Chapter 7
Land and Water Use, Social Issues, and Economics

This chapter provides environmental analyses relative to social parameters of the project area. Components of this study include a setting discussion, impact analysis criteria, project effects and significance, and applicable mitigation measures. This chapter is organized as follows:

- Section 7.1, "Land and Water Use";
- Section 7.2, "Social and Economic Conditions";
- Section 7.3, "Utilities and Public Services";
- Section 7.4, "Recreation Resources";
- Section 7.5, "Power Production and Energy";
- Section 7.6, "Visual/Aesthetic Resources";
- Section 7.7, "Cultural Resources";
- Section 7.8, "Public Health and Environmental Hazards";
- Section 7.9, "Environmental Justice"; and
- Section 7.10, "Indian Trust Assets."

Section 7.1
Land and Water Use

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on land and water use.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context against which the reader can understand the environmental changes caused by the action. The environmental setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts.

The environmental changes associated with the alternatives are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.1-1 summarizes land and water use impacts from implementing the SMP alternatives. There are no significant impacts on land and water use from implementing the SMP alternatives.

Table 7.1-1. Summary of Land and Water Use Impacts

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–

Affected Environment

Sources of Information

The Solano County General Plan (Solano County 2008) was used as a source of information in the preparation of this section.

Land Use at the Project Site

Historically, Suisun Marsh consisted of tidally inundated islands separated by sloughs. Prior to human alteration, the Marsh contained 68,000 acres of tidal wetlands. Diking of the Marsh began in the mid-1860s for livestock grazing. Shortly after, the first duck clubs were established around the ponds. By the early 1900s, livestock grazing was being replaced by other agricultural activities. Increasing salinity and land subsidence caused agriculture to fail and be replaced by duck clubs. The original levees constructed for farming now provide the infrastructure of the duck clubs. Approximately 7,672 acres of tidal wetland remain (Interagency Ecological Program 2008).

Suisun Marsh is divided between the Primary Management Area and the Secondary Management Area. The Primary Management Area consists of tidal marshes, seasonal marshes, managed wetlands, and lowland grasslands within the Marsh. The intent is for this area to remain in its existing marsh and related uses as provided for in the Suisun Marsh Protection Plan. The Secondary Management Area comprises upland grasslands and agricultural lands, which provide significant buffer habitat to the Marsh (Solano County 2008). Within this area, existing grazing and agricultural uses should continue, and agricultural practices favoring wildlife use and habitat enhancement should be encouraged (Solano County 2008). Current land use in the Marsh is a mixture of privately

and state-managed lands (Figure 7.1-1). Suisun Marsh has approximately 51,416 acres of managed seasonal wetlands. Most of the properties surrounding the slough and in the Marsh are privately owned duck and hunting clubs with some public recreation lands. It is home to public waterfowl hunting areas managed by DFG (13,500 acres) and 158 private duck clubs (37,500 acres). Agricultural lands in the study area are shown as grazing areas (Figure 7.1-2) and are covered under the Williamson Act (Solano County 2008).

Existing land use in the Marsh is zoned as marsh and agriculture, both having a resource conservation overlay (Figure 7.1-1). The marsh designation provides for protection of marsh and wetland areas. The land use permits aquatic and wildlife habitat, marsh-oriented recreational uses, agricultural activities compatible with the marsh environment and marsh habitat, educational and scientific research, educational facilities supportive of and compatible with marsh functions, and restoration of historical tidal wetlands (Solano County 2008).

The agriculture designation provides areas for the practice of agriculture as the primary use, including areas that contribute significantly to the local agricultural economy, and allows secondary uses that support the economic viability of agriculture. Agricultural land use designations protect these areas from intrusion by nonagricultural uses and other uses that do not directly support the economic viability of agriculture. Agricultural areas in Solano County are identified within one of 10 geographic regions. Within these regions, uses include both irrigated and dryland farming and grazing activities. Agriculture-related housing also is permitted within areas designated for agriculture to provide farm residences and necessary residences for farm labor housing (Solano County 2008).

The resource conservation overlay identifies and protects areas of the county with special resource management needs. This designation recognizes the presence of certain important natural resources in the county while maintaining the validity of underlying land use designations. The overlay protects resources by (1) requiring study of potential effects if development is proposed in these locations, and (2) providing mitigation to support urban development in cities (Solano County 2008). Resources to be protected through this overlay are those identified through technical studies as the highest priority areas within the habitat conservation planning process. Conservation measures used to achieve the County's resource goals vary based on the targeted resource. Removal of a resource conservation overlay from a subject property may be possible through a General Plan amendment (Solano County 2008).

Water Use at the Project Site

Water management for the managed wetlands within the Marsh is described generally as waterfowl habitat flooding operations and soil leaching for vegetation management. The majority of diversions occur in October and November at the beginning of the waterfowl habitat flooding period but extend into the spring. Most drainage from these managed wetlands occurs between

February and May. The wetlands generally are drained to allow vegetation growth during the summer.

Because the total managed wetland acreage is about 52,112 acres, and the flooded depth for waterfowl averages about 1 foot, the total diversions in October are likely about 52,112 acre-feet. The water used for soil leaching and evapotranspiration of the drained wetlands/vegetation in the summer is harder to estimate but would not exceed seasonal evaporation (about 4 feet). Some of this water is supplied by rainfall, so the total water diversions are likely between 100,000 and 150,000 acre-feet.

Regulatory Setting

Federal

The Farmland Protection Policy Act is discussed in detail in Chapter 10.

State

The San Francisco Bay Conservation and Development Commission is discussed in detail in Chapter 10.

California Land Conservation Act of 1965

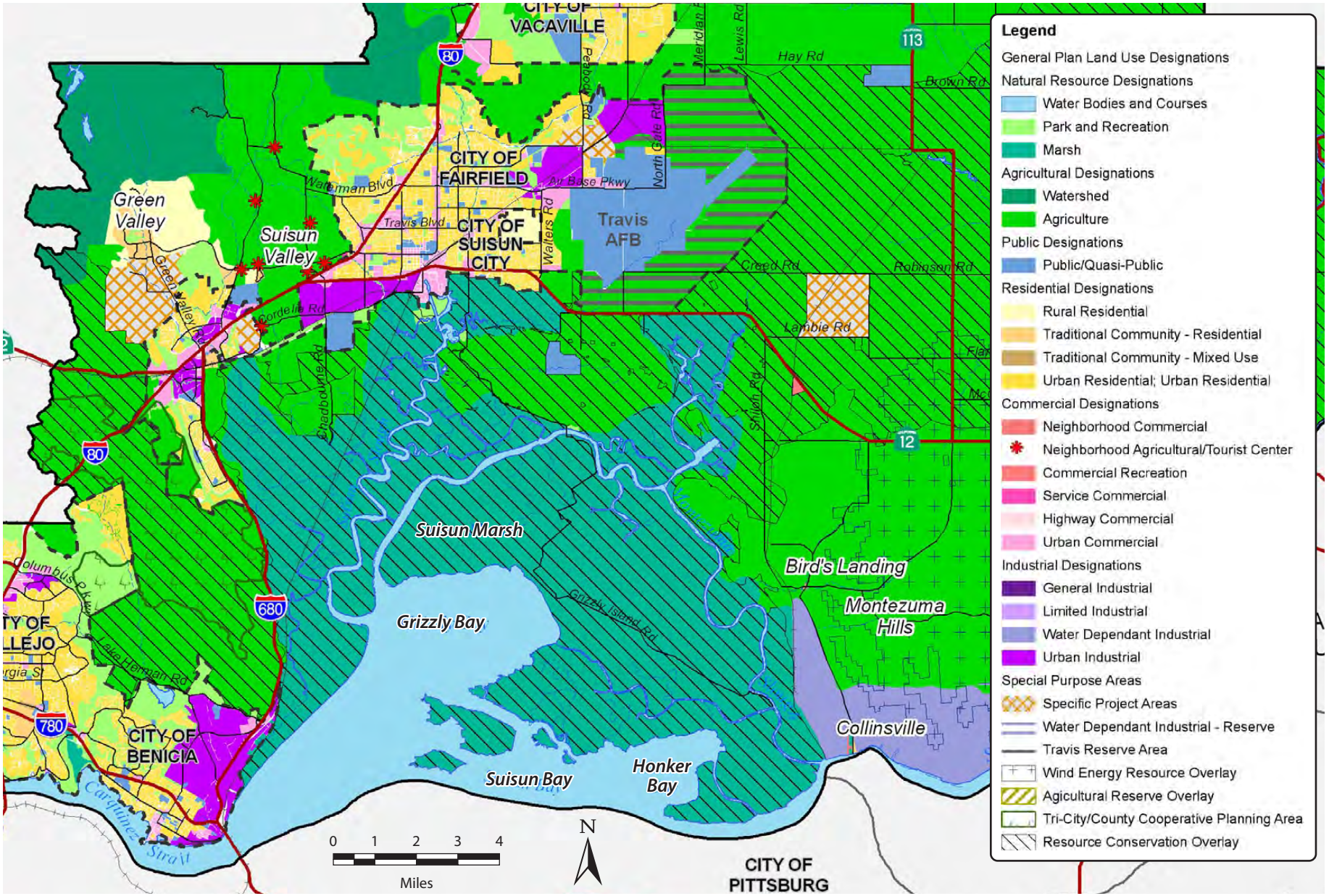
The California Land Conservation Act of 1965 (Williamson Act) helps preserve agricultural and open space lands by discouraging conversion to urban uses. The act creates an arrangement whereby private landowners enter into a 10-year contract with counties and cities to maintain their land in agricultural and compatible open-space uses in exchange for a reduction in property taxes. The contract is automatically renewed each year for 1 additional year unless it is cancelled.

Local

The County has applied Marsh Preservation and Limited Agricultural zoning districts to the Primary and Secondary Management Areas, consistent with the General Plan (Solano County 2008).

Solano County Airport Land Use Commission

The Solano County Airport Land Use Commission regulates land use around Travis Air Force Base (AFB) by recommending to cities that projects in their



Source: Solano County General Planning Documents, 2006 and 2008.

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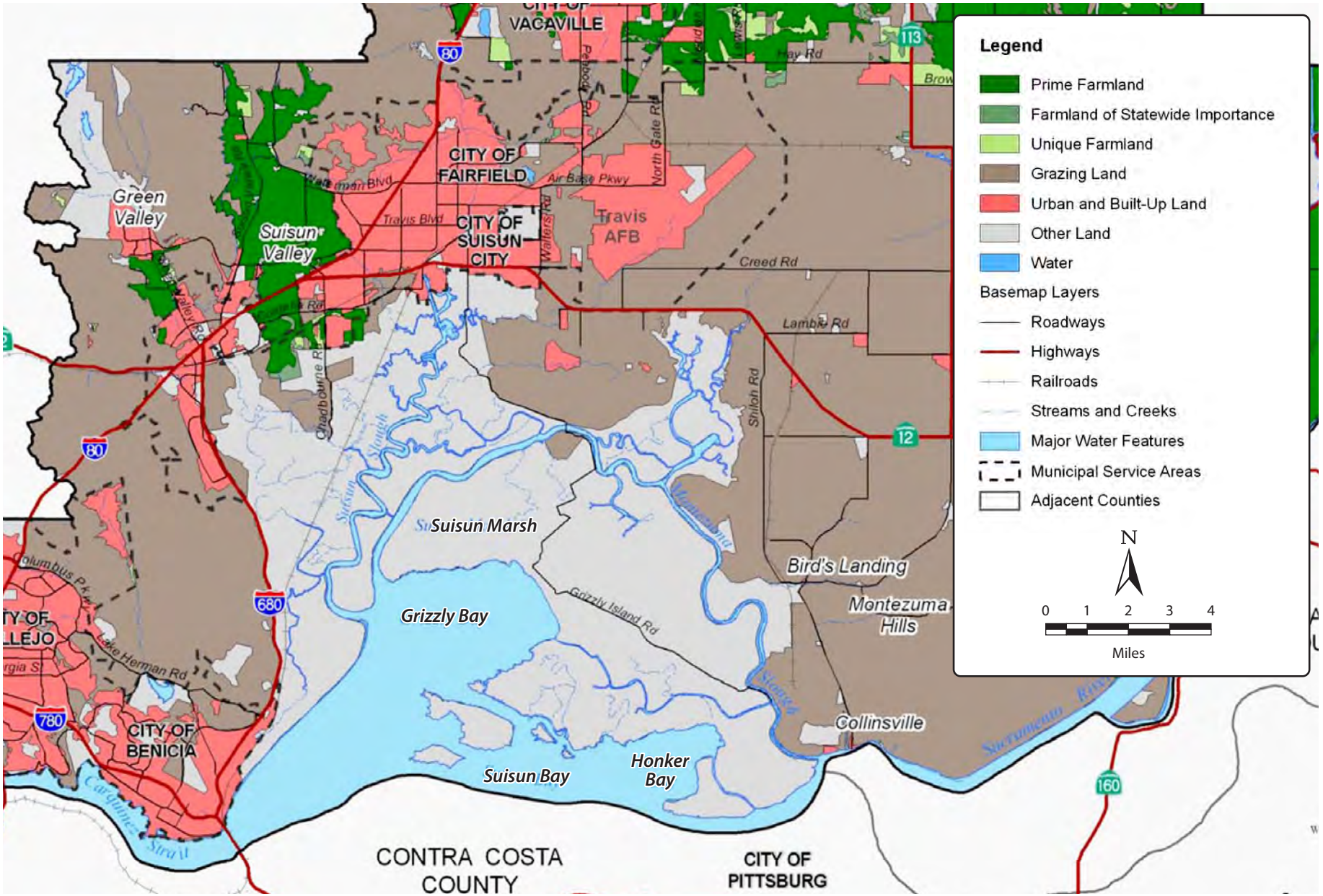
Figure 7.1-1
Land Use Diagram



Source: Solano County General Planning Documents, 2006 and 2008.

Graphics/Projects/project number/document (date) SS

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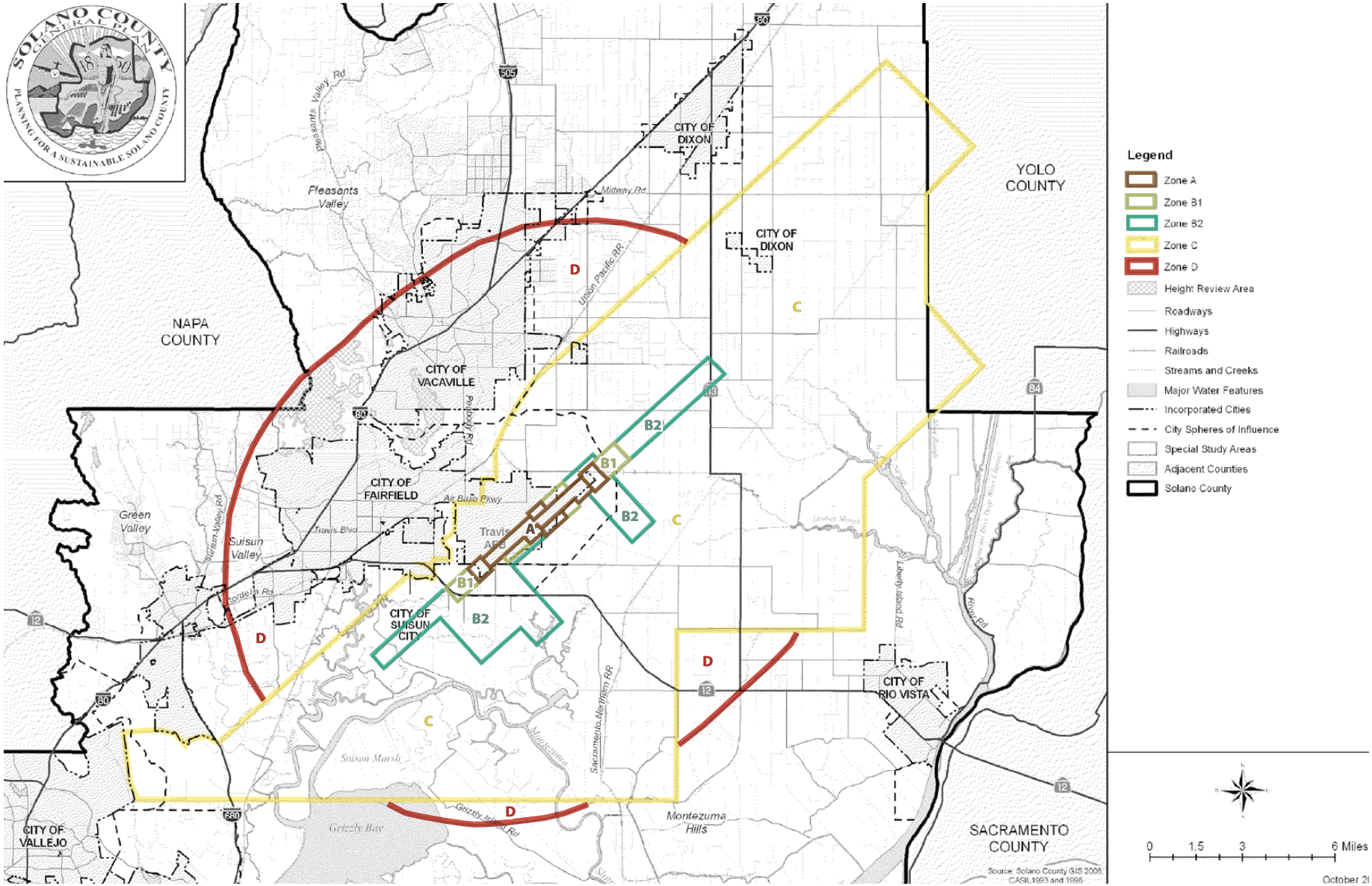
Figure 7.1-2
Agricultural Lands in the Study Area



Source: EDAW

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Figure 7.1-3
Travis Air Force Base Land Use Zones

jurisdictions comply with the Travis AFB Land Use Compatibility Plan. The plan identifies land use compatibility policies applicable to future development near Travis AFB. The policies are designed to ensure that future land uses in the surrounding area would be compatible with potential aircraft activity at the base. In certain circumstances, local governments have the ability to override the decisions of the Airport Land Use Commission.

