 to 20 minutes.

The most frequent calls to the Sheriff's Department from the area surrounding the site deal with trespassing, which tends to occur most often during hunting season. Hunting season is from October 15 through January 15. Complaints of shots being fired, domestic disputes, and minor burglaries are also called into the Sheriff's Department.

CALIFORNIA HIGHWAY PATROL. The CHP is primarily responsible for handling traffic violations and accidents on county roads and State Highway 12. The CHP facility closest to the site is in Fairfield and employs 65 uniformed officers. The estimated response time to the site is 15 to 20 minutes. The CHP regularly patrols Highway 12 but does not regularly patrol the roads closest to the site, such as Collinsville Road and Shiloh Road. Due to the relatively small number of residents in the vicinity, the CHP has responded to very few accidents or traffic violations in the area.

Fire Protection and Ambulance Service

The Montezuma site is served by the Rio Vista Fire Department. One part-time volunteer fire chief based in Rio Vista is responsible for responding to calls in the area. An additional 40 volunteer firemen based in Rio Vista would respond to the area as needed. Approximately 12 to 14 volunteer firemen live in the Collinsville area. Three fire trucks are located in the vicinity. A fire truck equipped to fight structural fires ("structural rig") located on Shiloh Road has an estimated response time of 5 minutes to the end of Collinsville Road; a fire truck equipped to fight grass fires ("grass rig") located in Birds Landing has an estimated response time of 3 minutes to the end of Collinsville Road; and an older military surplus truck with a 1,000-gallon capacity located on Fire Truck Road has a 1-minute estimated response time.

The Rio Vista Fire Department provides paramedic services and a rescue squad responsible for the vicinity. Most of the calls to the Rio Vista Fire Department that originate in the area concern grass fires, occasional vehicle accidents, and hunting accidents.

6.16.1.2 The Bel Marin Keys Site

Power Supply

The Bel Marin Keys site is located within the PG&E service area. A 115-kV overhead transmission line crosses the site near Novato Creek. A transmission line easement runs eastward from Headquarters Hill along the southern boundary of Bel Marin Keys Units 1-4 and across the site to San Pablo Bay.

Telephone Service

The Bel Marin Keys area is served by the Novato office of Pacific Bell. No telephone facilities are located on the site.

Water Supply

Potable water is provided to the Bel Marin Keys vicinity by the North Marin Water District, which obtains water from the Russian River and Stafford Lake west of Novato. The District is negotiating to increase its water contract with the Sonoma County Water Agency for Russian River water. Bel Marin Keys is currently served by a 30-inch line through Novato to Sunset Boulevard and a 24-inch line from Sunset Boulevard to Highway 37. Bel Marin Keys Units 1-4 are served by storage tanks, and the District is reviewing two Hamilton Field sites for future storage tanks.

Wastewater

The Bel Marin Keys site is not within the Novato Sanitary District, although Bel Marin Keys Units 1-4 to the north are in the southern part of the District. The Ignacio Treatment Plant serves this portion of the District. This plant has a capacity of 2.02 million gallons per day (mgd) dry weather flow. Existing development uses 1.7 mgd of that capacity. Development of Hamilton Army Air Force Base or development of housing at Bel Marin Keys would take most of the remaining capacity.

Solid Waste

The Novato Disposal Service provides solid waste collection service to the area. The Redwood Sanitary Landfill (RSL) provides disposal capacity, but its current configuration is at capacity. RSL's owner has proposed to re-engineer the landfill to increase its capacity.

Police Protection

The Bel Marin Keys site is served by the Marin County Sheriff's Department and the California Highway Patrol.

COUNTY SHERIFF. The site is covered by Beat 33, which also covers Bel Marin Keys, Ignacio, Blackpoint, and other areas in the northeastern part of Marin County. Beat 33 is patrolled by one officer, 24 hours a day. Emergency response time ranges from 5 to 10 minutes. The Department also patrols lagoons using jet-skis and a rescue boat. Calls for service from the Bel Marin Keys area often involve auto burglaries and illegally parked cars.

CALIFORNIA HIGHWAY PATROL. The Marin division of the CHP serves the County plus parts of San Francisco, Contra Costa, and Sonoma counties. Patrols vary from 8 to 10 units during the hours of 6:00 a.m. to 10:00 p.m. to two units during the late night to early morning shift. The CHP patrols U.S. Route 101, State Route 37, and roadways in unincorporated areas adjacent to freeways. The estimated response time is 7 to 10 minutes. Speeding in Bel Marin Keys is the major law enforcement problem in the site vicinity.

Fire Protection and Ambulance Service

The site is served by the Novato Fire Protection District. Station 4, west of Route 101 at Ignacio Boulevard and Enfrente Drive, provides first response to calls from the site area. Response time to the site is estimated at 10 minutes, or longer if roads are congested. Station 4 is staffed by five employees 24 hours a day, and operates an engine company and an ambulance.

6.16.1.3 The Hamilton Site

Power Supply

The Hamilton site is within the PG&E service area. Historically, PG&E has provided electrical service up to the boundary of the base. On-base electrical distribution is provided by the military. Power is delivered to the area by a 60-kV transmission line from PG&E's Ignacio substation and the Army's substation on Escolta Drive.[1] Electricity is routed to the Hamilton site through low-voltage overhead lines.[2] The lines are owned and maintained by the military. The overhead electrical system is outdated and may not meet California Public Utility Commission standards.[3]

Telephone Service

Telephone service on-site is provided by Pacific Bell and by AT&T. Pacific Bell owns the telephone lines, and AT&T owns the switching equipment.[4]

Water Supply

The Marin Municipal Water District (MMWD) is the primary source of all water for drinking, irrigation, and fire protection at the Hamilton site. The North Marin Water District (NMWD) provides backup water service, especially during the dry season, to maintain adequate pressure for fire protection.[5]

During summer, MMWD's water supply comes from rainfall runoff, which is stored in local reservoirs. From October through May, the water supply comes from the Russian River through a contract with the Sonoma County Water Agency.[6]

Wastewater

The Hamilton site is adjacent to, but not within, the Novato Sanitary District. The Ignacio Treatment Plant serves this portion of the District. This plant has a capacity of 2.02 mgd dry weather flow. Existing development uses 1.7 mgd of that capacity. Development of Hamilton Army Air Force Base or development of housing at Bel Marin Keys would take most of the remaining capacity.