The Travis Air Force Base Land Use Compatibility Plan prohibits land uses that would create glare or distracting lights; sources of dust, steam, or smoke; sources of electrical interference with aircraft communications or navigation; or any land use (e.g., landfills) that may attract an increased number of birds. Land has been acquired to the north and east of Travis AFB and is reserved for open space or future base expansion. Areas surrounding Travis AFB also are designated as Zones A, B1, B2, C, and D (Figure 7.1-3). Compatibility Zone D, in which Suisun Marsh is located, includes all other locations beneath any of the Travis AFB airspace protection surfaces delineated in accordance with Federal Aviation Regulations Part 77. Limitations on the height of structures are the only compatibility factors within this zone.

Solano County General Plan

Wildlife habitat within the Suisun Marsh shall be managed and preserved through the following policies (Solano County 2008):

- **Policy 1.** The diversity of habitats in the Suisun Marsh and surrounding upland areas should be preserved and enhanced wherever possible to maintain the unique wildlife resource.
- **Policy 2.** The marsh waterways, managed wetlands, tidal marshes, seasonal marshes, and lowland and grasslands are critical habitats for marsh-related wildlife and are essential to the integrity of the Suisun Marsh. Therefore, these habitats deserve special protection.
- **Policy 3.** The eucalyptus groves in and around the marsh, particularly those on Joice and Grizzly Islands, should not be disturbed.
- **Policy 4.** Burning in the primary management area is a valuable management tool. However, it should be kept to a minimum to prevent uncontrolled fires that may destroy beneficial plant species and damage peat levees, and to minimize air pollution.
- **Policy 5.** Where feasible, historical 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 also should be restored as tidal marshes.

The following policies apply specifically to the Suisun Marsh area. These policies are more specific than the balance of the general plan to address the requirements of the *Suisun Marsh Protection Plan* and the Suisun Marsh Protection Act of 1977 (Solano County 2008).

- **RS.P-10.** 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.
- **RS.P-11.** 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.
- **RS.P-12.** 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 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.
- **RS.P-13.** 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. These activities include extensive agricultural uses such as grain production and grazing. Intensive agricultural activities involving removal or persistent plowing of natural vegetation and maintenance of fallow land during part of the year should not be permitted.
- **RS.P-14.** Agricultural uses consistent with protection of the Suisun Marsh, such as grazing and grain production, should be maintained in the Secondary Management Area. In the event such uses become infeasible, other uses compatible with protection of the marsh should be permitted.
- **RS.P-15.** 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.
- **RS.P-16.** The County shall ensure that development in the County occurs in a manner that minimizes impacts of earth disturbance, erosion, and water pollution.
- **RS.P-17.** The County shall preserve the riparian vegetation along significant County waterways in order to maintain water quality and wildlife habitat values.
- **RS.P-18.** The County shall ensure that public access at appropriate locations is provided and protected along the County's significant waterways within the Suisun Marsh.
- **RS.P-19.** Within the watershed of the Suisun Marsh, the County shall encourage sound agricultural practices that conserve water quality and the riparian vegetation.

The following policies apply to all lands designated Agriculture on the Land Use Diagram (Solano County 2008).

- **AG.P-3.** Encourage consolidation of the fragmented pattern of agricultural preserves and contracts established under the Williamson Act and the

retention of agricultural preserves and contracts in agricultural, watershed, and marshland areas.

- **AG.P-25.** Facilitate partnerships between agricultural operations and habitat conservation efforts to create mutually beneficial outcomes. Although such partnerships are to be encouraged throughout the county, additional emphasis should be focused in locations where the resource conservation overlay and agricultural reserve overlay coincide.
- **AG.P-35.** Lands within the Agriculture designations may be redesignated to Watershed or Marsh.

Environmental Consequences

Assessment Methods

Information related to land use in the Marsh was reviewed and compared to the alternatives to evaluate the potential for land use conflicts. Potential impacts were compared to the thresholds of significance described below to determine the level of significance of each impact.

Significance Criteria

The following significance criteria were used to evaluate the proposed project site. Regarding land use, the proposed project was identified as resulting in a significant impact on the environment if it would:

- conflict with any applicable land use plan, policy, or regulation of local jurisdictions, or state or federal regulatory agencies, including general plans, community plans, and zoning;
- be inconsistent or conflict with statutes of the California Coastal Act or the land use goals, objectives, or policies of BCDC or other applicable state and federal agencies;
- substantially conflict with an existing on-site land use; or
- substantially conflict with existing or future adjacent land uses.

Environmental Impacts

No Action Alternative

Under the No Action Alternative some restoration activities would occur and managed wetlands would continue to be operated, although the frequency and magnitude of managed wetland activities would likely decrease. These activities

would not change land use. Therefore, no land use–related impacts would occur under the No Action Alternative.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact LU-1: Alteration of Existing Land Use Patterns

Alternative A would restore 5,000–7,000 acres of tidal wetlands. The entire Marsh would remain classified as marsh or agriculture. If agricultural lands are obtained for restoration and converted to marsh, the newly designated use is consistent with the Solano County General Plan for Agriculture, which states that agricultural land may be redesignated to marsh (See AG.P-35 above).

Although there could be a shift in site-specific uses, the overall current use of the Marsh for recreational activities (hunting, fishing, wildlife viewing, walking, etc.) would not change. Additional analysis related to specific changes in recreational use is provided in Section 7.4, Recreation Resources. However, the overall land uses in the Marsh would be consistent with current land use designations.

Conclusion: Less than significant. No mitigation required.

Impact LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations

The Solano County General Plan, Suisun Marsh Protection Plan, and the Suisun Marsh Protection Act of 1977 are the primary existing policies that have jurisdiction and provide land use guidance in the plan area. These plans and act call for the preservation and enhancement of aquatic habitat wherever possible. The SMP is aligned with and intended to further these and other preexisting goals.

The Travis AFB Land Use Compatibility Plan also includes a restriction of land use in the Marsh regarding the height of any structures. The proposed project would not build any new structures beyond duck clubs and other small facilities. Additional analysis on this topic is provided in Section 5.6, Transportation and Navigation.

Conclusion: No impact.

Impact LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan

The proposed project is a habitat management, preservation, and restoration plan and does not conflict with the existing Suisun Marsh Protection Plan (discussed above). There are no other known conservation plans that affect the proposed project area.

Conclusion: No impact.

Managed Wetland Activities Impacts

Impact LU-1: Alteration of Existing Land Use Patterns

This impact would be similar to that described for restoration activities. Under Alternative A, 44,000–46,000 acres of managed wetlands would be subject to managed wetland activities. However, the overall land uses in the Marsh would be consistent with current land use designations. The entire Marsh would remain classified as marsh or agriculture and the overall current use of the Marsh for recreational activities (hunting, fishing, wildlife viewing, walking, etc.) would not change.

Conclusion: Less than significant. No mitigation required.

Impact LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations

This impact would be similar to that described for restoration activities. The SMP is consistent with land use policies and the goal of the Solano County General Plan, Suisun Marsh Protection Plan, and the Suisun Marsh Protection Act of 1977, the primary existing policies that have jurisdiction and provide land use guidance in the plan area. The Travis AFB Land Use Compatibility Plan also includes a restriction of land use in the Marsh regarding the height of any structures. The proposed project would not build any new structures beyond duck clubs and other small facilities.

Conclusion: No impact.

Impact LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan

This impact would be similar to that described for restoration activities. The proposed project does not conflict with the existing Suisun Marsh Protection Plan (discussed above). There are no other known conservation plans that affect the proposed project area.

Conclusion: No impact.

Alternative B: Restore 2,000–4,000 Acres

Alternative B would restore 2,000–4,000 acres of marsh, leaving the remaining 46,000–48,000 acres of wetlands subject to managed wetland activities. Impacts for Alternative B are the same as for Alternative A because even though there would be less restoration than under Alternative A, the overall land uses would be consistent with all applicable planning policies.

Alternative C: Restore 7,000–9,000 Acres

Alternative C would restore 7,000–9,000 acres of marsh, leaving the remaining 41,000–44,000 acres of wetlands subject to managed wetland activities. Impacts for Alternative C are the same as for Alternative A, because even though there would be more restoration than under Alternative A, the overall land uses would be consistent with all applicable planning policies.

Section 7.2
Social and Economic Conditions

Introduction

This section describes the existing conditions and the consequences of implementing the SMP alternatives on social and economic conditions in the plan area.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing social and economic context against which the reader can understand the changes caused by the action. The setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts. For example, the setting identifies groups of people who reside in the action area because the action could change economic activity.

The changes associated with the action are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.2-1 summarizes social and economic conditions impacts from implementing the SMP alternatives. There are no significant impacts on socioeconomics from implementing the SMP alternatives.

Table 7.2-1. Summary of Social and Economic Conditions Impacts

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
SOC-1: Change in Employment and Income Resulting from Construction, Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
SOC-3: Changes in Property Tax Revenues as a Result of Purchasing and Restoring Private Lands	A, B, C	Less than significant	–	–
Managed Wetland Activities Impacts				
SOC-1: Change in Employment and Income Resulting from Construction Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–
SOC-4: Changes in Employment and Income Resulting from Increased Expenditures for Wetland Management Activities	A, B, C	Less than significant	–	–

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- California Department of Finance;
- California Employment Development Department;
- United States Department of Commerce, Bureau of the Census; and
- Solano County Assessor's Office.

Setting

This section describes the social and economic conditions in Solano County that could be affected by implementing the SMP alternatives. The study area for this analysis has been limited to Solano County because the plan area falls entirely within the county and changes in employment and expenditures for restoration and managed wetland activities are expected to occur primarily within the county. The three focus areas of this assessment are population, employment, and tax revenues.

Population

Population in Solano County was estimated to total approximately 425,000 residents in 2006. This represents an increase of approximately 7%

from the 2000 population of 397,000 residents. Population is projected to reach 441,000 by 2010.

Major communities in the county are Vallejo, with a population of 121,400, followed by Fairfield with 105,400 residents and Vacaville with 96,500 residents. Fairfield is located immediately northeast of Suisun Marsh.

Employment

Employment in Solano County totaled approximately 132,100 jobs in 2006 (U.S. Bureau of Labor Statistics 2008a). This represents an increase of 12% from 117,400 jobs in 2000 (U.S. Bureau of Labor Statistics 2008b). The unemployment rate in the county was 4.9% in 2006, the same as the California statewide average (California Employment Development Department 2008). The largest employment sector in the county is trade, transportation, and utilities, which accounted for 21% of total employment, followed by government accounting for approximately 20% of total employment.

Income

Personal income in Solano County totaled just over $13.7 billion in 2005. Per capita personal income in 2005 was $33,494, below the statewide average of $36,936. Median household income was approximately $57,700 in 2004, substantially higher than the statewide average of $49,900. An estimated 8.7% of the population fell below the poverty level in 2004, less than the statewide rate of 13.2%.

Tax Revenues

Sales tax revenues are distributed by the state to Solano County and incorporated cities. Sales tax revenues distributed to the county and cities totaled approximately $47.8 million in 2006 (California State Board of Equalization 2007). Fairfield received the most sales tax revenue at $14.2 million followed by Vacaville at $12.1 million. Solano County received $1.8 million in sales tax revenues in 2006.

The assessed value of property in Solano County totaled approximately $42.6 billion in 2006 (California State Board of Equalization 2007). Property taxes generated in the county totaled $408 million in 2006 (California State Board of Equalization 2007).

Environmental Consequences

Assessment Methods

Employment and Income

The analysis of potential changes in employment and income is a qualitative assessment of the changes in economic activity that may occur as a result of changes in expenditures on infrastructure maintenance and improvements and changes in recreation-related expenditures. A qualitative assessment was conducted because the location and duration of infrastructure maintenance and improvements activities are not known. A qualitative assessment of changes in recreation spending also was conducted to mirror the conclusions and assessment methods used to determine changes in recreation opportunities.

Property Tax Revenues

The potential changes in property tax revenue resulting from purchase of private lands to facilitate restoration of tidal marsh habitat were estimated by applying a semi-quantitative assessment methodology. A representative group of parcels was selected to help estimate property taxes generated for each acre of land that would be purchased. The five parcels ranged in size from approximately 50 acres to 620 acres. The assessed value of land and improvements for each parcel was determined by accessing Solano County Assessor's Office records. The average assessed value of the five parcels then was calculated, and the Solano County tax rate was applied to estimate an average per-acre property tax. This value then was used to estimate the total amount of property tax that would be generated by the land that would be purchased and converted to tidal marsh habitat. This evaluation did not attempt to estimate the rate at which lands would be purchased or converted. The analysis can be considered a worst-case assessment because it assumed all property would be purchased and converted simultaneously.

Significance Criteria

Impacts were considered significant if the plan alternatives would result in a substantial change in:

- population levels,
- employment and personal income levels, and/or
- tax revenues generated in Solano County.

Environmental Impacts

No Action Alternative

Under the No Action Alternative, a limited amount of restoration would occur. The socioeconomic impact is considered less than significant because even though there would be a reduced frequency of managed wetland activities, no substantial change in land use or recreation opportunities resulting in changes in economic activity is expected to occur.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact SOC-1: Change in Employment and Income Resulting from Construction, Restoration, and Other Expenditures

The proposed project includes infrastructure improvements, reconstructing existing levees, constructing new levees, and restoring up to 7,000 acres of tidal wetlands. Implementing these improvements would require expenditures on labor and materials. Although the exact location, duration, and timing of these improvements are not known, it is assumed that expenditures required to implement the proposed project would be greater than the expenditures under the No Action Alternative. This increased level of expenditures is expected to benefit employment and income in the region. Although greater than the estimated management and maintenance expenditures made under the No Action Alternative, any increase in expenditures attributable to the proposed project would be very small compared to the total economic activity occurring in Solano County.

Conclusion: Beneficial.

Impact SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use

As discussed in Section 7.4, Recreation Resources, implementing Alternative A could benefit some recreation by increasing boating opportunities and increasing non-consumptive recreation opportunities by restoring up to 7,000 acres of tidal wetlands. These changes would be very small compared to the total economic activity occurring in Solano County.

New boating and non-consumptive recreation opportunities in Suisun Marsh could increase employment and income levels in Solano County as a result of increased expenditures made by recreationists visiting these new sites. Although positive compared to the No Action Alternative, these changes would be very small compared to the total economic activity occurring in Solano County.

Conclusion: Beneficial.

Impact SOC-3: Changes in Property Tax Revenues as a Result of Purchasing and Restoring Private Lands

Restoring tidal wetlands would require the purchase of private lands from willing sellers. Under Alternative A, between 5,000 and 7,000 acres of private lands may be purchased and restored as tidal wetlands. Removing 7,000 acres from the property tax role would result in an estimated annual reduction in Solano County property tax revenues of approximately $31,100. This represents substantially less than 1% of Solano County's tax revenue in 2006.

Although not substantial compared to the total property tax revenues collected by Solano County, the purchase of private lands under Alternative A would adversely affect the County's tax revenue base. Section 1504 of the California Fish and Game Code requires DFG to pay annually to counties in which wildlife areas are located fees in lieu of taxes equal to the amount of property taxes levied upon the property at the time of acquisition by the state. If the private lands purchased for purposes of tidal restoration become part of the Grizzly Island Wildlife Area or are otherwise held by DFG, they would be subject to in-lieu payments. These payments generally would offset the loss of property tax revenue.

Conclusion: Less than significant. No mitigation required.

Managed Wetland Activities Impacts

Impact SOC-1: Change in Employment and Income Resulting from Construction Restoration, and Other Expenditures

This impact would be similar to that described for restoration activities. Infrastructure improvements under the proposed project would require expenditures on labor and materials. This increased level of expenditures, relative to the No Action Alternative, is expected to benefit employment and income in the region.

Conclusion: Beneficial.

Impact SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use

This impact would be similar to that described for restoration activities. Under Alternative A there could be an increase in boating opportunities and non-consumptive recreation opportunities in Suisun Marsh. This increase in recreation opportunities could increase employment and income levels in Solano County as a result of increased expenditures made by recreationists visiting these new sites.

There would be a net loss of managed wetlands, but the remaining managed wetlands would be enhanced, minimizing the loss of habitat for birds and other wildlife that provide consumptive recreation.

Conclusion: Beneficial.

Impact SOC-4: Changes in Employment and Income Resulting from Increased Expenditures for Managed Wetland Activities

As managed wetlands are restored to tidal wetlands, there could be a change in employment and income related to a decrease in managed wetland activities. However, the increased frequency of the managed wetland activities, including channel dredging, is expected to offset any losses in employment or income that may occur as a result of restoration activities.

Conclusion: Less than significant. No mitigation required.

Alternative B: Restore 2,000–4,000 Acres

Impacts of Alternative B are similar to Alternative A. However, there would be a smaller impact on Solano County tax revenue (loss of $21,500) because fewer acres would be restored. However, impact conclusions for Alternative B are the same as for Alternative A.

Alternative C: Restore 7,000–9,000 Acres

Impacts of Alternative C are similar to Alternative A. However, there would be a greater impact on Solano County tax revenue (loss of $44,800) because fewer acres would be restored. However, impact conclusions for Alternative C are the same as for Alternative A.

Section 7.3
Utilities and Public Services

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on utilities and public services, including electricity and natural gas, water supply, stormwater, wastewater, solid waste disposal, and emergency services.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing conditions against which the reader can understand the changes caused by the action. The setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts.

The environmental changes associated with the action are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.3-1 summarizes utilities and public services impacts from implementing the SMP alternatives.

Table 7.3-1. Summary of Utilities and Public Services Impacts

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
UTL-1: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Construction or Restoration Activities	A, B, C	Significant	UTL-MM-1: Relocate or Protect Overhead Powerlines or other Utilities that Could be Affected by Construction UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
UTL-2: Damage to Utility Facilities or Disruption to Service as a Result of Restoration	A, B, C	Significant	UTL-MM-3: Relocate or Upgrade Utility Facilities that Could be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines that Have the Potential for Failure	Less than significant
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
UTL-5: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Dredging	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- Solano County General Plan Update, Public Facilities and Services, EDAW; and
- Draft EIR/EIS for the ISDP, Volume I, July 1996.

Electricity

Electricity for Solano County is provided by The Pacific Gas and Electric Company (PG&E), as regulated by the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission. All public electrical energy for Solano County is generated outside of the county and is supplied via transmission lines. Major transmission line corridors that serve the greater metropolitan San Francisco Bay Area traverse Solano County (EDAW/AECOM 2006a).

Electricity in the plan vicinity is provided to local customers via high-voltage overhead transmission lines and distribution lines. Several sets of high-voltage transmission lines owned by PG&E traverse the Suisun Marsh area (EDAW/AECOM 2006a); however, only some islands in the Marsh have electrical service. In the event that transmission lines would need to be relocated as part of implementing the proposed project, the construction of transmission and power lines would be regulated by the CPUC.

Solano County electrical energy sources also include power plants, solar facilities, dams and hydroelectric facilities, geothermal resources, and wind facilities. Wind energy is of particular importance as Solano County's wind resource area contributes 6% of all new wind development in California and has the capacity to generate 165 megawatts (MW). Current and planned wind energy facilities are located adjacent to the eastern boundary of Suisun Marsh, in the western portion of the Collinsville–Montezuma Hills Wind Resource Area (EDAW/AECOM 2006a).

Natural Gas

Natural gas service for Solano County is provided by PG&E, as regulated by the CPUC and the Federal Energy Regulatory Commission. PG&E provides natural gas service to Solano County through underground and aboveground transmission and distribution facilities. In Solano County, natural gas distribution facilities are constructed within easements on private property and within existing streets to increase capacity (EDAW/AECOM 2006a).

Natural gas production fields are located throughout Solano County (Figure 5.3-3). Locations include Lindsey Slough, Van Sickle Island, Elkhorn Slough, Millar, Cache Slough, Sherman Island, Winters, Ryer Island, Suisun Bay, and the Rio Vista field (EDAW/AECOM 2006b).

Five working natural gas well sites are within Suisun Marsh. In addition, several energy companies are seeking county permits to drill exploratory and permanent wells in the Marsh area. Venoco Inc. of Santa Barbara conducted seismic exploration on Grizzly Island (EDAW/AECOM 2006b).

Various natural gas, product, natural gas liquids, and empty liquid pipelines run through Suisun Marsh (Figure 7.3-1). The majority of these pipelines are product and natural gas lines. On the western side of the Marsh, a product pipeline crosses under Peytonia, Boynton, and Goodyear Sloughs. On the eastern side, natural gas and product pipelines occur under Nurse and Montezuma Sloughs (U.S. Department of Transportation 1999).

Pipelines

Several pipelines traverse the Marsh as shown in Figure 7.3-1. Of greatest concern related to impacts from restoration and managed wetland activities are the three pipelines that traverse the west and east perimeters of the Marsh as shown in Figure 7.3-1. This figure shows the various pipeline alignments, and in some instances, more than 1 pipeline could be in the alignment. The scale of the figure does not allow distinction between alignments within several feet. Additionally, a pipeline serving Travis AFB runs along the northern end of the Marsh, just south of Highway 12. The pipelines that could be affected by the SMP activities transport natural gas and other usable product. Many of these pipelines traverse open water over some portion of their alignment and were constructed more than 50 years ago. They are an integral part of the transmission system. All of the pipeline locations are marked throughout the Marsh.

Water Supply and Distribution

The Marsh includes both managed wetlands and agriculture, and water supplies for these land uses are provided from within the Marsh. Water supply for managed wetlands is necessary to properly flood for habitat management. This water supply is diverted directly from the adjacent channels in the Marsh. For irrigation purposes, those in the Marsh rely entirely on groundwater unless they have individual rights to surface water supplies with Solano Irrigation District (Bell pers. comm.). Although Solano County Water Agency (SCWA) is Solano County's wholesale water provider, they do not provide water to the Marsh.

Wastewater

No wastewater infrastructure is located in unincorporated Solano County. Wastewater needs in these locations are met by septic systems installed by individual landowners. These systems are not connected to sewer lines, but are self-contained systems permitted and inspected by Solano County (Bell pers. comm.). Most likely, there are some nonconforming systems that predate wastewater permitting that are leaching into the shallow water table.

Stormwater Drainage

The Marsh is dependent on levees for flood and high-tide protection of land, structures, and key infrastructure. The need to maintain and enhance the Delta levee system is an urgent flood control concern in Solano County (EDAW/AECOM 2006a).

Impervious surfaces in the Suisun Marsh area are limited to Grizzly Island Road and the roofs of a small number of structures. Agricultural areas are drained

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Figure 7.3-1
Pipeline Locations in Suisun Marsh

primarily by overland flow into human-made ditches, natural drainage swales, and watercourses that discharge into Delta waterways (Bell pers. comm.).

Solid Waste Disposal

Solano County contracts solid waste management services. Various contractors serve unincorporated communities, including Allied Waste Industries, Vacaville Sanitary Service (Norcal Waste Systems), Solano Garbage Company (Waste Connections, Inc.), and Rio Vista Sanitation Service (Garaventa Enterprises). Two privately-owned landfills are located in the unincorporated Solano County—Potrero Hills Landfill (owned by Wasted Connections and located outside of Suisun City near SR 12) and Hay Road Landfill (owned by Norcal Waste Systems and located east of Vacaville and Dixon near SR-113) (Entrix and Resource Insights 1996). Potrero Hills Landfill has 3 years remaining before capacity is reached for Phase I build-out. A Phase II expansion is currently being proposed to increase the life expectancy of the facility for an additional 35 years. The Hay Road Landfill has approximately 64 years of operation remaining before reaching capacity. No new landfills are planned in the County or for use by the County. No incinerators or other non-landfill facilities in Solano County accept solid waste for disposal (Entrix and Resource Insights 1996).

Communications

AT&T (formerly SBC), provides local telephone communication service for Solano County. AT&T is one of the country's largest telecommunications providers and offers local phone service, long distance phone service, and high speed internet service. Major telephone transmission lines traverse Solano County and generally follow rights-of-way that parallel County roadways and rail lines (EDAW/AECOM 2006a).

Internet Digital Subscriber Lines (DSL) are available only in limited areas in the unincorporated County. Solano Wireless Internet (a business unit of Guacamole Press, LLC) specializes in high-speed wireless internet access to rural and unincorporated areas of Solano County. They provide service to Allendale, Cordelia, Elmira, English Hills, Green Valley, Suisun Marsh, and Travis Air Force Base (EDAW/AECOM 2006a).

The major cable television provider for Solano County is Comcast. Comcast offers a wide variety of entertainment products ranging from digital cable to high speed to "video on demand." Cable service is available in only a couple of areas in the unincorporated County (around Vallejo and Tolenas and in the Fairfield/Suisun City area (EDAW/AECOM 2006a).

Police, Fire, and Ambulance Services

The Solano County Sheriff's Department is responsible for law enforcement in unincorporated areas of Solano County and on Delta waterways, including Suisun Marsh. Emergency response uses vehicles or boats, depending on the location's accessibility, predicted response time, and availability of resources (Page pers. comm.).

The main Sheriff's office is located at 530 Union Avenue in Fairfield. The Sheriff's Office has an operating budget of $68 million and employs more than 500 people including 116 sworn law enforcement professionals. This amounts to approximately 0.006 officer per unincorporated County resident (EDAW/AECOM 2006a).

The Solano County Marine Patrol Program provides public safety resources to recreational boaters and commercial vessels operating on the navigable waterways in the county of Solano. The Marine Patrol Program is staffed with four full-time deputies. The program is operational 10 hours each day, 7 days each week, year-round, providing professional public safety services to the community. The Marine Patrol deputies are subject to callout 24 hours a day, 7 days a week to provide search and rescue operations on the waterways of Solano County (Entrix and Resource Insights 1996). Per the Penal Code, the County Sheriff's Department is responsible for criminal offenses in unincorporated Solano County (including robberies, rapes, and murders), while the Solano County CHP is responsible for traffic-related offenses (traffic accidents, DUIs, etc.) (Page pers. comm.).

Police protection services are provided by California Highway Patrol (CHP) from their Solano Office, located at 3050 Travis Boulevard in Fairfield. The Solano CHP has jurisdiction from the west end of the City of Davis to the Benicia Bridge and Carquinez Bridge. Because Suisun Marsh lies at the end of the jurisdiction of the CHP, adjacent roads are not routinely patrolled (Page pers. comm.).

The California State Department of Forestry and Fire Protection (CDF) provides fire protection to several unincorporated communities in Solano County. Suisun Marsh is primarily within the jurisdiction of Suisun Fire Protection District (FPD). The eastern and western portions of the Marsh are serviced by the Montezuma FPD and Cordelia FPD, respectively. There are no fire hydrants in the Suisun Marsh area. Montezuma FPD and Suisun FPD do not report their average response time performance (EDAW/AECOM 2006a).

Staff members in each fire district may consist of full or part-time fire fighters, administrative staff, and volunteers. CDF has 21 administrative units statewide with 806 fire stations. The Montezuma FPD has three full-time firefighters and 28 volunteers. The Cordelia FPD consists of three full-time firefighters and 55 volunteers (Entrix and Resource Insights 1996). Suisun FPD has two stations located at 4965 Clayton Road in Suisun Valley and 625 Jackson Street in Fairfield. Montezuma FPD has four stations located at 21 N. Fourth Street in

Rio Vista and in the County at 2251 Collinsville Road, 3545 Shiloh Road, and 6669 Birds Landing. Cordelia FPD has two stations, one in Suisun Valley at 1624 Rockville Road and one in Old Town Cordelia at 2155 Cordelia Road (EDAW/AECOM 2006a).

In the event of a fire emergency, the Montezuma, Cordelia, and Suisun fire departments would communicate with one another to determine the exact location of the fire and the appropriate FPD to respond, based on jurisdiction. If a fire is occurring near electric sources, the nearest FPD would respond (Solano County Office of Emergency Services 2008).

Many of the duck clubs in Suisun Marsh are gated and locked. Adjacent Fire Departments are in possession of keys to these gates (Solano County Office of Emergency Services 2008; Page pers. comm.).

The Solano Emergency Medical Services Cooperative (SEMSC), in its role as the local emergency medical service (EMS) agency, provides pre-hospital emergency care to any persons within its jurisdiction needing such service through a comprehensive and coordinated arrangement of appropriate health and safety resources (EDAW/AECOM 2006a).

Essential elements of the SEMSC's duties include:

- rapid response: to minimize the time from emergency event to arrival of resources;
- competency in practice: to apply clinical field medicine to highest standards using best practices; and
- accountability: to measure, validate, report and improve processes for the delivery of care.

Environmental Consequences

Assessment Methods

To evaluate potential impacts on public services and utilities, the Solano County General Plan and General Plan Update were reviewed to obtain information regarding known public services and utilities in the plan vicinity.

Significance Criteria

For the purposes of this analysis, impacts on public services and utilities are considered significant if implementation of the alternatives would:

- require the construction or expansion of electrical or natural gas transmission or distribution facilities;

- require the construction or expansion of a water conveyance or treatment facilities or require new or expanded water supply entitlements;
- require the construction of new or expanded stormwater drainage facilities;
- require the construction or expansion of wastewater treatment facilities;
- cause the capacity of a solid waste landfill to be reached sooner than it would without the plan;
- require the construction or expansion of communications facilities (telephone, cell, cable, satellite dish);
- adversely affect public utility facilities that are located underground or aboveground along the local roadways from project construction activities; or
- create an increased need for new fire protection, police protection, or ambulance services or adversely affect existing emergency response times or facilities.

Environmental Impacts

No Action Alternative

Under the No Action Alternative some restoration activities are assumed. However, there would be no change in the regional demand for electricity, natural gas, or communications facilities compared to existing conditions. There would also be no change in local or regional water supply distribution systems. Stormwater, wastewater, and solid waste disposal services would remain unchanged in the plan vicinity, and there would be no change in the need for police or fire protection or ambulance services in the Marsh compared to existing conditions.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact UTL-1: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Construction or Restoration Activities

Construction of the proposed restoration would have no impact on water conveyance or treatment facilities, stormwater drainage facilities, or communication facilities. On properties on which utilities are present, there is potential for disruption of services during construction. Restoration activities may occur on properties with overhead lines, underground pipelines, or wells. Ground-disturbing and other activities have the potential to damage these facilities or otherwise cause outages.

Conclusion: Less than significant with Mitigation Measures UTL-MM-1 and UTL-MM-2 incorporated.

Mitigation Measure UTL-MM-1: Relocate or Protect Overhead Powerlines or other Utilities that Could be Affected by Construction
If overhead utilities are present on a property that could be damaged or affected during construction or restoration activities, the specific project proponent will coordinate with the utility owner and/or operator to have the lines protected or relocated to ensure there is no potential for disruption to service or damage to the facilities during or after construction. The area of relocation would be selected to ensure that there are minimal or no sensitive resources that would be affected. Environmental commitments included in Chapter 2 will be incorporated into this activity. Relocation would occur prior to inundation.

Mitigation Measure UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way
The specific project proponent will coordinate with pipeline owners and/or operators to determine the location of the pipelines and design restoration to ensure that no ground-disturbing activities occur within the right-of-way. However, ground-disturbing activities associated with the repair or replacement of the pipelines as described below under Mitigation Measure MM-UTL-4 would need to occur. These activities are intended to improve the integrity of the pipelines and therefore, would not result in any additional impacts on the pipeline. Avoidance of these areas for purposes of restoration construction would ensure that no construction-related damage or disruption to services would occur.

Impact UTL-2: Damage to Utility Facilities or Disruption to Service as a Result of Restoration

Areas restored to tidal wetlands would change the general nature of properties from seasonally flooded to tidally inundated year-round. This has the potential to affect facilities that were installed prior to inundation that were not designed to exist in a tidally-inundated environment. This could result in damage to these facilities.

Inundation could also change how owners/operators of these facilities respond to emergencies such as leaks and ruptures. Since many of the pipelines in the Marsh are older than their design life, there is potential for these pipes to leak or rupture. Due to the change in the environment from seasonally inundated to permanently inundated, repair of these leaks or ruptures would require different techniques than are currently employed. These techniques may take longer, resulting in an increased period of service disruption to customers. Damage caused by inundation or an increase in service disruption time as a result of inundation would be a significant impact.

Conclusion: Less than significant with Mitigation Measures UTL-MM-3 and UTL-MM-4 incorporated.

Mitigation Measure UTL-MM-3: Relocate or Upgrade Utility Facilities that Could be Damaged by Inundation

Pipelines or other utilities that could be damaged by inundation would be relocated or upgraded by the utility owner and/or operator based on a determination by the utility owner and/or operator that inundation could cause damage to the facilities. Relocation would occur in areas with minimal or no sensitive resources. Upgrades could include buoyancy controls, reinforcements, or other improvements that would allow the facility to continue its normal operation under the inundated condition. Relocation and/or upgrading would occur prior to inundation of the site.

Mitigation Measure UTL-MM-4: Test and Repair or Replace Pipelines that Have the Potential for Failure

All pipelines have some potential for failure, but as pipes age, this potential may increase. Prior to inundation of a site, specific project proponents will coordinate with pipeline owners and/or operators to have them test existing pipelines for leaks or other weaknesses that could result in a failure. Depending on the results of these tests, repairs to or replacement of the existing pipe may be conducted. Various methods for pipe repair and replacement exist, including directional drilling, open trench replacement, and placement of a secondary pipeline around the existing pipeline. All of these treatments would occur within or adjacent to the existing alignment right of way. The impacts of this mitigation measure are similar to other restoration impacts on traffic, noise, air quality, biological resources, cultural resources, and soils. Mitigation for impacts of these resources resulting from pipeline repair or replacement along with Environmental commitments described in Chapter 2 for major construction activities would be implemented to ensure there are no additional effects related to implementing this mitigation measure.

Impact UTL-3: Reduction in Capacity of Local Solid Waste Landfills

Construction related to the proposed restoration is not expected to generate substantial amounts of solid waste. Materials removed from levees would be reused onsite as part of the restoration. Dredged material would be used for levee reinforcement, and the small amount of waste generated during construction over the 30 year plan implementation period is not expected to substantially decrease the lifespan of landfills in the plan vicinity.

Conclusion: Less than significant. No mitigation required.