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1 EIP 1986b and Bahn, personal communication.
2 EIP 1986b.
3 Nakata Planning Group 1989a.
4 Gallagher, personal communication.
5 Gallagher, personal communication. EIP 1986b.
6 Theisen, personal communication.

The Novato Sanitary District's (NSD) dechlorination station is located on state property northeast of the site. The station treats all effluent from the NSD's Novato and Ignacio treatment plants prior to discharge in San Pablo Bay. The NSD requires access across the site for maintenance purposes. The NSD has been granted an easement for the station, but access across the airfield is not under easement.

Solid Waste

The Novato Disposal Service provides solid waste collection service to the area. The Redwood Sanitary Landfill (RSL) provides disposal capacity, but its current configuration is at capacity. RSL's owner has proposed to re-engineer the landfill to increase its capacity.

Police Protection

Security services at the site have historically been provided through private contract. The City of Novato Police Department provides backup services to the site. In addition, the site is served by the CHP, as described previously for the Bel Marin Keys site.

Fire Protection and Ambulance Service

The Novato Fire Protection District provides fire protection services, full paramedic and ambulance services, and backup crash fire protection for the base on a contract basis.[7] The District's nearest fire station (Station 4), which provides first response to emergencies at the Hamilton site, is located west of U.S. Highway 101 at Ignacio Boulevard and Enfrente Road. Response time is generally 2 to 3 minutes, but times may vary depending on traffic conditions on U.S. Highway 101 and Ignacio Boulevard.

The Hamilton airfield is used as an emergency landing strip by the U.S. Coast Guard Strike Team.

6.16.2 Environmental Impacts and Mitigation Measures

6.16.2.1 Proposed Project

Power Supply

Demand for electrical power would increase as a result of the Project, but not significantly. At Project start-up, approximately 4,300 feet of electrical transmission and telephone lines would be relocated along the new access road to be constructed on the perimeter levee parallel to McDougal Cut. During later phases, approximately 17,000 feet of transmission line would be relocated from Phases II and IV to Fire Truck Road. These relocations could disrupt service for up to 4 hours while the old lines are disconnected and the new lines are connected.[8] Relocations and modifications would take place according to the State of California Public Utility Commission guidelines and General Order 95, which provides construction guidelines for overhead electrical service.

The contractor's work areas would be located adjacent to the proposed electrical power supply. Construction trailers would be powered by the existing 12-kV lines. Electrical supply to the offshore pumpout stations would require bringing power from the existing 12-kV line along the southern portion of

7 Berthinier and Gallagher, personal communication.

8 Rich Krauser, PG&E Service Planning, personal communication, November 23, 1993.

the site to the unloading station. When relocating utility poles or when extending service farther into the Project boundaries, poles would be placed approximately every 225 feet, depending on topography. Other electrical supply modifications could include changing conductors.

Diesel power would be required for the sediment transfer pumps. Approximately 4,500-horsepower (hp) would be necessary for pumping dredged materials. A 1,500-hp diesel-fueled pump would be located at the offshore pumpout station. A 5,000- to 10,000-gallon above-ground diesel storage tank would be located in the work area adjacent to the offshore stations, accessible to diesel fuel truck delivery. The tank would be installed according to all local and state regulations. Two additional 1,500-hp transfer pumps would be located along the dredged sediment pipeline.

Impact P-UTIL-1: Existing electric distribution and telephone lines are proposed to be relocated above ground, contrary to Solano County and BCDC policy, potentially adversely affecting wildlife habitat and visual resources. Wires would be at least 6 feet apart to protect birds from electrocution. (County-LS, Corps-LS)

The Solano County Resource, Conservation, and Open Space Element states that electric and telephone lines "...should be installed underground unless undergrounding would have a greater adverse environmental affect on the marsh than above-ground construction, or the cost of underground installation would be so expensive as to preclude service." In general, BCDC policies also discourage, but do not forbid the placement of overhead utility lines.

As discussed P-VIS-2, the costs of underground installation are estimated by PG&E as approximately $150 per linear foot. In comparison, the cost of locating lines aboveground is only $10-15 per linear foot.[9] Given that there are would be a need to install approximately 21,300 feet of utility line, the costs of undergounding the lines could range from $1-3 million, roughly 10 times what it would cost to install the lines aboveground. Utility lines would have to be relocated early during project implementation to support activities associated with Phase I and the rehandling facility. The Applicant has stated that these costs make undergrounding utility lines infeasible; the expense would preclude the Applicant's ability to carry out the Proposed Project.[10] Underground lines would also be less reliable, and more costly to maintain, because of corrosion and soil instability associated with seasonal and tidal flooding.[11]

This impact is determined to be less-than-significant, and no mitigation is required. (LS)

Telephone Service

The existing telephone service to the Jerico Towing Company would be extended to the Project office and laboratory trailers in the rehandling facility area, near the Sacramento River (Figure 4.2-2). The telephone and power lines would be relocated along the new access road to be constructed on the perimeter levee parallel to McDougal Cut. Please refer to Impact P-UTIL-1.

9 Jim Redman, PG&E (Rio Vista), verbal communication, April 1998.

10 Doug Lipton, Levine-Fricke-Recon, verbal communication, April 1998

11 Jim Redman, PG&E (Rio Vista), verbal communication, April 1998

Water Supply

Because no municipal water service is available to the Project site, potable water would be supplied either by newly constructed water supply wells or by water truck. All water used at the site must meet requirements of the County and State health departments. No permanent water distribution or treatment facilities are planned as part of this Project.

The sediment handling procedures for the Project would require water supply to mix with dredged materials for slurry as described in section 4.6.3. This water supply would be non-potable and would come from on-site shallow groundwater supply wells. Groundwater would be pumped from screened intervals in the upper 60 feet of water supply wells located in the southern part of the Project area, near the Sacramento River. The wells would tap into the sand aquifer underlying the southern portion of the site. Peak water demand could exceed 2,000 gallons per minute. One or two holding ponds are proposed to maximize water reuse and to minimize peak flow demand.