Impact UTL-4: Increase in Emergency Service Response Times

The proposed restoration would result in a temporary increase in the number of construction vehicles traveling on local roadways. These construction vehicles are not expected to cause a substantial reduction in response times by emergency service providers because there would be minimal construction vehicles, activities would occur throughout the Marsh, and roads in the Marsh generally operate at a high LOS. Additionally, emergency access via water would not be disrupted because the in-water work would not result in channel inaccessibility or other delays. See Section 5.6, Transportation and Navigation, for a more detailed discussion.

Conclusion: Less than significant. No mitigation required.

Managed Wetland Activities Impacts

Impact UTL-3: Reduction in Capacity of Local Solid Waste Landfills

This impact would be similar to that described for restoration activities. Construction related to marsh maintenance activities is not expected to generate substantial amounts of solid waste. Materials removed from levees would be reused and dredged material would be used for levee reinforcement. The small amount of waste generated during construction over the 30 year plan implementation period is not expected to substantially decrease the lifespan of landfills in the plan vicinity.

Conclusion: Less than significant. No mitigation required.

Impact UTL-4: Increase in Emergency Service Response Times

This impact would be similar to that described for restoration activities. The proposed managed wetland activities would result in a temporary increase in the number of construction vehicles traveling on local roadways. However, a substantial reduction in response times by emergency service providers is not expected because there would be minimal construction vehicles, activities would occur throughout the Marsh, and roads in the Marsh generally operate at a high LOS. Additionally, emergency access via water would not be disrupted because the in-water work would not result in channel inaccessibility or other delays.

Conclusion: Less than significant. No mitigation required.

Impact UTL-5: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Dredging

It is assumed that implementation of the current managed wetland activities would not result in any disruptions because these activities occur in the same or similar location each time they are conducted. However, dredging has the potential to disrupt underground facilities in the dredging areas. Figure 7.3-1 depicts the location of each of the pipelines. As described above, the location of these pipelines is marked in the Marsh. To ensure that dredging does not affect pipelines and this impact is less than significant, Mitigation Measure MM-UTL-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way, will be implemented.

Conclusion: Less than significant with Mitigation Measure UTL-MM-2 incorporated.

Mitigation Measure UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way

The specific project proponent will coordinate with pipeline owners and/or operators to determine the location of the pipelines and ensure that no ground-disturbing activities occur within the right-of-way. Avoidance of these areas for

purposes of dredging would ensure that no construction-related damage or disruption to services would occur.

Alternative B: Restore 2,000–4,000 Acres

Impacts for Alternative B would be the same as for Alternative A.

Alternative C: Restore 7,000–9,000 Acres

Impacts for Alternative C would be the same as for Alternative A.

Section 7.4
Recreation Resources

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on recreation resources. The SMP does not propose the construction or change of existing recreation facilities that would be evaluated in terms of impacts or significance under CEQA, but does affect certain recreational opportunities. The discussion in this section is therefore strictly a NEPA analysis regarding potential effects to recreation resources, access, and social effects such as recreational uses.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context against which the reader can understand the environmental changes caused by the action.

The environmental changes associated with the action are discussed under Environmental Consequences.

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- Solano County General Plan (2008a), and
- Internet resources.

Suisun Marsh Recreation Use and Activities

Suisun Marsh's proximity to major highways and urban areas makes the Marsh accessible to many people. Duck hunting is the major recreational activity in the Marsh occurring from late October until January. Fishing accounts for nearly as much recreational use in the Marsh as duck hunting. In addition, several other

forms of recreation such as water sports, upland game hunting, hiking, and wildlife observation are popular in the Marsh (Solano County 2008b). Much of the recreation associated with Suisun Marsh is water-dependent (boating and fishing) or water-enhanced (picnicking, hiking, hunting, and scenic/wildlife viewing). Recreation is a multimillion-dollar industry in the state. The demand for recreational resources in California is expected to increase with future population growth. Increasing demand is expected to put additional pressure on limited recreation resources and potentially contribute to deterioration of the quality of recreation experiences.

Fishing occurs year-round in the Marsh. In 2009, there were 6,600 visitors to the Grizzly Island Wildlife Area for fishing (Grizzly Island Wildlife Area Recreation User Survey 2009), and over the last several years, use of Belden's Landing for visitors for boat launching and pier fishing has ranged from 12,000 to 16,000 (Solano County Parks and Recreation 2009).

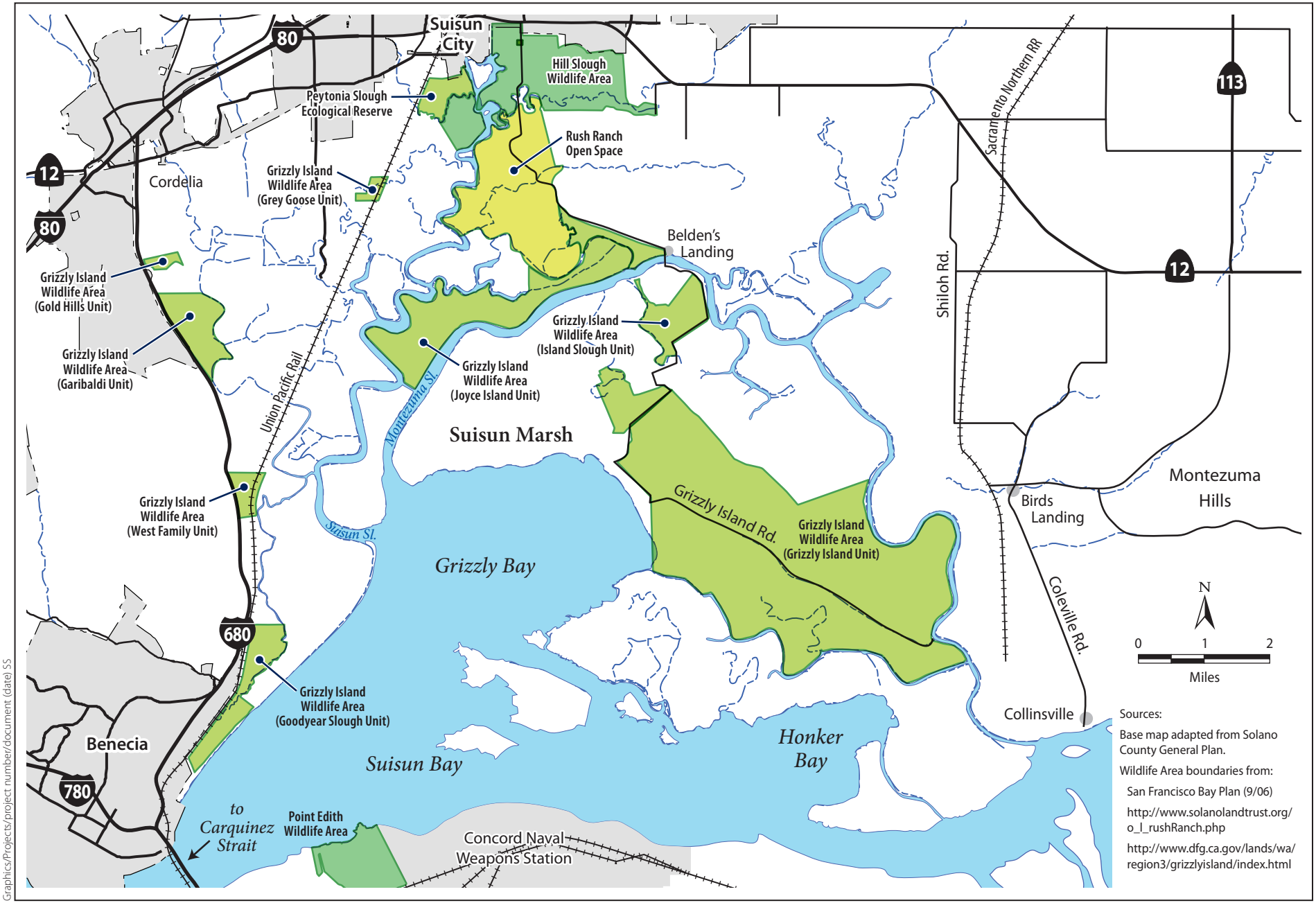
Duck hunting occurs from late October until January. Approximately 158 private duck clubs are located in the Marsh (California Department of Water Resources 2010). Private duck clubs compose approximately 37,500 acres of the Marsh and provide 41,000 waterfowl hunter days each year (Solano County Planning Department 1982). In addition to private clubs, DFG manages 15,300 acres of wildlife habitat for hunting and fishing opportunities and other public uses in the Grizzly Island Wildlife Area. Over the last several years, approximately 6,200 hunters visited Grizzly Island Wildlife Area during each hunting season (California Department of Fish and Game no date). Wildlife observation, photography, nature study, canoeing, kayaking, and motor boating are also popular recreational activities within the Marsh and occur year-a-round.

Figure 5.6-3 shows the major surface waters in and around the Marsh. Bays and minor and major sloughs compose 25,666 acres of navigable channels (Table 6.2-2). The two major channels are Montezuma and Suisun Sloughs. Suisun Slough runs from Grizzly Bay to the northern portion of the Marsh, and Montezuma Slough runs from the eastern side of Grizzly Bay to the western side, with several smaller channels diverging from it. Other navigable waterways are Cordelia, Denverton, Nurse, and Hill Sloughs.

Most of the Marsh is navigable by small boats, and some channels, such as Montezuma and Suisun Sloughs, are navigable by much larger boats. A major navigation channel, the Suisun Bay channel, connects to the Carquinez Strait. Ability to navigate or access smaller channels and outer edges of the bay is influenced by the tides and type of watercraft used.

Existing Plan Area Facilities and Access

Figure 7.4-1 shows the location of the following existing recreation areas.



Graphics/Projects/project number/document (date) SS

ICF INTERNATIONAL

Figure 7.4-1
Locations of Recreational Areas in Suisun Marsh

Grizzly Island Wildlife Area

Grizzly Island Wildlife Area encompasses approximately 15,300 acres in seven units dispersed throughout the Marsh. It is owned and managed by DFG. Hunting, fishing, wildlife viewing, boating, hiking, dog training, and nature tours are available at Grizzly Island. Hunting includes waterfowl, snipe, coots, moorhens, doves, pheasants, tule elk, and rabbits. Grizzly Island is also open for fishing and an extremely popular destination. Fish species caught include striped bass, catfish, white sturgeon, and the occasional largemouth bass, Chinook salmon, and steelhead. A herd of 100–150 tule elk reside on Grizzly Island. Grizzly Island access operates as follows (California Department of Fish and Game 2008b):

February–July	Open for hiking, fishing, nature viewing (dog training allowed only in February and July).
August–September	Area closed to all general public use during special tule elk hunts.
Late September	Area opens for last 1–2 weeks in September for hiking, nature viewing, fishing, and dog training.
October–January	Area closed to all general public use during waterfowl and pheasant hunting season.

Belden's Landing Water Access Facility

Belden's Landing Water Access Facility was purchased by the DFG in the 1980s and added to the County Parks system in spring 2002. This day-use facility includes a boat launch ramp, a fishing pier, restrooms, and parking (Solano County 2008a). As described above, visitors to this access area have ranged from 12,000 to 16,000 over the last several years.

Peytonia Slough Ecological Preserve

Peytonia Slough Ecological Preserve is open for public boating (kayaking), hiking, fishing, and wildlife observation.

Hill Slough Wildlife Area

Hill Slough Wildlife Area has 1,722 acres of tidal marsh, managed marsh, sloughs, and upland grasses (California Department of Fish and Game 2008a). Recreational angling is the number one public use, and more than 10,000 anglers use Hill Slough annually, fishing mostly for striped bass or catfish. Bird watching, hiking, and sightseeing are other popular uses that attract visitors to Hill Slough (Rogers 2001).

Suisun City Marina and Solano Yacht Club

Suisun City Marina and Solano Yacht Club are privately owned and have 153 boat slips. It is located on Suisun Channel. Gas and diesel, a pumpout station, and a launch ramp (City of Suisun City 2008) are available at the marina. Charter boats are available for bird watching. Most boats are motorized and fishing and recreational uses are the most popular activities at the marina. Most anglers catch striped bass, white sturgeon, catfish, and carp.

Suisun City Boat Launch

Suisun City Boat Launch is located on Suisun Slough and offers boat launching, picnicking, pier fishing, gas, and repairs. Kayaks and canoes can launch at the Suisun City Boat Launch free of charge.

McAvoy Yacht Harbor and Yacht Club

McAvoy Yacht Harbor and Club is located on Suisun Bay at Bay Point. Gas, a launch ramp and dock are available at the marina.

Rush Ranch

Rush Ranch is owned and managed by Solano Land Trust. It is 2,070 acres of open space, about one half is undiked tidal marsh, 80 acres are diked managed wetlands, and the remainder is upland areas of the Potrero Hills. Picnicking, hiking, and docent tours are available for groups (Rush Ranch no date).

Regulatory Setting

Federal

National Environmental Policy Act

NEPA requires that lead agencies evaluate potential effects on the built environment, which can include social effects such as those on recreational uses and facilities. As such, this section includes an analysis of potential effects on recreational uses in the Marsh.

Other Federal Plans, Programs, and Policies

There are no federal regulations, programs, or policies directly related to recreation activities.

State

California Environmental Quality Act

Unlike NEPA, CEQA requires only the evaluation of impacts on the physical environment and does not require disclosure of social impacts unless they lead to a change in the physical environment. As such, impacts described in this section related to changes in recreational uses that do not in turn result in changes to the physical environment are for purposes of meeting NEPA requirements only.

McAteer-Petris Act and San Francisco Bay Plan

The McAteer-Petris Act of 1965 established BCDC as the state agency responsible for increasing public access to the bay shoreline. The San Francisco

Bay Plan (San Francisco Bay Conservation and Development Commission 1968, as amended) was developed in response to a planning effort mandated by the McAteer-Petris Act. It encourages public access via marinas, waterfront parks, and beaches and requires the provision of maximum access along the waterfront and shorelines, except where public uses conflict with other significant uses, or where public use is inappropriate because of safety concerns. BCDC is responsible for implementing the policies of the Bay Plan.

Local

Solano County General Plan

Solano County's adopted acres-to-population park standards are 10 total acres of local and regional parkland for each 1,000 persons. As of 2002, 2,858 acres of neighborhood, community, and regional parkland were available for a population of 394,542, which results in a ratio of approximately 7.25 acres of local and regional parkland per 1,000 persons. Therefore, Solano County is currently below the established standard (Solano County 2008a).

The Solano County Park and Recreation Commission

The purpose of the Solano County Park and Recreation Commission is to:

A. act as a resource agency and advisory body to the Board of Supervisors in matters regarding park and recreation needs in Solano County as well as the protection and propagation of fish and game;

B. act in an advisory capacity to the Board of Supervisors and Planning Commission on park and recreation needs as may apply to the Solano County Code, Chapter 26, Subdivisions and California Government Code, Section 66477;

C. promote the use of park and recreation facilities and the protection and propagation of fish and game for the education, pleasure, and welfare of the Solano County residents and visitors;

D. make specific recommendations on all matters pertaining to regional parks in or adjacent to Solano County;

E. review and make recommendations to the Board of Supervisors concerning the role of Solano County on all proposed buffer zones, open spaces, and greenbelts;

F. review and evaluate implementation of the Park and Recreation Element of the Solano County General Plan and make recommendations and modifications as needed, in conjunction with all related documentation to the Board of Supervisors;

G. provide appropriate and timely review, comment, and recommendations to the Board of Supervisors on environmental impact reports, environmental

impact statements, and other such reports, studies, and findings as may have an effect on the recreation facilities, either existing or proposed, of Solano County Regional Parks; and

H. conduct an annual grant award process for disbursement of fish and wildlife propagation funds, contained and designated in a separate and exclusive budget pursuant to Section 13103 of the Fish and Game Code, and make recommendations to the Board of Supervisors for approval of recommended awards (Solano County 2005).

Solano County Policies and Regulations

As described in the Solano County Policies and Regulations Governing the Suisun Marsh, the general plan also sets policies related to land use in Suisun Marsh and Secondary Management Area. The plan sets the following policies:

- within Suisun Marsh, provision should be made for public and private recreation development to allow for public recreation and access to the Marsh for such uses as fishing, boating, picnicking, hiking, and nature study;
- recreational uses in the Marsh should be located on the outer portions near population centers and easily accessible from existing roads; and
- recreation activities that could result in adverse impacts on the environment of Suisun Marsh should not be permitted.

Environmental Consequences

Assessment Methods

The impacts of implementing the proposed alternatives on recreation and public access were analyzed qualitatively, focusing on existing and proposed recreation and public access policies related to the plan area, the types of changes expected to result, and the potential of the restoration changes to adversely affect access and recreational uses in the plan area.

Environmental Impacts

No Action Alternative

Under the No Action Alternative, some restoration and natural breaching may occur. The primary change to recreation resources would occur if natural breaches to levees were not repaired and these breaches allowed channels to form that could allow more public access via navigable waters to inland areas of the Marsh. Such a change may also result in displacing hunters from flooded private duck clubs that would no longer be suitable for managed marsh hunting.

Additionally, the reduction in frequency of managed wetland activities would reduce hunting opportunities. If the SMP is not implemented, recreational users would not reap the benefit of improved wildlife habitats in the Marsh. Under this alternative, existing conditions would persist, and changes to recreation would be minimal.

Alternatives A (Proposed Project), B, and C

The SMP action alternatives propose to convert managed wetlands to tidal wetlands and to protect and enhance existing tidal wetland acreage. Existing managed wetlands would be enhanced by implementing the managed wetland activities. The SMP does not propose the construction or change of existing recreation facilities that would be considered under CEQA, but does affect certain recreational opportunities.

Recreation areas that could be affected by restoration activities would be Belden's Landing, Peytonia Slough Ecological Preserve, Hill Slough Wildlife Area, Grizzly Island Wildlife Area, Rush Ranch, and some private duck clubs. Most land-based activities would be unaffected by actions relating to implementing the SMP or its alternatives. Non-motorized recreational boating (e.g., kayaking and canoeing) would be the most affected if velocity changes were substantial in sloughs where breaching occurred. As discussed in Section 5.1, Water Supply, Hydrology, and Delta Water Management, the highest velocities are simulated in Hunter Cut. The tidal elevation difference (caused by the lag in the tidal wave propagation) allows a large flow with a peak of about 10,000 cfs, creating velocities of about 4 feet/second in Hunter Cut; temporary velocity increases may occur as a result of restoration activities (Appendix A: Figure 5-48 on page 103 of the RMA report). Belden's Landing would remain the same for each scenario (Figure 7.4-2).

Over the 30-year implementation of the SMP, up to 7,000 acres of managed wetlands that provide hunting opportunities would be purchased from willing sellers and converted to tidal wetlands. This represents a potential loss of up to 10% of existing managed wetlands. Some of these restored tidal wetlands within public ownership should continue to provide waterfowl and other hunting opportunities. These new areas should be accessible via navigable sloughs or existing public access areas. Remaining private duck clubs within the Marsh would continue their operations. The conversion to tidal wetlands may alter use patterns of these areas by dabbling ducks which are favored by local Marsh hunters and clubs. This waterfowl guild includes mallard, gadwall, northern shoveler, northern pintail, green-winged teal, and Canada goose. Additionally, the shift from managed to tidal wetlands as a result of the club owners willful sale of their property, may reduce the total number of private hunters allowed in the Marsh on busy days, such as opening day of the hunting season, due to the reduction in acres of managed wetlands. It is expected however, that existing and newly restored public lands and the remaining duck clubs would provide plenty of hunting opportunities during most days of the year. Additionally, the tidal restoration areas will attract many species of wildlife, including shorebirds,

threatened and endangered species, and numerous dabbling and diving ducks. Fishing opportunities may increase due to the increase in tidal wetland and open-water habitats via navigable waters. Although there would be some displacement of dabbling duck habitat through tidal marsh restoration, other forms of wildlife habitat will be created. Hunting and other recreational activities still would occur on the public lands and public opportunity may increase as a result of the tidal restoration.

Most of the land surrounding the Marsh is private. Public recreational access within the Marsh is primarily via county roads, navigable waters, and publically owned land and designated areas.

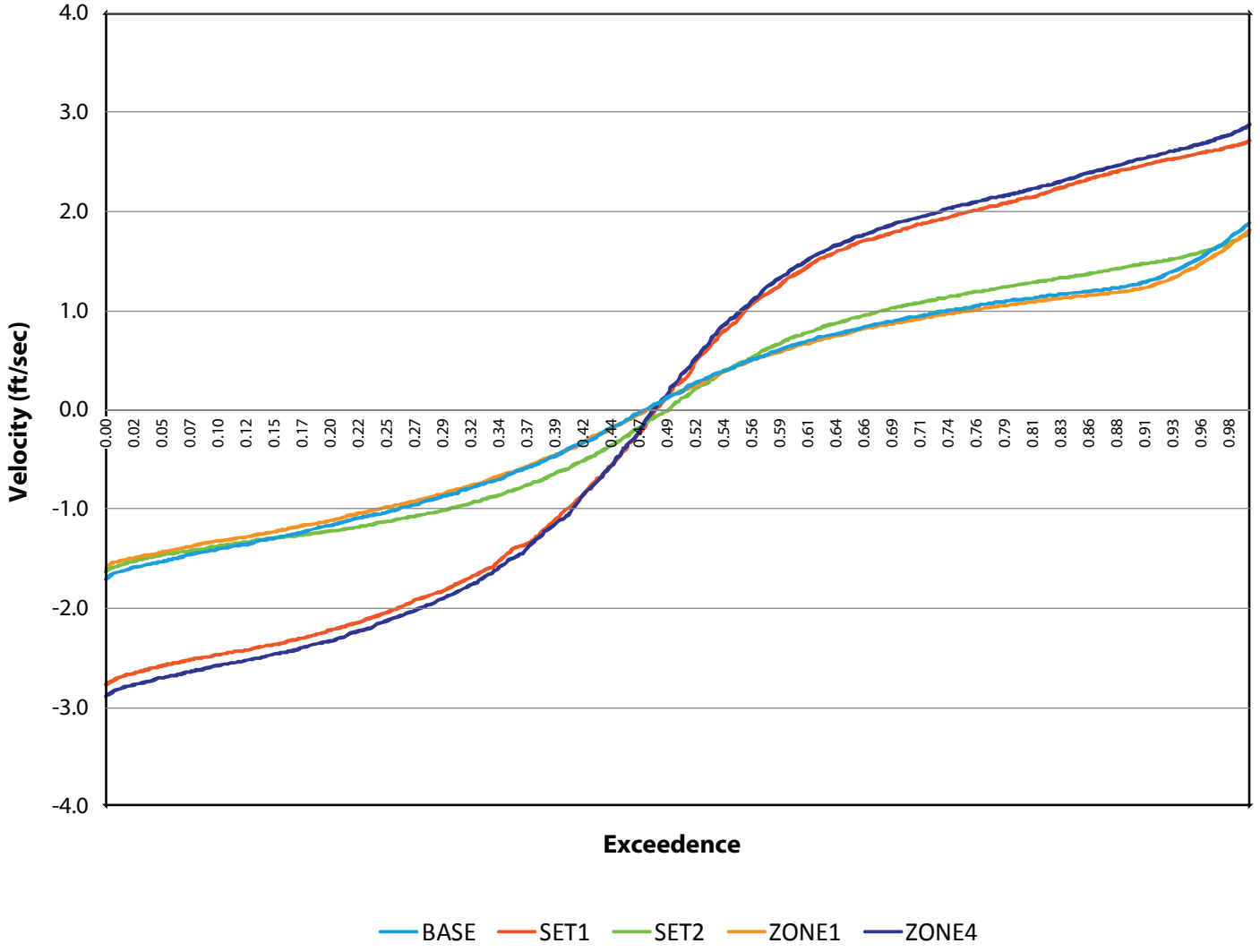
Restoration activities that affect the waterside of exterior levees could temporarily disrupt recreational boating, personal watercraft use, and fishing in the area. In-channel or near-channel work may require that a portion of the channel be temporarily blocked to reduce the risk of boating hazards. Restoration activities are not proposed to occur in established recreation areas.

Environmental commitments related to these effects include:

- construction and restoration activities will occur in a manner that allows boating access through half the channel cross section at all times;
- construction will not occur during major summer holiday periods;
- warning signs and buoys will be posted at, upstream of, and downstream of all construction equipment, sites, and activities; and
- adequate warning will be provided regarding activities and equipment in construction sites.

The plan would result in a net increase in navigable areas, thus increasing potential boating opportunities in the Marsh. Velocities are not expected to change at Belden's Landing (Figure 7.4-2), where boat launching occurs. Modeling shows there may be a temporary increase in velocity at Hunter Cut (Appendix A). Velocity changes are not expected to be significant in other sloughs (See Impact HYD-2). Existing areas presently accessed by motorized boats would not be affected by increased velocities because breaches would be designed to ensure that velocities do not exceed 2fps. However, kayaks, canoes, and other non-motorized boats may have trouble traversing or traveling past areas that are newly breached during incoming or outgoing tides. This difficulty would be temporary, and as described in Chapter 2 under Environmental Commitments, warning signs and buoys will be installed to direct boaters to safe locations and routes. Restoration is expected to occur throughout the Marsh over 30 years, resulting in minor, sporadic, temporary changes in velocities in localized areas.

Managed wetland activities that affect the waterside of exterior levees, such as replacing riprap on exterior levees, could temporarily disrupt recreational boating, personal watercraft use, and fishing in the area.



Source: RMA 2008, Numerical Modeling in Support of Suisun Marsh PEIR/EIS

Graphics/Projects/project number/document (date) SS

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Figure 7.4-2
Velocity Distributions for the Five Scenarios at Belden's Landing, July 2002

Proposed dredging activities on the sloughs throughout Suisun Marsh could temporarily disrupt boating access, personal watercraft use, and fishing during operation of dredging equipment from a barge. Boating and other recreation access would be restricted in the dredged area while equipment is operating, which could result in delays in or temporary loss of recreation opportunities on the slough. Dredging activities could occur in center channels, adjacent to fish screens, and in historical dredger cuts. The disruption of recreational boating in the area would be temporary and the environmental commitment described in Chapter 2 to reduce construction-related effects on recreational boating will be implemented. This environmental commitment includes measures to ensure that:

- construction will not occur during major summer holiday periods;
- warning signs and buoys will be placed at, upstream of, and downstream of all construction equipment, sites, and activities;
- adequate warning will be provided regarding activities and equipment in construction sites; and
- signs describing alternate boating routes will be posted in convenient locations when boating access is restricted.

Section 7.5
Power Production and Energy

Introduction

This section describes the existing conditions and the consequences of implementing the SMP alternatives on power production and energy resources.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing context against which the reader can understand the changes caused by the action. The setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts.

The environmental changes associated with the alternatives are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.5-1 summarizes impacts on power production and energy from implementing the SMP alternatives. There would be no significant impacts on power production and energy from implementing the SMP alternatives.

Table 7.5-1. Summary of Impacts on Power Production and Energy

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
POW-1: Substantial Temporary Increase in Energy Use during Construction and Restoration Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
POW-2: Substantial Temporary Increase in Energy Use during Construction and Managed Wetland Activities	A, B, C	Less than significant	None required	–

Affected Environment

Sources of Information

The following key source of information was used in the preparation of this section:

- Energy Background Report. Solano County General Plan Update. August 2006.

Environmental Setting

Solano County electrical energy sources include power plants, wind facilities, solar facilities, dams and hydroelectric facilities, and geothermal resources. Imported fossil fuels make up the vast majority of transportation fuels. All public electrical energy for Solano County is supplied via transmission lines by PG&E, some of which pass through the Suisun Marsh Region (EDAW/AECOM 2006).

Renewable energy and conservation measures are important elements of Solano County's energy management, with wind energy being of particular importance. Solano County wind resource area contributes 6% of all new wind development in California, has a capacity to generate 165 megawatts (MW), and produces 102 gigawatt hours (GWh) of wind power generation, with most of that power produced during spring and summer (April through September) when winds are stronger (California Energy Commission). Current and planned wind energy facilities are located in the western portion of the Collinsville-Montezuma Hills Wind Resource Area, which is adjacent to the eastern boundary of the Suisun Marsh region (EDAW/AECOM 2006).

Natural gas production fields are located throughout Solano County with locations including Lindsey Slough, Van Sickle Island, Elkhorn Slough, Millar, Cache Slough, Sherman Island, Winters, Ryer Island, Suisun Bay, and the Rio Vista field. In December 2005, from these fields in Solano County 1,030,173 million cubic feet (mcf) of gas were produced, with the daily production of 33,231 mcf from 148 operational wells (California Department of Conservation 2005). Many of these fields are located within the Suisun Marsh region (EDAW/AECOM 2006). Gas pipelines are located in the Marsh and are discussed in Chapter 7.3, Utilities.

Three geothermal springs have been identified in Solano County, all in the western portion. These are of a low temperature and thus not used for electric power generation. However, the potential for new sources capable of electric power generation does exist (EDAW/AECOM 2006).

Solar and hydroelectric facilities are not located in the plan area and therefore would not be affected by the SMP.

Transportation fuels are primarily fossil fuel–derived and imported. Solano County has a major petroleum refinery located in Benicia to the west of the plan area (EDAW/AECOM 2006) that would not be affected by implementation of the SMP. Consumption of fossil fuels would temporarily increase during restoration and related activities as a result of pumping, dredging, transportation, etc., but not in a wasteful manner.

Environmental Consequences

Assessment Methods

The following qualitative evaluation was based on the description of basic actions for each of the alternatives addressed in Chapter 2. Because all of the SMP alternatives include the same basic components but differ in the amount of tidal wetland restored and managed wetlands subject to managed wetland activities, the primary difference is not the actions themselves, but rather their scale. Therefore, a range of potential effects is addressed in the Environmental Impacts section below. Effects assessed are based on potential impacts on energy consumption and generation.

Significance Criteria

Evaluation of SMP effects on power production and energy was based on criteria used in the CALFED Bay-Delta Program Final Programmatic EIS/EIR (July 2000), the SFO Environmental Analysis of Tidal Marsh Restoration in San Francisco Bay (Jones & Stokes 2001), and those suggested in Appendix G of the State CEQA Guidelines. Based on these criteria an effect would be considered significant if implementation of the plan:

- causes net electricity consumption to increase substantially, causing availability reduction to other customers—for this analysis, a substantial increase is defined as an increase in net electricity consumption of more than 5% on existing supply infrastructure during an average year or any single month of an average year;
- causes utility rates to increase to levels higher than available in open-market conditions;
- encourages activities that result in the use of large amounts of fuel or energy in a wasteful manner; or
- requires or results in construction of new electrical power or transmission facilities or expansion of existing facilities, the construction of which causes substantial effects.

Environmental Impacts

No Action Alternative

Power production and energy impacts under the No Action Alternative would be minimal. Although the limited activities of maintenance, levee alterations, dredging, pumping, etc., involved in the estimated restoration would temporarily increase energy consumption, it would not be considered wasteful or substantial.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact POW-1: Substantial Temporary Increase in Energy Use during Construction and Restoration Activities

Under Alternative A, 5,000–7,000 acres of the Marsh would be restored to fully functioning, self-sustaining tidal wetlands, and 44,000 to 46,000 acres of managed wetlands would be enhanced.

Restoration activities would include upgrading or constructing new exterior levees, breaching levees, and dredging. These activities have the potential to be energy intensive. However, actions would have limited influence on the electrical grid and depend primarily on on-site energy generation (e.g., internal combustion engines). This would temporarily increase fuel use and emissions but not in a wasteful or substantial manner.

Conclusion: Less than significant. No mitigation required.

Managed Wetland Activities Impacts

Impact POW-2: Substantial Temporary Increase in Energy Use during Construction and Managed Wetland Activities

This impact would be similar to Impact POW-1, described for restoration activities. Managed wetland activities include modifying levees, breaching levees, and dredging. These activities have the potential to be energy intensive, but would likely have limited influence on the electrical grid and depend primarily on on-site energy generation (e.g., internal combustion engines). This would temporarily increase fuel use and emissions but not in a wasteful or substantial manner.

Conclusion: Less than significant. No mitigation required.

Alternative B: Restore 2,000–4,000 Acres

Impacts for Alternative B would be the same as for Alternative A.

Alternative C: Restore 7,000–9,000 Acres

Impacts for Alternative C would be the same as for Alternative A.

Section 7.6
Visual/Aesthetic Resources

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on visual/aesthetic resources.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context against which the reader can understand the environmental changes caused by the action. The environmental setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts. For example, the setting identifies groups of people who have views of the action area because the action could change their views and experiences.

The environmental changes associated with the action alternatives are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.6-1 summarizes impacts on visual/aesthetic resources from implementing the SMP alternatives. There would be no significant impacts on visual/aesthetic resources from implementing the SMP alternatives.

Table 7.6-1. Summary of Impacts on Visual/Aesthetic Resources

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-2: Temporary Changes in Views Caused by Habitat Reestablishment Period	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–

Concepts and Terminology

Identifying a project area's visual resources and conditions involves three steps:

1. objective identification of the visual features (visual resources) of the landscape;
2. assessment of the character and quality of those resources relative to overall regional visual character; and
3. determination of the importance to people, or *sensitivity*, of views of visual resources in the landscape.

The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area (Federal Highway Administration 1988). Scenic quality can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area (U.S. Bureau of Land Management 1980). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, number of views seen, distance of the viewers, and viewing duration. Viewer sensitivity relates to the extent of the public's concern for a particular viewshed. These terms and criteria are described in detail below.

Visual Character

Natural and artificial landscape features contribute to the visual character of an area or view. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features are those associated with landscape settlements and development, including roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary significantly seasonally, even hourly, as weather, light, shadow, and elements that compose the viewshed change. The basic components used to describe visual character for most visual assessments are the elements of form, line, color, and texture of the landscape features (USDA Forest Service 1995; Federal Highway Administration 1988). The appearance of the landscape is described in terms of the dominance of each of these components.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by the Federal Highway Administration, employing the concepts of vividness, intactness, and unity (Federal Highway Administration 1988; Jones et al. 1975), which are described below.

- **Vividness** is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- **Intactness** is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes and in natural settings.
- **Unity** is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.
- **Visual quality** is evaluated based on the relative degree of vividness, intactness, and unity, as modified by its visual sensitivity. High-quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Visual Exposure and Sensitivity

The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and duration of views, number of viewers, and type and expectations of individuals and viewer groups.

The importance of a view is related in part to the position of the viewer of the resource; therefore, visibility and visual dominance of landscape elements

depend on their placement in the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (Federal Highway Administration 1988). To identify the importance of views of a resource, a viewshed must be broken into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Although distance zones in a viewshed may vary between different geographic region or types of terrain, the standard foreground zone is 0.25–0.5 mile from the viewer, the middleground zone from the foreground zone to 3–5 miles from the viewer, and the background zone from the middleground to infinity (USDA Forest Service 1995).