Wastewater

Wastewater disposal service is not available in the Project area. During the initial site preparation phase, portable chemical toilets would be needed at the construction trailer and work areas. All wastewater removal would be in accordance with the Solano County Department of Environmental Health requirements. Since the Project has an anticipated life span of approximately 10 to 15 years and would employ 20 to 46 workers, portable toilets would need to be replaced or emptied relatively frequently. Thus, installation of a permanent on-site sewage system will be evaluated during final facility design. Design of a permanent treatment system would assume a flow of 75 to 100 gallons of wastewater per day per on-site employee. The final selection of a sewage system for the project will be based on a cost-effectiveness evaluation of the options. The final design phase will evaluate three types of permanent sewage systems: a leach field/septic system, a land disposal system, and a package treatment plant.

Solid Waste

Demand for solid waste disposal services would increase as a result of the Project. During construction, solid waste would be generated from the daily activity of construction workers and Project personnel. The Solano Garbage Company would expand its service to the area. Waste materials from construction activities would also need to be removed from the site. The volume of waste generated by employees or from construction waste would be relatively small. Since Potrero Hills Landfill has an adequate capacity far into the future, no impacts related to solid waste are anticipated.

Police Protection

COUNTY SHERIFF. The Proposed Project would bring a small number of new employees to the Collinsville area, but it would not add any permanent residents. For this reason, no significant impact regarding police protection is anticipated.

CALIFORNIA HIGHWAY PATROL. The Proposed Project would add a small number of vehicles to Highway 12 as employees come to work at the Project site. The workers employed by the Project would not add a significant amount of traffic to the highway or increase the need for CHP services.

Fire Protection and Ambulance Service

The Proposed Project would slightly increase demand for fire protection and emergency medical services on the Project site. However, due to the small number of Project employees on site, the Rio Vista Fire Department and its associated emergency medical services would not be significantly impacted. The three fire trucks and 12 to 14 volunteer firemen in the Collinsville area could adequately handle any fires associated with the Proposed Project.

6.16.2.2 Alternative 1: Managed Wetland

Alternative 1 would generally have the same utilities and public services effects as the Proposed Project. The same impacts and mitigation measures previously described for the Proposed Project would apply to this alternative as well. Please refer to the previous description for details.

6.16.2.3 Alternative 2: Combined Wetlands

Alternative 2 would generally have the same utilities and public services effects as the Proposed Project. The same impacts and mitigation measures previously described for the Proposed Project would apply to this alternative as well. Please refer to the previous description for details.

6.16.2.4 Alternative 3: The Bel Marin Keys Site

Power Supply

Impact 3-UTIL-1: New electric distribution and telephone lines are proposed to be placed above ground, contrary to BCDC policy, potentially adversely affecting wildlife habitat and visual resources. Wires would be at least 6 feet apart to lessen potential imapcts on birds. (County-LS, Corps-LS)

BCDC policies discourage the placement of overhead utility lines. Where feasible, any new utility lines should be placed underground to avoid potential impacts on biological resources and visual resources. As for the Proposed Project, this impact would be considered less than significant, and underground installation would probably be prohibitively expensive (refer to discussion under P-UTIL-1 in section 6.16.2.1). No mitigation is suggested.

Impact 3-UTIL-2: Placement of dredged materials could raise the site elevation and cause settlement, which could affect stability of the PG&E 115 kV lines. (County-S, Corps-LS)

Weight of fill on clay soils around transmission line poles could cause settlement. The existing PG&E 115-kV line requires a 35-foot sag clearance. The dredged materials and levee construction cannot be placed so as to reduce sag clearance below 35 feet. The PG&E transmission line easement would have to be moved to the edge of the site.

> Mitigation Measure 3-UTIL-2: The existing transmission line shall be moved to the perimeter of the site. A 35-foot clearance between transmission lines and material placed shall be required. (LS)

Telephone Service

Alternative 3 would not have an impact on existing telephone service. New lines would be extended to the off-loading area.

Water Supply

Potable water for on-site workers would be provided by truck and must meet County and State health department requirements. Potable water would be provided to the project site by the North Marin Water District, and trucked on site to project personnel. No significant impacts on water supply are anticipated.

Dredged materials handling would require large quantities of non-potable water. Peak demand could exceed 2,000 gallons per minute; water would be pumped from San Pablo Bay to slurry dredged materials for placement. Holding ponds on site are proposed to maximize water reuse and to minimize peak flow demand.

Wastewater

Portable toilets would be provided for the on-site workers. Wastewater removal would conform to Marin County Department of Environmental Health regulations.

Although the site is not currently within a sanitary service district, Novato Sanitary District could annex the property into its service district with LAFCO and District approval in order to make effluent service connections. This would not be necessary for the project, though permanent restrooms would more adequately serve project employees.

Solid Waste

Construction activities and workers would generate a small amount of solid waste. The Novato Disposal Service would need to extend its service to the project area. Sanitary landfill capacity would not be significantly affected by the solid waste generated by the project employees.

Police Protection

COUNTY SHERIFF. Alternative 3 would not have a significant effect on police protection because it would employ relatively few workers. It would not bring more permanent residents to the area.

CALIFORNIA HIGHWAY PATROL. The number of people driving to the site would not be large enough to have a significant impact on the service provided by the CHP.

Fire Protection and Ambulance Service

The number of workers on the site would not significantly affect the ability of the Novato Fire Protection District to provide fire fighting and emergency medical service. Station 4 could serve the site.

6.16.2.5 Alternative 4: The Hamilton Site

Power Supply

This alternative would require extension of PG&E lines onto the site to serve project facilities.

Impact 4-UTIL-1: New electric distribution and telephone lines are proposed to be placed above ground, contrary to BCDC policy, potentially adversely affecting wildlife habitat and visual resources. Lines would be at least 6 feet apart to lessen impacts on birds. (County-LS, Corps-LS)

BCDC policies discourage the placement of overhead utility lines. Where feasible, any new utility lines should be placed underground to avoid potential impacts on biological resources and visual resources. As for the Proposed Project, this impact would be considered less than significant, and underground installation would probably be prohibitively expensive (refer to discussion under P-UTIL-1 in section 6.16.2.1). No mitigation is suggested.

Telephone Service

This alternative would require extension of telephone service by Pacific Bell. Alternatively, cellular phone service could be used on site and extensions of Pacific Bell service would not be needed.

Water Supply

Water demand on site would increase significantly to handle sediments. Peak water demand could exceed 2,000 gallons per minute; water would be pumped from San Pablo Bay to slurry dredged materials for placement. Holding ponds on site are proposed to maximize water reuse and to minimize peak flow demand.