Visual sensitivity depends on the number and type of viewers and the frequency and duration of views. Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, visual sensitivity is generally higher for views seen by people who are driving for pleasure; people engaging in recreational activities such as hiking, biking, or camping; and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (USDA Forest Service 1995; Federal Highway Administration 1988; U.S. Soil Conservation Service 1978). Commuters and non-recreational travelers have generally fleeting views and tend to focus on commute traffic, not on surrounding scenery; therefore, they generally are considered to have low visual sensitivity. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes; therefore, they generally are considered to have high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic overlooks usually are assessed as having high visual sensitivity.

Judgments of visual quality and viewer response must be made based on a regional frame of reference (U.S. Soil Conservation Service 1978). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- direct observation through a site visit occurring on November 1, 2007;
- Suisun Marsh land ownership map; and
- Google Earth.

Regional Character

Suisun Marsh is located east of San Pablo Bay and the Carquinez Strait in the Delta, just south of Suisun City and Fairfield, Solano County. The plan region, as discussed in this section, is considered the area within 30 miles of a project site. The greater San Francisco Bay region is a complex system of mountain ranges, valleys, and waterways that together create areas that are unique and not only define the character of the region but also contribute to the overall character of California. Some of these notable areas include the wine country of the Napa and Sonoma Valleys, the distinctive urban center of San Francisco, and the vertical cliffs of the Marin Headlands' Pacific coastline. In addition, the region is characterized by panoramic views from the Berkeley/Oakland hills; rolling hillsides whose grasslands range from green and sprinkled with wildflowers in the spring to brown contrasting against stately valley oaks with dark green foliage in the summer; and numerous waterways traversed by vessels ranging from enormous tankers to small sailboats.

The plan region is characterized by a mix of industrial, commercial, residential, agricultural, and public open space uses. Waterfront industry is an established element in this setting and locally includes the C&H sugar refinery in Crockett and oil refineries in Hercules, Martinez, Benicia, and Richmond. The region has many public open space areas, including the Mount Diablo State Park to the south; Benicia State Recreation Area, Carquinez Strait Regional Park, and San Pablo Bay National Wildlife Refuge to the west; and the Point Pinole Regional Shores and Wildcat Canyon Regional Parks and the Golden Gate National Recreation Area to the southwest. Major waterways in the region are the Pacific Ocean; Suisun, Grizzly, Honker, San Pablo, San Rafael, and San Francisco Bays; Sacramento, San Joaquin, Napa, and Petaluma Rivers; Mare Island and Carquinez Straits; and numerous other sloughs, creeks, and tidally influenced waterways of the Bay-Delta.

Vicinity Character

The project vicinity is defined as the area within 0.5 mile of a project site. The character of Suisun Marsh is influenced by its geographic setting and the historical, present, and future planned uses on the Marsh. The Marsh is bounded by Interstate 80 (I-80) and Highway 12 to the north; Montezuma Hills to the east; Grizzly, Suisun, and Honker Bays to the south; and Sulphur Springs Mountain to the west. Key viewpoints, shown in Figure 7.6-1, have been chosen for their representation of the views within the Marsh. The Sacramento Northern Railroad runs along the eastern border and into the southeastern portions of the Marsh, and the Union Pacific runs through the western portion, both lines carrying freight cars (Figure 7.6-2, Photo 1). The Marsh is relatively flat and is submerged land, tidal marsh, or managed wetlands. The Potrero Hills and Kirby Hill offer the greatest topographic relief, each rising more than 100 feet in the northern and eastern reaches of the Marsh, respectively (Figure 7.6-2, Photo 2). Sloughs of the Marsh form dendritic channel patterns that wind and branch through the low-

lying landscape. Many of these channels are contained by the low levees that have contributed to maintaining historical channel patterns. A few human-made channels have been created to allow access to areas of the Marsh, such as Roos Cut, or to connect sloughs, such as the Suisun and Montezuma Sloughs connector, Hunter Cut.

Development in the Marsh historically was patterned by the functions associated with early agricultural practices, dairy mike production, beef cattle grazing and managing the land for waterfowl hunting. Land parcels are divided by levees to create a visible patchwork of land ownership that still persists. Prior to the static footprint imposed by humans upon the landscape, the Marsh was a highly naturalized system of tidally influenced marshland that metamorphosed through tidal action, sedimentation, vegetation establishment, and weathering. The Marsh lacked the trappings of infrastructure needed to maintain the static footprint and intended land use, including levees, riprap, outfalls, flap gates, roadways, utility lines, and buildings. Prior to the presence of infrastructure, sweeping and uninterrupted views would have been present over the Marsh.

Presently, the numerous navigable waterways allow inland access to much of the Marsh and provide view corridors. Utilities and infrastructure present in the plan area include wooden utility poles and lines, drainage outfalls, riprap, piers and pylons, and buildings but are not very invasive and do not detract greatly from overall character of the Marsh (Figure 7.6-2, Photos 3 and 4). The form and natural character of the Marsh; its geographic location in the landscape; outstanding views offered by, of, and from the Marsh; and abundance of wildlife combined with the presence of human-made elements contribute to a setting that is moderately high in vividness, intactness, and unity to create an overall visual character that is moderately high.

Existing Viewer Groups and Viewer Responses

Residents

The largest cities surrounding Suisun Marsh are Suisun City and Fairfield to the north; Pittsburg, Bay Point, and Martinez to the south; and Benicia to the west. The outskirts of these cities have scenic views of Grizzly, Suisun, and Honker Bays and the outline of opposite landforms and larger vegetation massings, but the distance between the Marsh and cities makes detail of the Marsh indistinguishable from those vantages. Because of the distance from the site, these residents are considered to have low sensitivity to visual changes resulting from implementing the SMP alternatives.

Residents on parcels of land within the Marsh are very few, but they are physically closer to the terrestrial and aquatic features that give the Marsh its astounding scenic quality. These residents have chosen to live here for those scenic qualities and for the resources offered by the Marsh, such as boating, fishing, wildlife viewing, and hunting. Residents within the Marsh are likely to

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Figure 7.6-1
Key Viewpoints and Photo Locations

Photo 1. Looking northwest from Cordelia Slough toward the Union Pacific Railroad. Note eucalyptus trees in the middle right of the photo and the Sulpher Spring Mountains in the background.

Photo 2. Looking southeast from Suisun Slough towards Potrero Hills.

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Figure 7.6-2
Representative Photographs of the Project Area

Photo 3. This photo depicts an outfall structure that is common to the project area.

Photo 4. This photo depicts common infrastructure in the marsh including a pier and pylons, outfall structure, and riprap (inset). The building in the inset photo is the lower Joice Island Fish Screen Facility.

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Figure 7.6-2 (continued)
Representative Photographs of the Project Area

Photo 5. This photo depicts boating recreational use within the marsh.

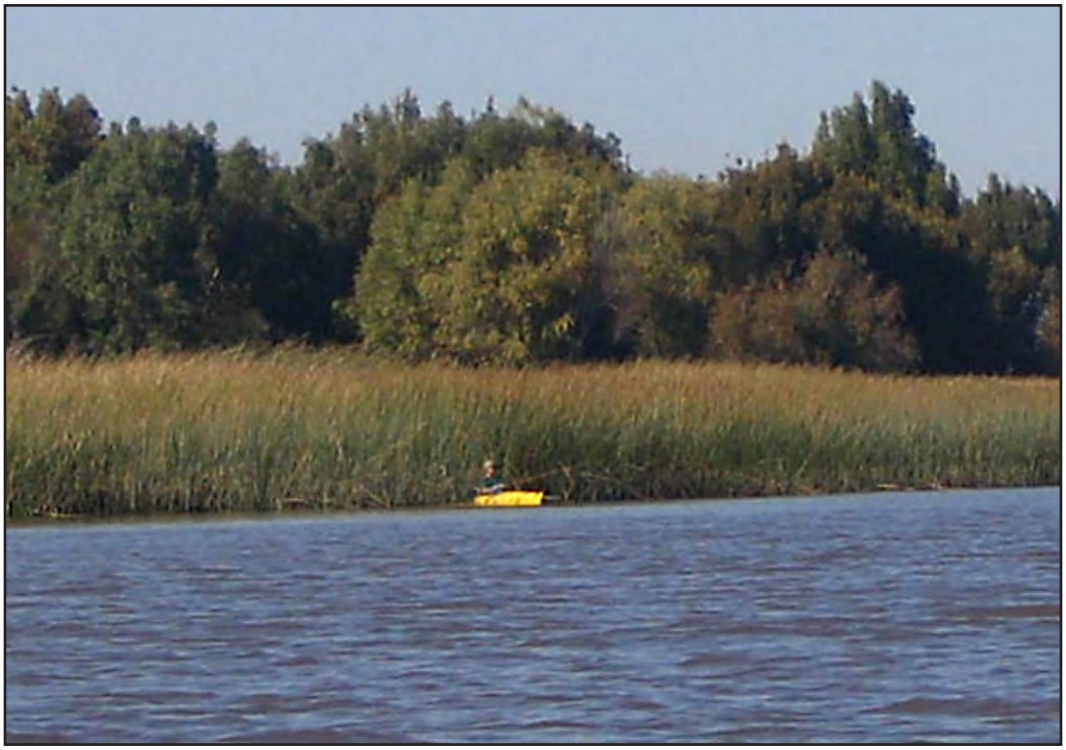

Photo 6. This photo depicts kayaking and fishing recreational uses within the marsh.

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Figure 7.6-2 (continued)
Representative Photographs of the Project Area

Photo 7. This photo depicts water-based hunting recreational use within the marsh.

Photo 8. This photo depicts land-based fishing recreational uses within the marsh.

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Figure 7.6-2 (continued)
Representative Photographs of the Project Area

Photos 9 and 10. These photos depict picturesque views within the marsh.

Photos 11 and 12. These photos depict how atmospheric conditions, such as fog, create picturesque views within the marsh and how wildlife contributes to the overall aesthetic quality of the marsh.

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Figure 7.6-2 (continued)
Representative Photographs of the Project Area

Photo 13. This photo depicts a hunting club house within the marsh. Note that the height and color of the building help it to blend better with the natural surroundings.

Photo 14. This photo depicts a hunting club house within the marsh. Note that the building does not detract from the natural setting.

Figure 7.6-2 (continued)
Representative Photographs of the Project Area

Photo 15. This photo depicts the heavy equipment present within the marsh used for maintenance activities.

Photo 16. This photo also depicts the heavy equipment present within the marsh used for maintenance activities.

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Figure 7.6-2 (continued)
Representative Photographs of the Project Area

have high sensitivity to visual changes because of their proximity to features in the Marsh, appreciation of the surrounding natural environment and visual experience, and high sense of ownership over such experiences and features.

Roadway Users

Major roadways that border the plan vicinity include I-80 and SR 12 to the north and I-680 to the west. The majority of roadways in the vicinity are smaller local roadways that wind through the Marsh, many of them on the levees that are used to manage the Marsh. Travelers on major roadways drive at varying speeds; normal highway speeds differ based on the traveler's familiarity with the route and roadway conditions (i.e., presence/absence of rain or potholes). While scenic views do exist of the bays and Marsh, views from the interstates and highways typically are of short duration, except on straighter stretches where views last slightly longer. Viewers who frequently travel these routes generally possess low visual sensitivity to their surroundings. The passing landscape becomes familiar to these viewers, and their attention typically is not focused on the passing views but on the roadway, roadway signs, and surrounding traffic.

Travelers on the local roadways within the Marsh are likely to have a higher sensitivity to visual changes in the Marsh than interstate and highway travelers. Local routes within the Marsh often have immediate views over the surrounding landscape that are noted for scenic quality. Local routes within the Marsh can be seen in Figure 5.6-2. Motorists traveling along these roadways include area residents and recreationists. Roadway speeds are generally much slower than highway speeds because of the safety considerations of driving on top of levees and on narrower roadways of varying conditions. Roadways within the Marsh offer limited public access because the majority of these travelers are using the roadways to reach the specific destination of private hunting clubs and not public facilities. Roadway users are more likely to be interested in sweeping views of the Marsh, bays, and surrounding hills and mountains experienced when en route to their destination. They are likely to possess moderately high visual sensitivity to their surroundings because they are likely to have high regard for the natural environment and view it as a holistic visual experience.

Recreationists

Recreational users view the action area from lands within the Marsh, public parks or use areas, surrounding waterways, and from public roadways. The primary uses in the plan vicinity are boating, fishing, hunting, hiking, and wildlife and nature viewing (Figure 7.6-2, Photos 5 through 8). Other recreational uses in the plan vicinity are running, jogging, and bicycling along local public roads. Waterway users have differing views, based on their location in the landscape, and are accustomed to variations in the level of industrial, commercial, and recreational activities in the vicinity. Most recreationists in the vicinity are moving around in the landscape and are not in one area for extended periods of

time, except for hunters and fisherman on land. Hunters and fishermen are often situated in one location for a longer time than other recreationists. During this time, views may differ based on location in the landscape, and attention is often focused more on the activity itself than on the surrounding landscape (Figure 7.6-2, Photos 9 through 12). Hunting clubhouses are often physically close to the terrestrial and aquatic features that give the Marsh its astounding scenic quality (Figure 7.6-2, Photos 13and 14). These locations offer both the scenic qualities and resources of the Marsh, such as boating, fishing, wildlife viewing, and hunting. Users of parks or public use areas in the vicinity, such as Rush Ranch and Grizzly Island Wildlife Area, are likely to seek out sweeping views of the bay and natural areas from hiking trails, park roadways, and other access points.

Recreationists who frequent the vicinity and surrounding area likely are accustomed to seeing some level of maintenance activities taking place (including the presence of heavy equipment) that are associated with wetland management (Figure 7.6-2, Photos 15 and 16). Generally, those participating in recreational activities in the plan vicinity are more likely to value the natural environment highly, appreciate the visual experience, and be sensitive to changes in views. Because of this appreciation of the natural landscape combined with limited viewing times and focus on tasks at hand, this viewer group is considered to have moderately high sensitivity to changes in views.

Regulatory Setting

Federal

Coastal Zone Management Act of 1972

Section 302 of the Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. § 1451). (Congressional findings) states that

> (b) The coastal zone is rich in a variety of natural, commercial, recreational, ecological, industrial, and esthetic resources of immediate and potential value to the present and future well-being of the Nation and that (e) important ecological, cultural, historic, and esthetic values in the coastal zone which are essential to the well-being of all citizens are being irretrievably damaged or lost.

Section 303 (16 U.S.C. § 1452). (Congressional declaration of policy) declares that

> it is the national policy (2) to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development, which programs should at least provide for (F) assistance in the redevelopment of deteriorating urban waterfronts

and ports, and sensitive preservation and restoration of historic, cultural, and esthetic coastal features.

Section 306 (16 U.S.C. § 1455). (Administrative grants) states that management programs for administrative grants submitted by coastal states are required to have "(2G) a definition of the term *beach* and a planning process for the protection of, and access to, public beaches and other public coastal areas of environmental, recreational, historical, esthetic, ecological, or cultural value." This section also states that "(9) the management program includes procedures whereby specific areas may be designated for the purpose of preserving or restoring them for their conservation, recreational, ecological, historical, or esthetic values."

San Francisco Bay Conservation and Development Commission

The BCDC is designated by the federal government to uphold and enforce the CZMA for the San Francisco Bay Area of the California Coastal Zone. As such, the BCDC has the authority to confirm or deny permits regarding the placement or extraction of materials, including dredged material, along the coast of the state of California. The CZMA guidelines suggest that visual access to San Francisco Bay and San Pablo Bay is an important component of public access. Therefore, waterfront projects approved by BCDC must enhance visual access to the bay and shoreline by including public views from public thoroughfares and the bay. BCDC also requires that structure locations and the height and placement of landscaping maintain or improve bay views. In addition, new roads should be planned to keep bay and access areas in view as much as possible, especially where roads change direction (San Francisco Bay Conservation and Development Commission 2007, 2008, 2010).

State

Suisun Marsh Protection Plan of 1976

The Suisun Marsh Protection Plan contains the following aesthetic-related findings and policies (San Francisco Bay Conservation and Development Commission 2010).

Utilities, Facilities and Transportation

Policy 1 (a). 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.

Policy 1 (c). 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 as to preclude service. Any distribution line necessary to be constructed above ground should have all wires at least six feet apart.

Policy 1 (d). New telephone lines installed in the Marsh and within one-half mile of the Marsh should be buried underground. Existing telephone lines in the Marsh should be buried at the time of line repair. All new telephone cables routed through the Suisun Marsh area should be buried, and the alignment should avoid wetland areas whenever possible.

Policy 8 (g). Industrial facilities should be located and designed to avoid visual intrusion on the Suisun Marsh. Where sloping land is to be used for industrial development, it should be terraced, rather than leveled, and soil erosion and storm water run-off should be controlled. Buildings should not be highly visible against the skyline, should have a low profile, be well designed and unobtrusive in appearance, and use colors and materials compatible with the surrounding landscapes. Appropriate landscaping should be used to reduce the impact of industrial structures on views from the Suisun Marsh.

Policy 8 (h). The industrial waterfront is attractive and interesting to many people and public access to the shoreline should be provided wherever feasible, unless it will result in interference with industrial activities or hazards to the public. Public access to exceptional natural features within industrial areas should also be provided wherever feasible.

Recreation and Access

Finding 1. The Suisun Marsh is a major open-space resource of the San Francisco Bay region, and recreation is the major human use of the Suisun Marsh. A major attraction of the Marsh for recreational use is its undisturbed open-space character.

Finding 3. The demand for existing recreational uses of the Suisun Marsh is presently high and will probably increase in the future. There is also a high demand for water sports and passive recreational activities, such as nature walks, picnicking, and sightseeing. Participation in these activities would increase if better facilities were provided.