Wastewater

Portable toilets would be provided for the on-site employees. Wastewater removal would conform to Marin County Department of Environmental Health regulations. Permanent restrooms would more adequately serve project employees and should be considered. A permit would be required for worker restrooms.[12]

Impact 4-UTIL-2: Implementation of this alternative could restrict access to the NSD dechlorination station. (County-LS, Corps-LS)

Implementation of the project could result in restriction on the Novato Sanitary District's access to the dechlorination station.

> Mitigation Measure 4-UTIL-2: The Applicant shall grant the NSD a perpetual easement across the airfield for access to the dechlorination station. NSD access shall be ensured through continual maintenance and operation of pumps and levees. (LS)

12 Tom Selfridge, Novato Sanitation District, personal communication, August 31, 1993.

Solid Waste

Construction activities and workers would generate a small amount of solid waste. The Novato Disposal Service would need to extend its service to the project area. Sanitary landfill would be unaffected by the solid waste generated by project employees.

Police Protection

No new police services would be needed to meet the needs of the project employees.

Fire Protection and Ambulance Service

No new fire or ambulance services would be needed to meet the needs of the project employees.

Impact 4-UTIL-3. Implementation of this alternative would result in the loss of Hamilton Field as an emergency landing strip. (County-LS, Corps-LS)

The emergency landing strip at the airfield would be covered by dredged materials as a result of the project.

> Mitigation Measure 4-UTIL-3: Gnoss Field airstrip in northern Marin County shall be designated as an emergency landing strip. Alternately, another Bay Area airstrip could be designated for emergency landings. (LS)

6.16.2.6 No-Project Alternative

The No-Project Alternative would have no impacts on utilities and public services.

6.16.2.7 Cumulative Impacts

The Proposed Project and the project alternatives would increase the demand for municipal services and utilities. However, given the relatively small number of personnel and equipment required for wetland restoration projects, this need would be very small. If all proposed dredged materials wetland restoration projects were built, the need for increased public services would be minimal. Mitigation of site-specific utilities and public service impacts would eliminate the potential for significant cumulative utility and public service impacts.

6.17 Economic and Fiscal Factors

This section discusses the economic and fiscal effects of the Proposed Project and the alternatives.

6.17.1 Affected Environment

The Proposed Project and all project alternatives could have effects on both the local and regional economy. By providing a site for disposal of some of the dredged materials from ship channel maintenance, the Proposed Project and project alternatives would facilitate maintenance of shipping channels in the San Francisco Bay Area, and could have an indirect but positive effect on the regional economy.

According to the *Long-Term Management Strategy for Dredged Material Disposal in the San Francisco Bay Region*,[1] containerized cargo represents the largest sector of deep ship drafting due to high cargo value and extensive transportation and handling support services. The large container ships in the Port of Oakland, for instance, are constrained by existing channel depths. A cessation in dredging would effectively eliminate transpacific intermodal cargo as channels begin to shoal and would have significant economic ramifications including the undermining of the Bay Area's linkage to the burgeoning Pacific Rim economy. The estimated loss of economic activity in the container sector would be $2.6 billion only 5 years after cessation and $3.4 billion 10 years after implementation.[2]

6.17.1.1 The Montezuma Site

Economic Setting

Existing economic uses of the site include 1,822 acres used for cattle and sheep grazing; 360 acres leased to a private hunting club for hunting ducks and pheasant; and industrial activities of the Jerico Towing Company, which processes oyster shells and sand that are brought to the site and sells the material for construction purposes.

Factors supporting future development of the site for industrial use include the existing land use designation and the size of the site.

The existing Solano County Water-Dependent Industrial District (I-WD) zoning and General Plan designations on portions of the site would potentially allow development of industrial and marine terminal uses. Also, the Collinsville area is the largest vacant site on the West Coast currently approved for heavy industry or marine terminal use.

However, the prospects for near-term development of the Collinsville property for industrial or port uses are limited for a number of reasons.

First, water-related industry has been in decline in the Bay Area over the past decade. This decline can be attributed to the fact that less industrial production is water-dependent since pre-processed inputs can be supplied by other means. When this is considered in light of the Bay Area's high costs of transportation, land, labor, utilities, environmental considerations, and political climate, there is little prospect for industries with non-local markets to locate at Collinsville. Since industries that cater to the northern

1 U.S. Army Corps of Engineers 1990.

2 U.S. Army Corps of Engineers 1990.

California market (food processing, metal finishing and fabrication, and chemical production) are less likely to be water-dependent than in the past, there is greater probability that these industries would locate in the Central Valley and other parts of the state where land and development costs are lower.[3]

Secondly, although petroleum refining and storage are the largest water-related industries in the Bay Area, accounting for 81 percent of all developed land reserved for water-related industry in the San Francisco Bay Plan. Yet, global economic and political conditions, as well as industrial trends, make major new site construction unlikely.[4] Other heavy industrial users, such as petrochemicals, chemicals, and metal refining and fabrication, are equally unlikely to be making future expansions outside existing sites. Although there is a growth trend in smaller firms within such industries, their small scale of operation is likely to encourage use of existing container ports when water transportation is used.[5]

The third reason for limited near-term development prospects at the site relates to the demand forecasts for port development. The Bay Conservation and Development Commission (BCDC) *Seaport Plan* predicts that, because of significant shifts in the method of transporting cargo, future needs for marine terminals may be reduced , thus decreasing the number of bulk terminals and berths designated in the Seaport Plan to meet 2020 cargo forecasts.[6] While the Seaport Plan designates the Collinsville site as a port priority use area, the Plan's policies state that, because of the Site's extensive wetlands, lack of infrastructure, and isolation from other industrial areas, it offers no potential for future marine terminal development. The policies further state that the site should not be developed as a marine terminal unless there is no other available site in the Bay Area and all other terminals have reached their maximum throughput capacity[7].

An earlier 1989 forecast estimated that there would not be a need for a port at this site until at least the year 2010.[8] Also, a 1989 Williams-Kuebelbeck & Associates survey of manufacturing representatives reflected a general lack of long-term interest in the Collinsville area, due to its physical isolation and lack of infrastructure.[9] No significant land use entitlements have been perfected for the area under the current General Plan and Zoning Ordinance.[10]

The 1989 Collinsville-Montezuma Hills Development Study for Solano County has questioned the operational suitability of this location for a container port, in view of its remoteness from main highway/rail lines, as well as its relatively shallow channel depth of 35 feet. The 1989 study also indicated that future development of State, or County, toll roads could offset access disadvantages, as could local channel deepening and/or increased congestion of existing terminal sites around the Bay Area.[11] However, no toll roads are currently being proposed.

In conclusion, the future industrial and port development potential of the Project site is limited because of the lack of projected demand for port-related terminal capacity for at least the next 15 to 20 years; the

3 Williams-Kuebelbeck & Associates, Inc. 1989.
4 QED Research Inc. 1986.
5 QED Research Inc. 1986.
6 BCDC (MTC) 1996
7 BCDC (MTC) 1996.
8 Williams-Kuebelbeck & Associates, Inc. 1989.
9 Williams-Kuebelbeck & Associates, Inc. 1989.
10 Taylor 1996.
11 Williams-Kuebelbeck & Associates 1989.

physical isolation and lack of infrastructure at the site; the presence of wetlands and federally protected species; and the related cost of mitigation.

Fiscal Setting

For the fiscal year ended June 30, 1995, Solano County's four governmental fund types (i.e., general fund, special revenue, debt service, and capital projects) had total revenues of $286.7 million and expenditures of $306.1 million. This resulted in a $19.4 million excess of expenditures over revenues. Intergovernmental revenues comprise the largest revenue source, comprising 67.9 percent of total revenues, followed by taxes (13.1 percent), and charges for services (12.9 percent). The largest expenditure categories are public assistance (38.5 percent), followed by public safety (30.4 percent), health and sanitation (14.0 percent), and general government (7.2 percent). Other financing sources, primarily bond proceeds, contributed net proceeds of $9.2 million, resulting in a combined fund balance of $39.1 million on June 30, 1995, compared to a $49.4 million fund balance on June 30, 1994. The respective fund balances in 1993 and 1992 were $50,326,953 and $54,174,289.

Three reports related to Solano County's fiscal operations have been prepared in recent years. Solano County contracted with Recht-Hausrath & Associates to produce *The Cost of Growth* (1991)[12] and *The Cost of Growth Phase II* (1992),[13] which analyze factors relating to the County's funding of capital improvements and on-going operations and maintenance. The two studies discuss the cost of new development and identify per capita cost factors. The Phase II study was used by the County as the basis for establishment of a developer fee to fund capital improvements made necessary by new growth. The County subsequently adopted a fee ordinance for new development.

A separate study, the *Strategic Plan for Solano County Economic Development* (1992),[14] was prepared by the Private Industry Council of Solano County. This study looked at the fiscal effects of specific public and private development projects on the County. The study was commissioned by the Solano County Board of Supervisors but never formally adopted. It presents findings and a set of recommendations. Per capita cost factors presented in the *Strategic Plan* (Appendix VI), some of which are taken from the Recht-Hausrath studies, have been used to calculate the fiscal balance of the Montezuma Wetlands Project.

6.17.1.2 The Bel Marin Keys Site

Fiscal Setting

The Bel Marin Keys site generates approximately $155,000 (in 1991 revenue) in property taxes from the existing uses, including the five residences on-site, and $144,000 (1990 revenue) annually from oat hay production. County spending for services to this site is insignificant.[15]

FUTURE DEVELOPMENT POTENTIAL. The Bel Marin Keys area is the subject of a development proposal called Bel Marin Keys Unit 5. At buildout, the development is proposed to include 746 dwelling units on 146 acres. This proposal also includes a commercial center, a social center, and a golf course on 259 acres, 784 acres of tidal marsh, 210 acres of fresh water wetlands, and a 198-acre salt water lagoon.

12 Recht-Hausrath 1991.

13 Recht-Hausrath 1992.

14 Private Industry Council of Solano County 1992.

15 Environmental Sciences Associates, Bel Marin Keys Unit 5 EIR/EIS, 1992.

6.17.1.3 The Hamilton Site

Fiscal Setting

As a military base, the site has generated no revenue in past years for the County or City of Novato, nor has it required costs for services from local government. With annexation of the site to the City of Novato, and anticipated development, the fiscal situation will change.

FUTURE DEVELOPMENT POTENTIAL. The Hamilton site is designated for airport use by BCDC and designated as Planned Community by the City of Novato.

The Reuse Plan for Hamilton suggests the following uses:

- Return to unmanaged salt marsh and tidal wetland;
- Develop as commercial/residential;
- Retain airfield for general aviation;
- Use low-lying areas for dredged materials and wetland restoration.

The Hamilton Field Master Plan proposes mixed use development on the base, and wetlands restoration on the site.[16]

6.17.2 Environmental Impacts and Mitigation Measures

The following sections describe the likely economic and fiscal effects associated with the Proposed Project and project alternatives.

6.17.2.1 Proposed Project

Economic effects are considered differently under NEPA and CEQA. For economic and fiscal factors associated with the project, impacts are determined to be either adverse or beneficial and then, under NEPA, determined to be significant or less than significant. The significance of economic impacts is not applicable under CEQA, which does not consider economic impacts to be environmental impacts. It is possible that a socioeconomic impact could cause a significant physical environmental impact, which in turn would require analysis and mitigation under CEQA. No such impacts were identified for the proposed project or alternatives.

Economic Effects

The Project would use approximately 541 acres of Water-Dependent Industrial (I-WD) land for wetlands restoration. Proposed Zoning Ordinance and General Plan amendments would add wetlands restoration as an allowable use in the I-WD zoning district. The total percentage of industrially designated acreage that would become unavailable for industrial development in the County is small, less than 10 percent of the more than 5,000 acres designated for water-dependent industrial use. This portion of the water-dependent industrially zoned land would be unlikely to develop over the next 15 to 20 years, and could be substantially restricted by the presence of endangered species and jurisdictional wetlands on parts of the

16 The Martin Group, Hamilton Field Master Plan 1991.

site. Future port use on the acres reserved for water-related industry around McDougal Cut and along the Sacramento River shoreline would continue to be a potential use option. This potential economic effect is not considered to be adverse.