Finding 6. Due to the diversity of vegetation and fish and wildlife species the Suisun Marsh has high potential for scientific and educational use.

Finding 7. The Solano County Park Department has proposed parks for two sites in the Suisun Marsh: at Beldon's Landing on Montezuma Slough and on Hill Slough. These would increase opportunities for public access and recreation activities in the Marsh.

Policy 3. 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.

Policy 4. Public agencies acquiring land in the Marsh for public access and recreational use should provide for a balance of recreational needs by expanding and diversifying opportunities for activities such as bird watching, picnicking, hiking, and nature study.

Policy 6. Recreational activities that could result in adverse impacts on the environmental or aesthetic qualities of the Suisun Marsh should not be permitted. Levels of use should also be monitored to insure that their intensity is compatible with other recreation activities and with protection of the Marsh environment. For example, boat speeds and excessive noise should be controlled and activities such as water skiing and naval training exercises should be kept at an acceptable level.

Land Use and Marsh Management

Finding 4. There are several seasonal marshes around the periphery of the managed wetlands. They have high value for Marsh-related wildlife and also serve to buffer the Suisun Marsh to a certain extent from potential adverse ecological and aesthetic impacts. The seasonal marshes are presently used for grazing during the dry summer months.

Finding 8. The upland grasslands and cultivated areas adjacent to the Suisun Marsh are critical to its protection. These undeveloped areas, presently used for grazing cattle and cultivated agricultural lands, function as a buffer for the Marsh. Development in the uplands adjacent to the Marsh would remove this protective function and result in potential adverse ecological and aesthetic impacts. Furthermore, these areas represent valuable habitats for many species of Marsh-related wildlife.

Policy 9. The upland grasslands and cultivated lands surrounding the Marsh should be included in a secondary management area. The function of the secondary management area should be to act as a buffer area insulating the habitats within the primary management area from adverse impacts of urban development and other uses and land practices incompatible with preservation of the Marsh. The boundaries of the secondary management area should, for the most part, correspond to physical barriers to wildlife movement, with exceptions where necessary to control specific potential threats to the Marsh from beyond the wildlife barrier. The proposed boundary of the secondary management area is shown on the Protection Plan Map.

Suisun Marsh Preservation Act of 1977

The General Provisions of the SMPA state that the act was prepared "(29004a) for the orderly and long-range conservation, use, and management of the natural, scenic, recreational, and manmade resources of the Marsh." Under this act, SMPA protection program shall include "(29401g) enforceable standards for the design and location of any new development in the Marsh to protect the visual characteristics of the Marsh and, where possible, to enhance views of the Marsh" (San Francisco Bay Conservation and Development Commission 2007).

Local

Solano County Policies and Regulations Governing the Suisun Marsh

The County Policies and Regulations Governing the Suisun Marsh (Solano County 1982) includes policies found in the Solano County General Plan (2008). In addition, these policies have been implemented by the BCDC under the Suisun Marsh Protection Plan (Bay Conservation and Development Commission 2008). Both contain the following aesthetic-related policies:

Land Use and Circulation Elements (Page 12)

Recreation Land Use

Policy 1. Within Suisun Marsh, provision should be made for public and private recreational development to allow for public recreation and access to the Marsh for such uses as fishing, hunting, boating, picnicking, hiking, and nature study.

Resource Conservation and Open Space Elements

Utilities, Facilities, and Transportation

Policies (Pages 22–25). This resource section includes undergrounding electrical (Policy 1c) and telephone lines (Policy 1d), as well as pipelines, wires, and cables (Policy 2).

Recreation and Marsh Access

Policy 2. Land should 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.

Policy 3. Public agencies acquiring land in the Marsh for public access and recreational use should provide for a balance of recreational needs by expanding and diversifying opportunities for activities such as bird watching, picnicking, hiking, and nature study.

Policy 5. Recreational activities that could result in adverse impacts on the environment or aesthetic qualities of Suisun Marsh should not be permitted. Levels of use should be monitored to insure that their intensity is compatible with other recreation activities and with protection of the Marsh environment. For example, boat speeds and excessive noise should be

controlled and activities such as water skiing and naval training exercises should be kept at an acceptable level.

Scenic Roadways Element

The entire length of SR 12 is a Solano County Designated Scenic Roadway (page 51) (Solano Transportation Authority 2001). As such, the following policies would apply:

General Requirements (Pages 49–50)

Policy 1. Current general plan provisions of the county which designate foreground and distant view components of the scenic roadways for agriculture and other open space uses should be retained.

Policy 2. The number of man-made interruptions or incidents along a scenic roadway (housing, commercial uses, signs, driveways, etc.) should be limited to maintain the current visual values as the prevalent feature of the route. Individual driveways and garages, for example, should not connect directly with a scenic roadway unless necessitated by severe topographic constraints. Rather, they should combine before intersecting with the scenic route to minimize visual and functional disruption.

Specific Policies (Page 51)

These policies apply to the foreground (≤0.25 miles from the roadway) of scenic corridors.

Marshlands Policy 1. Immediately adjoining dry land and upland within and around a marsh should remain in open space use (grazing, cropland, or other extensive uses).

Marshlands Policy 2. Existing animal and vegetative habitats should be protected from encroachment due to their own visual value and their role in maintaining the marsh ecosystem and its overall scenic value.

Marshlands Policy 3. Public roadway construction and improvements activities should be subject to restrictions permitting the natural water movement necessary to sustain the marsh environment.

Marshlands Policy 4. Since such a flat and expansive natural environment tends to exaggerate vertical elements, undergrounding of utility lines is highly recommended.

Eucalyptus Windbreaks Policy 1. Maintenance and protection of existing windbreaks should be encouraged to provide a contrasting visual element on flatland landscapes and to call attention to distant farm development or to places where major changes occur in the alignment or the scenic roadway.

Eucalyptus Windbreaks Policy 2. Where appropriate, expansion or addition of new windbreaks should be encouraged to identify distant changes in visual units, road alignments, land use activities, etc.

Ordinances in the Solano County Code

The Marsh falls largely within the Marsh Preservation District (page 66) that has zoning requirements for site design, including signage (Section 28-23.6b3 and 28-23.6b4). In addition, there are area requirements for features on a parcel, building heights, and potential need for architectural approval (Sections 28-23.6d through 28-23.6h).

Environmental Consequences

Assessment Methods

This section describes the NEPA/CEQA impact analysis relating to visual resources for the SMP alternatives. It describes the methods used to determine impacts and lists the thresholds used to conclude whether an impact would be significant. Because evaluating visual impacts is inherently subjective, federal and professional standards of visual assessment methodology have been used to determine potential impacts on aesthetic values of the plan area. Measures to mitigate (avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany each impact discussion.

Methodology

Using the concepts and terminology, described at the beginning of this section, and criteria for determining significance, described above, analysis of the visual impacts of implementing the plan is based on:

- direct field observation from vantage points, including neighboring buildings, property, and roadways (conducted date);
- photographic documentation of key views of and from the plan area, as well as regional visual context;
- review of project construction drawings; and
- review of the project in regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality.

Professional Standards

According to professional standards, the plan may be considered to have significant impact if it would significantly:

- conflict with local guidelines or goals related to visual quality;
- alter the existing natural viewsheds, including changes in natural terrain;

- alter the existing visual quality of the region or eliminate visual resources;
- increase light and glare in the project vicinity;
- result in backscatter light into the nighttime sky;
- result in a reduction of sunlight or introduction of shadows in community areas;
- obstruct or permanently reduce visually important features; or
- result in long-term (that is, persisting for 2 years or more) adverse visual changes or contrasts to the existing landscape as viewed from areas with high visual sensitivity.

Significance Criteria

Standards for Determining Significance under NEPA

NEPA criteria for determining significance are listed in Title 40 CFR §1508.27, but are considered broader and less stringent than CEQA criteria, set forth below. Also, the CEQA criteria below incorporate NEPA standards. For these reasons, identification of impacts as significant under CEQA is treated herein as sufficient for identifying impacts considered significant under NEPA. Mitigation measures set forth to minimize CEQA significant impacts are presumed also to mitigate NEPA significant impacts. These assumptions are made only for the purpose of identifying the magnitude of particular impacts; this document complies with NEPA requirements and uses the CEQA analysis only as a source of supporting information.

Criteria for Determining Significance under CEQA

The State CEQA Guidelines were used to determine whether the proposed action would have a significant environmental impact. The proposed action may have a significant impact on visual resources under CEQA if it would:

- cause a substantial, demonstrable negative aesthetic impact on a scenic vista or view open to the public or have a substantial adverse impact on a scenic vista;
- substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings; or
- create a new source of substantial light or glare that would adversely affect day or nighttime public views.

Environmental Impacts

No Action Alternative

Under this scenario, some restoration and natural breaches to levees would occur. The primary change to visual resources would occur if the natural breaches allowed channels to form that would allow more public access to inland areas of the Marsh via the channels. Such a change also would result in displacing hunters from lands no longer suitable for hunting; however, this displacement would not be so great as to negatively affect this viewer group. If the SMP is not implemented viewer groups would not reap the benefit of improved aesthetics associated with increasing visual access to marshlands and having those views be of tidal marshes that are more natural with less of an infrastructure imprint. Under this alternative, existing conditions would persist, so changes to views would be less than significant.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact VIS-1: Temporary Changes in Views Caused by Construction Activities

The following actions would result in physical activities resulting in changes to the existing visual environment. Other actions not specifically addressed would not require much, if any, physical activity and would not result in much physical change, and therefore are not discussed under this impact.

Breaching and lowering exterior levees; upgrading or creating new interior levees; the creation of habitat levees increasing connectivity between marsh plain and waters; and redirecting intakes, discharges, and outfalls all would require construction activities. In addition, acquiring public property and using it to increase access to public lands may require infrastructure improvements such as roadways, parking lots, and bringing utilities to the site, and the construction of new public facilities such as interpretive facilities and restrooms. Construction of these proposed actions would create temporary changes in views of and from the project area.

Construction activities associated with restoration would introduce considerable heavy equipment and associated vehicles, including dozers, graders, scrapers, and trucks, into the viewshed of all viewer groups in the vicinity. Construction activities would take place over a period of 30 years, often during a relatively short window each year, and the overall intensity and duration of each action would vary based on the individual project. In addition, the dredged material would be placed on the landside and crown of the levee so would be visible to only a very small number of viewers, primarily hunters. Presently, it is not

uncommon for heavy equipment to be seen, intermittently, during levee maintenance operations and for use in managing wetlands. Evening and nighttime construction activities would require the use of extremely bright lights to accomplish the task at hand, and this would affect nighttime views of and from the plan area. However, the environmental commitment for visual/aesthetic resources in Chapter 2 include minimizing fugitive light from portable sources for nighttime operations and installing visual barriers to prevent light spill from truck headlights in areas with sensitive view receptors.

The temporary nature of construction, scattering of construction activities in different locations throughout the Marsh, over the 30-year plan implementation period, varying intensity and duration of construction, and implementing the above-mentioned Environmental Commitment would make temporary changes in views associated with construction less than significant.

Conclusion: Less than significant. No mitigation required.

Impact VIS-2: Temporary Changes in Views Caused by Habitat Reestablishment Period

After construction, the tidal areas restored may be denuded of vegetation, or appear to be so from a distance because of immature planted vegetation, and look more like a mud flat or open water where mature vegetative communities once existed. The sites would be in a transitional state, and over a period of a couple of years, plant species would mature and vegetation would re-colonize the sites. Furthermore, the sites would be scattered in different locations throughout the Marsh so would not create a visual imposition upon the landscape or be perceived as a centralized, large-scale visual change. In addition, restored sites would increase the amount of native vegetative communities that attract wildlife, thus helping to improve the visual quality of the Marsh.

Conclusion: Less than significant. No mitigation required.

Impact VIS-3: Changes in Views to and from Suisun Marsh

Views to and from Suisun Marsh would not be greatly affected by the proposed actions. Breached and lowered exterior levees; upgraded or new interior levees; created habitat levees; increased connectivity between marsh plain and waters; and redirected intakes, discharges, and outfalls would all quickly appear to be part of the existing visual landscape as they would not alter the existing visual character of the Marsh. Shortly after construction, these elements would not be discernable to most viewer groups, except those viewers who have an acute visual reference of the Marsh and the change between past and present features. Once the restoration sites have become established, they would blend with the surrounding landscape, and actually open up the landscape for more public access.

Restored sites likely would provide more public access to the Marsh via navigable waterways and controlled public access to certain restoration sites, should it be determined to permit such access via land. If it is determined that restored lands would be open to public access, infrastructure improvements like

roadways, parking lots, utilities, and new public facilities such as interpretive facilities and restrooms likely would be implemented.

Installed fencing to improve grazing management and to protect sensitive habitat areas; constructed brush boxes; planted upland, riparian, and tidal vegetation; would be barely noticeable, are in keeping with the existing visual character, and would not detract from the existing visual character.

Restored lands with increased public access would act to improve the aesthetic quality of the Marsh and increase availability of those aesthetic resources. In addition, restoration of sites would increase the amount of native vegetative communities that would attract wildlife, so they would help improve the visual quality and resources of the Marsh available to viewer groups, primarily recreationists.

Conclusion: Less than significant. No mitigation required.

Impact VIS-4: Damage to Scenic Resources along Scenic Highway

There is no roadway in or near the plan area that is designated in California plans as a scenic highway or route worthy of protection for maintaining and enhancing scenic viewsheds. However, SR 12 is a County-designated scenic route. Implementing the proposed project would not affect resources along this roadway and could even improve views from the roadway by restoring the Marsh to a more natural state. Therefore, implementation of the plan alternatives would not damage scenic resources such as trees, rock outcroppings, and historic buildings along a scenic highway.

Conclusion: No impact.

Impact VIS-5: Create a New Source of Light and Glare That Affects Views in the Area

Glare would be minutely increased by implementation of restoration that would increase the amount of water surface that is present in the Marsh through the creation of new waterways.

There is already a great deal of glare from the existing water surfaces, and the addition of water surface from created channels would be negligible in comparison to the larger whole of the Marsh.

Other actions may require the installation of permanent lighting features, and some restoration activities may require the use of portable lighting and maintenance vehicles during the night. The environmental commitment for visual/aesthetic resources, in Chapter 2, include the minimization of fugitive light from portable sources for nighttime operations and permanent lighting features and installation of visual barriers to prevent light spill from truck headlights in areas with sensitive view receptors.

Construction of new buildings could result in created glare from windows and the use of inappropriate building materials, finishes, or colors. As described in the

environmental commitments, any constructed buildings would blend with the natural environment and not create a new source of glare.

Conclusion: Less than significant. No mitigation required.

Impact VIS-6: Conflict with Policies or Goals Related to Visual Resources

The SMP is consistent with the intent and purpose behind the establishment of the policies and goals created to help protect and enhance the aesthetic value of the Marsh. Furthermore, the actions would aid in the facilitation of goals to preserve and enhance the aesthetic resources of the Marsh and, therefore, improve views of, from, and within the Marsh.

Conclusion: No impact.

Managed Wetland Activities Impacts

Impact VIS-1: Temporary Changes in Views Caused by Construction Activities

This impact would be similar to that described for restoration activities. The continuation of currently authorized managed wetland activities would not affect visual resources, because these activities are already a part of the existing visual environment and would not alter the character of the Marsh or detract from existing visual resources. The activities authorized under the RGP and IP that would change include accounting for levee repairs by lineal footage instead of parcel acreage. This change would not affect visual resources, because it is an administrative change, and the action of repairing existing levees still would take place as it presently does.

Of the three categories of managed wetland activities, the one that has the potential to affect visual resources is new activities because these new actions would take place on the landscape and would be visible to all viewer groups. Dredging from tidal sloughs for source material for exterior levee maintenance would require the use of a clamshell dredger or long-reach excavator that is operated on an in-channel barge pulled by a tugboat or on land from the levee. Use of the barge would create temporary changes in views of and from the project area by introducing considerable heavy equipment and associated vehicles into the viewshed of all viewer groups in the vicinity.

The placement of riprap in new locations would alter the appearance of existing vegetated levees. However, only 6,000 feet of new riprap would be placed within the reaches of the Marsh. The integration of “living” bank protection, where feasible to do so, would help to visually reduce the appearance of the riprap once the vegetation matures.

Activities such as installing fencing to improve grazing management and to protect sensitive habitat areas; installing brush boxes; and planting upland, riparian, and tidal vegetation would not introduce considerable heavy equipment.

Brush boxes and biotechnical wave dissipaters would be installed by hand so would not require the use of heavy equipment and would not adversely affect the visual environment. Plants would mature and appear to be naturally recruited after a short period of time. Furthermore, such features already have been used in the Marsh and are visible if one pays close attention. These soft features do not adversely affect the visual environment and would not detract from the existing visual quality of the Marsh. Also, revegetation of exposed levee toes would improve the aesthetics of a degraded levee toe.

Installation of new fish screens would require construction activities and equipment for implementation, which would be temporary. Once the screens are installed they would, after a short period of time, appear to be part of the existing visual landscape as they presently exist in the Marsh and would not alter the existing visual character of the Marsh. They would not be discernable to most viewers as a new feature.

Construction activities associated managed wetland activities would introduce heavy equipment and associated vehicles into the viewshed of all viewer groups in the vicinity. Construction activities would take place over a period of 30 years, often during a relatively short window each year, and the overall intensity and duration of each action would vary based on the individual project. Presently, it is not uncommon for heavy equipment to be seen, intermittently, during levee maintenance operations and for use in managing wetlands.