Impact P-ECON-1: The Proposed Project would displace grazing activity on 1,822 acres and hunting on 360 acres. (County-NA, Corps-LS)

Much of the Collinsville-Montezuma Hills area is used for grazing. The Proposed Project would displace grazing activity on 1,822 acres. This would have a minimal effect on the County's agricultural land resources, given the large quantity of similar land throughout the eastern portion of the County. This represents approximately 0.5 percent of the 340,328 acres of land in farms in Solano County and is not considered to be significant.

Approximately one-third of the total acreage of the Birds Landing Hunting Preserve and Sporting Clays would be lost to wetland restoration activities in Phase III of the Project. Noise and dust generated by construction activities in this area would cause an out-migration of certain types of hunting fowl as would the introduction of a wetland environment. Certain types of hunting game which depend on dryer, grassland areas for habitat, such as pheasants, rabbits and snipe, would leave the site. As a result, a minor economic impact would occur. It is anticipated that waterfowl would replace these game birds following wetlands restoration on the site, but that hunting would not occur during the life of the Project.

The above impacts are considered to be less than significant and require no mitigation.

Anticipated Project Economic Benefits

From a regional perspective, the Project appears to provide a partial solution to the dredging problem that has threatened the region's water-related industry and ports. By providing a potentially acceptable location for dredged materials deposition, the Project would bolster the Bay Area's ports and economy.

Impact P-ECON-2: The Proposed Project would significantly increase disposal capacity for dredged materials, which would help maintain navigation channels, indirectly maintaining or increasing port-related economic activity, and adding local income in Solano County. (County-NA, Corps-S)

Following Project development (which would employ an average of 30 people for approximately four months) operation of the Proposed Project would employ 20 persons full-time, and an additional 26 persons during periods when the Project operates 24 hours per day. The Project's operation schedule will vary in response to the rate of sediment delivery, which depends on the schedules of dredging projects and seasonal dredging restrictions that may apply to some projects. Assuming 24-hour operations occur half the time, total monthly payroll would be approximately $195,900, implying an annual payroll of approximately $2.4 million. Gross wages paid over the life of the Project (estimated at 10 to 15 years) would amount to $24 to 36 million (in constant 1996 dollars). These employees would most likely be involved in heavy equipment operation, surveying and engineering, and other related activities including manual labor associated with wetland restoration. Assuming at least a portion of the Project employees live in or spend money in Solano County, a positive economic effect on Solano County businesses would be realized. The fiscal effects of providing county services to these employees is addressed in the section below.

In addition to the direct benefits of spending by employees, the Project would also require materials purchases, the magnitude of which is not estimated in this analysis. The above impact is considered beneficial; no mitigation is required.

Fiscal Effects

SHORT-TERM FISCAL EFFECTS

Table 6.17.2-1 shows projected fiscal effects of the Proposed Project on Solano County's revenues and expenditures, with and without the Applicant's proposed $0.20/cubic yard donation[17] to the County General Fund.

Revenues. Annual revenue would be $39,784 without the Applicant's proposed donation. The largest source of revenue resulting from the Project would be property taxes. Including the donation, the total annual revenues become approximately $389,984. It is assumed that a portion or all of the Project lands would be dedicated to a public agency after 10 to 15 years, and as a result would not generate property taxes for the County. Additional revenues may accrue to the County from sales taxes associated with the sale of rehandled materials for off-site use. However, these revenues are not quantified in this discussion since it is unknown whether specific off-site sales would or would not be subject to sales tax.

Projected property tax receipts associated with this land are $15.71 per acre. This amounts to $37,610 per year in property taxes for the 2,394-acre site. Since the marsh restoration area is 1,822 acres, the annual loss of property tax revenue resulting from its dedication would be $28,624. No revenues from property transfer taxes have been assumed since transfer of the wetland after the 10 - 15 year project life is not certain and could occur through dedication to a public agency if it occurred.

Expenditures. The County would not incur major expenditures as a result of the Project. Projected expenditures are based on per capita costs for 46 employees. The total Project-related expenditures by Solano County are estimated at approximately $12,890 each year. The greatest expenditure would result from required police protection (estimated at $3,680 annually), judicial/probation (estimated to be $3,123 annually), jails (estimated to be $1,724 annually), and public ways and facilities (estimated at $880 annually). In addition, the County's capital facilities fund would incur $779 in current annual debt service, countywide capital facilities services would cost $2,369 annually, and libraries $335 annually.

Net Fiscal Effects. For the purposes of the EIR/EIS, the fiscal impact of the Proposed Project is considered to be the impact without the Applicant's proposed donation, since no formal agreement has been reached between the Applicant and the County at this time. Without the Applicant's proposed donation, the positive economic impact of the Project would be approximately $26,894 annually over the life of the Project, estimated at 10 to 15 years. This is considered to be a beneficial impact but not significant. With the Applicant's proposed donation, the net fiscal effect on the County would be a **$377,094** annual surplus.

<u>Impact P-ECON-3:</u> The Proposed Project would result in an operating surplus for the County. (County-NA, Corps-LS)

LONG-TERM FISCAL EFFECTS

<u>Impact P-ECON-4:</u> If the Project were to be initiated but abandoned prior to or after its proposed completion, remediation or continued maintenance and operation, may be required to prevent the release of contaminants. This could be a significant impact on County financial resources. Should adequate County financial resources not be available, this in turn could result in potentially significant physical environmental impacts. (County-S, Corps-S)

17 Levine-Fricke comment letter contained in Appendix Q.

Table 6.17.2-1
Annual Fiscal Balance (in constant 1996 dollars)

Item	Revenue
Fiscal Balance Excluding Applicant's Proposed Donation[a]	
Property Tax	$37,610
Sales & Use Tax	-0-
Property Transfer Tax	-0-
Fines, Forfeitures & Penalties	323
Use of Money & Property[b]	783
Charges for Current Services	1,068
Intergovernmental Revenue	-0-
Total Revenues	39,784
Less Projected Expenditures	12,890
Net Operating Surplus (Deficit)	26,894
Fiscal Balance Including Applicant's Proposed Donation[c]	
Add Donation[c]	**$340,000**
Additional Revenue from Use of Money & Property	**10,200**
Total Revenues Including Donation	**389,984**
Less Projected Expenditures	**12,890**
Net Operating Surplus (Deficit) Including Applicant's Proposed Donation	**$377,094**

Notes:
a The Applicant's proposed donation to the County General Fund is excluded from the primary revenue calculation to demonstrate the probable revenue-generating capacity of the Project without this item.
b Use of money and property reflects interest rates of 3 percent to ensure a conservative estimate of revenue.
c The Applicant's proposed donation to the County General Fund is $0.20 per cubic yard of dredged sediment accepted at the site; the calculations assume **1.7** million cubic yards per year for 10 years.

Sources: Private Industry Council of Solano County 1992; Recht-Hausrath 1991 and 1992.

The County could be responsible for maintenance of the site if the Project failed. It is probable that the County would have to retain qualified consultants to assist them in these responsibilities, and staff administrative time for management and coordination of these efforts would increase. Phasing of the Project, as proposed by the Applicant, lessens but does not fully mitigate this potential fiscal impact.

Mitigation Measure P-ECON-4: A Project Mitigation Monitoring and Reporting Plan (MMRP) shall be prepared before issuance of the County use permit. The MMRP will

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provide a checklist for all aspects of Project monitoring and will aid County staff in assessing Project progress and the development of potential problems. The Applicant shall be required to post bonds or appropriate financial assurances in an amount sufficient to perform remediation and restoration, or on-going maintenance and operation. The amount and timing of the bonds would be commensurate with the volume and type of sediment placed at the restoration site. The approach for calculating the bond amount will be determined during preparation of the County use permit.(LS)

Impact P-ECON-5: If restored wetlands are donated to a public or non-profit entity at the end of the Project's life, there would be an unspecified cost to this entity associated with long-term management, maintenance, and monitoring of the Project site. (County-LS, Corps-LS)

The long-term success of the wetlands restoration project would require on-going management to achieve the goals of the Project (i.e., the physical stabilization of constructed channels; persistence of native marsh vegetation; and confirmation of the site's value as a restored tidal wetland). The County will be responsible for review and evaluation of the results of monitoring, maintenance, and for making decisions regarding permit compliance. Any public or non-profit entity that manages the site on a long-term basis would have on-going costs associated with the Project.

Mitigation Measure P-ECON-5: The County shall require that the Applicant establish a self-supporting fund to reimburse any public or non-profit entity that takes over the site and provides long-term management and maintenance. Details as to the form and amount of such fund shall be worked out prior to permitting. (LS)

6.17.2.2 Alternative 1: Managed Wetland

A non-tidal wetland would have similar economic and fiscal effects as the Proposed Project. For a detailed discussion of these effects, and applicable impacts and mitigation measures refer to the analysis under the Proposed Project.

6.17.2.3 Alternative 2: Combined Wetlands

A non-tidal wetland would have similar economic and fiscal effects as the Proposed Project. For a detailed discussion of these effects, and applicable impacts and mitigation measures refer to the previous analysis under the Proposed Project.

6.17.2.4 Alternative 3: The Bel Marin Keys Site

Economic Effects

This alternative would result in the loss of 784 acres of agricultural land, now producing oat hay which generated revenues of $88,143 in 1990. At least 800 acres are needed to retain a viable oat hay crop. Currently, the subject land is designated as "farmland of local importance" in Marin County. The Bel Marin Keys Unit 5 Draft EIR/EIS considered the loss of agricultural land for the development as a significant impact. According to that source, the loss of 1,200 acres would equate to an approximate loss of 2,200 tons of oat hay. Using this same ratio, the loss of 784 acres would equate to an approximate loss of 1,437 tons of oat hay. This would account for approximately 23 percent of the total annual value of oat hay production in Marin County, or $88,143 (in 1990 dollars).

LFR
LEVINE • FRICKE

LETTER OF TRANSMITTAL
2393.99-09

September 28, 2000

Olene Chard
CalFed
1416 9th Street, Suite 1155
Sacramento, California 95814

Re: Montezuma Wetlands Project

The following items are Enclosed via Fed Ex

Description	No. of Copies
July 1998 Final EIR/EIS - Volume I	1

The item(s) are transmitted:
- ☐ At your request
- ☐ For your review/comment
- ☐ For your approval
- ☐ For your action
- ☐ For your files
- ☒ For your information

Comments:

Sincerely,

Julie C. Sharp, P.E., Senior Engineer

1900 Powell Street, 12th Floor, Emeryville, California 94608-1827 • (510) 652-4500 • *fax* (510) 652-2246 • *www.lfr.com*
Offices Worldwide

In addition to the direct loss of revenue from oat hay production, a significant indirect impact would result. The oat hay grown in the north Bay is used as feed for the dairy cattle in West Marin. To a large degree, the industry is dependent upon this feed source as oat hay trucked from other areas is more expensive. Costs for dairy farmers would rise if "imported" oat hay were needed. As dairy farming is highly sensitive to increases in costs, the loss of this oat hay resource could be significant, particularly if considered as a cumulative impact.

Impact 3-ECON-1: This alternative would result in the loss of revenue from oat hay farming on 784 acres of land. (County-NA, Corps-LS)

Mitigation Measure 3-LU-1 should be required to mitigate this impact. An alternative measure would be retaining 800 acres of agricultural land (the minimum acreage for a viable oat hay crop) on the Bel Marin Keys site, and combining wetlands restoration on this site and the Hamilton site.

This alternative would have similar employment levels and similar per capita costs of providing governmental services to those of the Proposed Project. The major difference would be a shorter project operational life, and lower property taxes due to the smaller acreage of this site. It can be assumed that this site would operate for 8.5 to 13 years compared to the 10 to 15 years estimated for the Proposed Project, and would result in about 85 percent of the economic benefits of the Project. Employment and payroll would be similar for either site. Assuming at least a portion of the employees generated from the wetlands project live, work, or spend money in Marin County, a minor positive economic effect on cities such as Novato could be realized through employee spending. In addition to the direct benefits of spending by employees, this alternative would also require materials purchases. The degree or magnitude of this effect is not estimated in this analysis. From a regional perspective, this alternative would provide a partial solution to the problem of locating a viable site for depositing dredged materials, an issue that is threatening the region's ports and water-related industries.

Impact 3-ECON-2: This alternative would significantly increase disposal capacity for dredged materials, which would help maintain navigation channels, indirectly maintaining or increasing port-related economic activity and adding local income in Marin County. (County-NA, Corps-S)

This is a beneficial impact; no mitigation is required.

Fiscal Effects

This alternative would require public services including police, fire, and general government, similar to those of the Proposed Project. The alternative may also generate revenues including but not limited to property taxes and charges for current services. Assuming similar annual fiscal effects for this alternative on Marin County as for the Proposed Project on Solano County, revenues would exceed service costs, both with and without the Applicant's proposed donation to the County General Fund of $0.20 per cubic yard of dredged sediment accepted at the site. Residential development is proposed on portions of the Bel Marin Keys Unit 5 development site. The cost and revenues associated with residential development of the Bel Marin Keys Unit 5 site are not included in this analysis. Wetland restoration at this site is intended to mitigate the impacts of that proposed residential development. Because residential development has not been approved on the 784 acres addressed in this Alternative 3, and because wetlands restoration would occur on the site if the Bel Marin Keys Unit 5 development proposal were approved, this alternative would not adversely affect potential future revenues available to Marin County from probable future residential development.

Impact 3-ECON-3: This alternative would result in an operating surplus for Marin County. (County-NA, Corps-LS)

This is a beneficial impact; no mitigation is required.

Impact 3-ECON-4: If the project fails prior to its proposed completion, remediation and restoration of the site to pre-project conditions, or continued maintenance and operation, would be required. This could be a significant impact on County financial resources. (County-S, Corps-S)

Mitigation Measure 3-ECON-4: The Applicant shall be required to post bonds in an amount sufficient to perform remediation and restoration, or on-going maintenance and operation. (LS)

Impact 3-ECON-5: If restored wetlands are donated to a public or non-profit entity at the end of the project's life, there would be an unspecified cost to this entity (or to the County if such an arrangement failed) associated with long-term management and maintenance of the project site. (County-LS, Corps-LS)

Mitigation Measure 3-ECON-5: The County shall require that the Applicant establish a self-supporting fund to reimburse any public or non-profit entity that takes over the site and provides long-term management and maintenance. (LS)

6.17.2.5 Alternative 4: The Hamilton Site

Economic Effects

The site currently has no economic activity, and the current development proposal for the site, the Hamilton Field Master Plan,[18] does not propose development of the site for revenue-generating uses. Use of the site for a marsh restoration project is being considered.[19] The City of Novato's designation of Planned Community for the site could, however, allow urban development on the site in the future. Such development on the site would be constrained by the presence of existing and potential jurisdictional wetlands. It is, therefore, unlikely that this alternative would have a major adverse effect on reasonably foreseeable or probable revenue-generation or economic activity on the site in the future.

It can be assumed that this alternative would have similar employment levels and per capita costs of providing governmental services to those of the Proposed Project. The major difference would be a shorter project operational life and lower property taxes, due to the smaller acreage (840 acres) and capacity of this site (8.7 mcy compared to 17 mcy for the Proposed Project). It can be assumed that this alternative would result in about 40 percent of the economic benefits of the Proposed Project. Employment and payroll would be similar for either site. Assuming at least a portion of the employees generated from the wetlands project live, work, or spend money in Marin County, a positive economic effect on cities such as Novato could be realized through employee spending. In addition to the direct benefits of spending by employees, this alternative could also require materials purchases. The degree or magnitude of this effect is not estimated in this analysis. From a regional perspective, this alternative would provide a partial solution to the problem of locating a viable site for depositing dredged materials, an issue that is threatening the region's ports and water-related industries.

18 The Martin Group, Hamilton Field Master Plan 1991.

19 S. Johnson, personal communication.

Impact 4-ECON-1: This alternative would significantly increase disposal capacity for dredged materials, which would help maintain navigation channels, indirectly maintaining or increasing port-related economic activity and adding local income in the City of Novato. (County-NA, Corps-S)

This is a beneficial impact; no mitigation is required.

Fiscal Effects

This alternative would require per capita public services and annual expenditures including police, fire, and general government, similar to those of the Proposed Project. The alternative would generate revenues including but not limited to property taxes and charges for current services. Property taxes and other revenues would be approximately 35 percent of the Proposed Project due to the reduced size of this site. The operating surplus would be less than the Proposed Project.

Impact 4-ECON-2: This alternative would result in a minor operating surplus for the City of Novato. (County-NA, Corps-LS)

This is a beneficial impact; no mitigation is required.

Impact 4-ECON-3: If the project fails prior to its proposed completion, remediation and restoration of the site to pre-project conditions, or continued maintenance and operation, would be required. This could be a significant impact on City of Novato financial resources. (County-S, Corps-S)

> Mitigation Measure 4-ECON-3: The Applicant shall be required to post bonds in an amount sufficient to perform remediation and restoration, or on-going maintenance and operation. (LS)

Impact 4-ECON-4: If restored wetlands are donated to a public or non-profit entity at the end of the project's life, there would be an unspecified cost to this entity (or to the City of Novato if such an arrangement failed) associated with long-term management and maintenance of the project site. (County-LS, Corps-LS)

> Mitigation Measure 4-ECON-4: The City of Novato shall require that the Applicant establish a self-supporting fund to reimburse any public or non-profit entity that takes over the site and provides long-term management and maintenance. (LS)

6.17.2.6 No-Project Alternative

Economic Effects

Economic impacts on port and Bay activities could result from delays in identifying and permitting alternative sites for dredged materials disposal. The regulatory process for approving potential sites is long and protracted, and the potential costs of a search for substitute sites would increase, given the time-value of money and the fact that the sediment load in the Bay would continue to mount. Hence, the regional economic impact of the No-Project Alternative depends largely on the available options regarding other feasible disposal sites.

The Long-Term Management Strategy (LTMS) identifies a mix of ocean, in-Bay, and upland disposal sites to accommodate the projected dredged material disposal needs related to routine channel maintenance and major port improvements through the year 2044. The success in locating, permitting, and implementing disposal programs at off-shore and upland locations would be critical to the success of the LTMS.

The No-Project Alternative would have no fiscal effects.

6.17.2.7 Cumulative Impacts

The cumulative impacts of the Proposed Project and the project alternatives are generally the same. If a significant number of wetland restoration projects are completed and transferred to public ownership, a regional effect could occur since no property tax would be generated from the lands. This cumulative impact would result to the extent that fiscal revenues are diminished as a result of wetland restoration projects.