The temporary nature of construction, scattering of construction activities in different locations throughout the Marsh, over the 30-year plan implementation period, varying intensity and duration of construction, and implementation of the environmental commitment for visual/aesthetic resources in Chapter 2 would make temporary changes in views associated with construction less than significant.

Conclusion: Less than significant. No mitigation required.

Impact VIS-3: Changes in Views to and from Suisun Marsh

This impact would be similar to that described for restoration activities. Views to and from the project area would not be greatly affected by the proposed actions. Replaced water management infrastructure; placed dredged materials for exterior levee maintenance; and redirected intakes, discharges, and outfalls would all quickly appear to be part of the existing visual landscape and would not permanently alter the existing visual character of the Marsh.

Conclusion: Less than significant. No mitigation required.

Impact VIS-4: Damage to Scenic Resources along Scenic Highway

There is no roadway in or near the plan area that is designated in California plans as a scenic highway or route worthy of protection for maintaining and enhancing scenic viewsheds. However, SR 12 is a County-designated scenic route. Implementing the proposed project would not affect resources along this roadway and could even improve views from the roadway by restoring the Marsh to a

more natural state. Therefore, implementation of the plan alternatives would not damage scenic resources such as trees, rock outcroppings, and historic buildings along a scenic highway.

Conclusion: No impact.

Impact VIS-5: Create a New Source of Light and Glare That Affects Views in the Area

This impact would be similar to that described for restoration activities. Glare would be minutely increased by implementation of new managed wetland activities that would increase the amount of reflective material present by increasing the amount of riprap in the Marsh.

Riprap is already a common feature in the Marsh, and there is already a great deal of glare from the existing water surfaces. The addition of new riprap would be negligible (no more than 200 feet per year) in comparison to the total amount in the Marsh, and the riprap would weather over a short period of time and vegetation would colonize the rock interstices. In this way the slightly altered appearance associated with the addition of fresh riprap would be reduced.

Other managed wetland activities may occasionally require the use of portable lighting and maintenance vehicles during the night. Implementation of the environmental commitment for visual/aesthetic resources in Chapter 2, which include the minimization of fugitive light and installation of visual barriers to prevent light spill from truck headlights in areas with sensitive view receptors, would ensure that new managed wetland activities combined with the environmental commitment would not create a new source of light or glare that would affect views in the area.

Conclusion: Less than significant. No mitigation required.

Impact VIS-6: Conflict with Policies or Goals Related to Visual Resources

This impact would be the same as that described for restoration activities. The SMP is consistent with the intent and purpose behind the establishment of the policies and goals created to help protect and enhance the aesthetic value of the Marsh.

Conclusion: No impact.

Alternative B: Restore 2,000–4,000 Acres and Alternative C: Restore 7,000–9,000 Acres

Alternatives B and C call for the same restoration and managed wetland activities, but with different amounts of land being restored . In comparison to the overall size of the Marsh, these differences in acreage between Alternatives A and C and Alternative B would not be a great enough difference to affect the

existing visual resources or alter the existing visual character. Implementation of these actions also would take place over 30 years, with the overall intensity and duration of each action varying based on the individual project. Like Alternative B, these alternatives would act to improve the overall visual quality of the Marsh. In summary, all changes resulting from implemented actions would be the same for Alternatives B and C as they are for Alternative A.

Section 7.7
Cultural Resources

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on cultural resources. *Cultural resource* is a general term that encompasses the National Historic Preservation Act's (NHPA's) *historic property* as well as CEQA's *historical resource* and *unique archaeological resource* (see Regulatory Setting below for definitions of historical resource and unique archaeological resource). Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, or scientific importance. According to guidance published by the Office of Historic Preservation (1995:2), any "physical evidence of human activities over 45 years old may be recorded for purposes of inclusion in the [Office of Historic Preservation's] filing system." In other words, physical evidence of human activities more than 45 years old is considered a cultural resource.

Summary of Impacts

Table 7.7-1 summarizes impacts on cultural resources, including the plan's potential to result in significant impacts, from implementing the SMP alternatives.

Table 7.7-1. Summary of Cultural Resource Impacts

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
CUL-1: Damage to Montezuma Slough Rural Historic Landscape as a Result of Ground-Disturbing Activities along Montezuma Slough	A, B, C	Significant	CUL-MM-1: Document and Evaluate the Montezuma Slough Rural Historic Landscape, Assess Impacts, and Implement Mitigation Measures to Lessen Impacts	Significant and unavoidable
CUL-2: Damage to or Destruction of Known Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas	A, B, C	Significant	CUL-MM-2: Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Resources prior to Ground-Disturbing Activities	Less than significant
CUL-3: Damage to Known Cultural Resources as a Result of Inundation	A, B, C	Significant	CUL-MM-3: Protect Known Cultural Resources from Damage Incurred by Inundation through Plan Design (Avoidance) CUL-MM-4: Resolve Adverse Effects prior to Construction	Significant and unavoidable
CUL-4: Inadvertent Damage to or Destruction of As-Yet-Unidentified Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas	A, B, C	Significant	CUL-MM-5: Conduct Cultural Resource Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable
CUL-5: Damage to or Destruction of Human Remains as a Result of Ground-Disturbing Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
CUL-6: Damage to or Destruction of Shipwrecks or Other Submerged Resources as a Result of Channel Dredging	A, B, C	Significant	CUL-MM-6: Stop Ground-Disturbing Activities, Evaluate the Significance of the Discovery, and Implement Mitigation Measures as Appropriate	Less than significant
CUL-7: Damage to or Destruction of Known Cultural Resources Resulting from Managed Wetland Activities	A, B, C	Significant	CUL-MM-7: Prepare and Implement a Programmatic Agreement (PA) and Historic Properties Treatment Plan (HPTP) ; Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Cultural Resources prior to Ground-Disturbing Activities	Less than significant
CUL-8: Damage to or Destruction of As-Yet-Unidentified Cultural Resources in Uninspected Areas as a Result of Other Ground-Disturbing Managed Wetland Activities	A, B, C	Significant	CUL-MM-8: Prepare and Implement a PA and HPTP for the Proposed Project; Conduct Cultural Resources Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- detailed records searches obtained from the California Historical Resources Information System (CHRIS), and
- a review of published literature pertinent to Suisun Marsh environment, prehistory, ethnography, and history.

Methods

A records search was conducted at the Northwest Information Center (NWIC) of the CHRIS on July 24, 2007 (NWIC File No. 07-132). The NWIC maintains the CHRIS's official records of previous cultural resource studies and known cultural resources for a 16-county area that includes Solano County. The records search covered the entire SMP area (plan area) and consisted of a review of maps of previous cultural resource studies and recorded cultural resources.

The records search and literature review indicate that approximately 35% of the plan area has been surveyed for the presence of cultural resources, principally in upland, non-marsh environs or reclaimed marsh (CALFED Bay-Delta Program 1996; California Department of Water Resources and U.S. Department of the Interior, Bureau of Reclamation 2006; Chavez 1990; Ecumene Associates 1980; EDAW 2003; Esser 1999; Flynn et al. 1989; Holson et al. 1989; Johnson and Johnson 1974; Jones & Stokes Associates 1974, 1985; Jones & Stokes Associates and Geier and Geier Consulting 1995; Kenton 1980; Lee and Page 1993; Mabry 1979; Martin and Self 2002, 2003, 2004; Napton 1985; Nelson et al. 2000; Owens 1991; Parks 1996; Sullivan and Allen 1996; Theodoratus et al. 1980; William Self Associates 1993).

The records search and literature review also indicate that 34 previously recorded cultural resources are present in the plan area. Brief descriptions of these cultural resources are provided in Table 7.7-2.

Table 7.7-2. Previously Recorded Cultural Resources in the Plan Area

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance
Prehistoric Cultural Resources				
CA-SOL-13	Burial and village site	High elevation tidal marsh, managed wetland area	2	Undetermined
CA-SOL-66	Destroyed village site	Upland	1	Undetermined
ISO 20	Isolated projectile point	Managed wetland area	4	Undetermined
Historic-Era Cultural Resources				
CA-SOL-268H	Historic ranch	Upland	4	Undetermined
CA-SOL-282H	Historic ranch	Upland	4	Undetermined
CA-SOL-290H	Molena railroad station	Upland	4	Undetermined
CA-SOL-291H	Windmill	Upland	4	Undetermined
CA-SOL-366H	Historic refuse scatter	Lowland grassland	4	Undetermined
CA-SOL-367H	Historic refuse scatter	Upland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-368H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-369H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-370H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-371H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-372H	Historic pump house	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-373H	Historic pump house and refuse	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-374H	Historic refuse scatter	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-375H	Historic dump	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
Ca-SOL-376H	Ranching related	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-377H[1]	Historic railroad grade, trestles, and station	Farmed bayland, managed wetland area, uplands	4	Recommended eligible (NRHP/CRHR)
CA-SOL-378H	Ranching debris	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-415H	Montezuma Wetlands flume structure	Managed wetland area	4	Undetermined
P-48-207	Historic ditch	Managed wetland area	1	Undetermined
P-48-209	Southern Pacific Railroad	Managed wetland area	1	Undetermined

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance
P-48-442	Utility line	Managed wetland area	1	Undetermined
P-48-443	Lingos Landing	Major slough	4	Undetermined
P-48-491	Historic ranch house	Upland	1	Undetermined
P-48-492	Ranch, Garibaldi Wildlife Refuge	Upland	1	Recommended ineligible (NRHP)
P-48-513[1]	Birds Landing dock and road	Managed wetland area	4	Undetermined
P-48-514[1]	Dutton's Landing	Ruderal	4	Undetermined
P-48-549	Central Pacific Railroad	Marsh, upland	1	Undetermined
P-48-568	Windmill	Upland	3	Recommended ineligible (NRHP/CRHR)
TCR 41H	Structural depression and historic debris scatter	Managed wetland area	4	Undetermined
None	Mein's Landing[1]	Major slough	4	Undetermined
None	Montezuma Slough Rural Historic Landscape[2]	Major slough, marsh	3, 4	Undetermined

[1] These resources are also constituent elements of the Montezuma Slough Rural Historic Landscape.

[2] The Montezuma Slough Rural Historic Landscape includes four previously recorded cultural resources as constituent elements, as indicated above.

NHRP = National Register of Historic Places.

CRHR = California Register of Historic Resources.

To date, three Native American archaeological resources have been identified in or adjacent to the plan area: CA-SOL-13, CA-SOL-66, and ISO 20. CA-SOL-13 and ISO 20 are located in lowland marsh contexts, whereas CA-SOL-66 is situated at the edge of Suisun Marsh. An additional five prehistoric archaeological sites are located at the margin of the plan area, as shown in Table 7.7-3.

Table 7.7-3. Previously Recorded Prehistoric Cultural Resources in and Immediately Outside of the Plan Area

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance
CA-SOL-22		Upland	1	
CA-SOL-24	Burial and village site with historic-period component	Upland	1	Undetermined
CA-SOL-25/H	Occupation and burial site with historic component	Upland, high elevation marsh	1	Undetermined
CA-SOL-263		Upland	1	
CA-SOL-273		Upland	1	

NHRP = National Register of Historic Places.
CRHR = California Register of Historic Resources.

Thirty of the 34 previously recorded cultural resources in and immediately adjacent to the plan area are non–Native American, historic-period archaeological sites, buildings, and structures. Eight of these resources are located in or extend through uplands, and 23 are located on or extend through marshes and other lowlands[1]. The resources relate to railroad travel, ranching and farming, refuse disposal, water conveyance, utilities, and maritime economy (Table 7.7-2).

Montezuma Slough Rural Historic Landscape

Of the previously recorded cultural resources listed in Table 7.7-2, the Montezuma Slough Rural Historic Landscape deserves special mention, as it is a property type that is not commonly discussed in environmental impact documents. The National Register of Historic Places (NRHP; see Regulatory Setting below) recognizes five general property types: districts, sites, buildings, structures, and objects. The NRHP defines a *district* as

> a geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. A district may also comprise individual elements separated geographically but linked by association or history. (36 CFR 60.3[d].)

A rural historic landscape is a type of district defined as

> a geographic area that historically has been used by people, or shaped and modified by human activity, occupancy, or intervention, and that possesses

[1] The apparent discrepancy in the total number of historic-period cultural resources stems from the fact that some linear cultural resources (such as railroads) extend through uplands and lowlands and therefore are included in the tally for more than one context.

> a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features (McClelland et al. 1995:3).

The Montezuma Slough Rural Historic Landscape is a linear district extending the length of Montezuma Slough from the town of Collinsville on the east to Grizzly Bay on the west. The rural historic landscape is otherwise generally contained within the outside banks of Montezuma Slough. Esser (1999:Figure 3) documents the portion of the rural historic landscape from Collinsville to the confluence of Nurse Slough and Montezuma Slough; Esser's documentation of this section of the rural historic landscape is not complete and does not contain a formal significance evaluation (see Regulatory Setting for an explanation of significance evaluations) of the district.

Numerous historic buildings, structures, sites, and objects—both formally recorded and unrecorded—constitute the Montezuma Slough Rural Historic Landscape. Features include siphons and pump stations, pilings, deliberate landscaping such as eucalyptus windbreaks, railroad crossings, levees, shipwrecks, cuts, salinity control gates, landings (such as Mein's and Dutton's Landings), and railroad sidings (Esser 1999:58–60, 62). These historic features constitute a district by virtue of their association with common historic contexts, namely maritime transportation and economy.

Setting

The setting presented here (Natural Environment, Prehistoric Archaeology, Ethnographic Setting, and Historical Setting) describes the historically dynamic nature of the plan area and the effects that natural and cultural changes in this area impose upon the distribution and visibility of cultural resources. The setting begins with a summary overview of the modern plan area then outlines its development from the terminal Pleistocene Epoch (about 18,000–10,000 years ago) to present conditions.

The setting next summarizes what is known of the plan area's aboriginal inhabitants, first as manifested in the prehistoric archaeological record, then as known from ethnographic and historical sources. Historic-period cultural developments, focused on Mexican and Euroamerican cultures, are reviewed next. The discussion concludes by analyzing the setting's implications for cultural resource distributions in the project area.

Natural Environment: Overview

The plan area encompasses Suisun Marsh, as well as the Potrero and Kirby Hills. It is flanked on the west by the North Coast Ranges and on the east by the Montezuma Hills. South of the area are Grizzly, Suisun, and Honker Bays. To

the north, the wetlands of the plan area gradually give way to alluvial plains that emanate from Green Valley and Suisun Creeks.

Suisun Marsh is the largest remaining wetland complex in the San Francisco Bay area. It consists of 85,000 acres of tidal marsh, managed wetlands, and waterways. The Marsh supports diverse avian, reptile, mammalian, fish, invertebrate, and amphibian fauna. (Jones & Stokes Associates 1985:65.) As a key wintering area for waterfowl that traverse the Pacific Flyway, the Marsh supports wading and dabbling ducks, geese, water birds, shorebirds, and raptors in abundance. The wetland environments and adjacent uplands provide habitat for numerous animals of economic importance to Native Americans, historic-period Euroamericans, and modern populations. Such animals include pheasant, ducks, tule elk, beaver, river otter, and black-tailed jackrabbit. Important fisheries include Chinook salmon and steelhead. Detailed species lists can be found in Sections 6.1 and 6.3.

Land cover types in the plan area consist of bays and sloughs, tidal wetlands, managed wetlands, riparian corridors, uplands, seasonal wetlands and vernal pools, and developed land. With the exception of developed land, the mosaic of land cover types provides economically important plants as well as habitat. Such plants include rushes, seed-bearing grasses, reeds, and cattails. Proximity to Green Valley and the North Coast Ranges provided Native American inhabitants with ready access to acorns and buckeyes, as well as certain toolstone materials, such as sandstone. Available land cover types in the marsh proved of lesser subsistence importance to later, non-Indian populations, although swampland reclamation efforts did foster a local dairy farming industry in the marsh—a use in which green pastures were a boon. Some of the same toolstone localities and geologic formations of interest to Native American later drew the attention of Euroamericans, as these areas frequently provided cement and coarse aggregate for building projects.

Geomorphologic Formation of the Plan Area

The modern plan area and Delta are the most recent of several that formed during a sequence of depositional and erosional cycles in the Quaternary Period (1.6 million years ago to present) (Shlemon 1971; Shlemon and Begg 1975). These cycles resulted from fluctuations in climate and sea level related to the advance and retreat of glacial ice. The most recent cycle is one of deposition, resulting from a rise in sea level initiated by deglaciation following the height of the last (Tioga) glaciation approximately 20,000 years ago, a time when sea level was approximately 394 feet lower than it is today (Hickman 1993; U.S. Army Corps of Engineers 1974). As glacial ice retreated, sea level rose more rapidly at first, then slowed to a rate of about 0.4–0.8 inches per year, a rate that has persisted from about 6,000 years ago to the present time (Atwater et al. 1977).

Unlike most marshes and deltas, the modern plan area and Delta formed during the Holocene (ca. 10,000 years ago to present) in an inland direction as rising sea levels intruded upstream and flooded a pre-Holocene valley, creating a broad

tidal marsh. Rising sea levels gradually submerged the plan area, creating anaerobic conditions that greatly reduced the rate of plant decomposition. As a result, the accumulation of decomposing plant material kept pace with rising sea levels over approximately 7,000 to 11,000 years, resulting in the formation of thick peat deposits (Prokopovich 1988; Shlemon and Begg 1975), and permitted the formation of extensive tidal-marsh deposits during the Middle Holocene (7000–4000 B.P.) (Meyer and Rosenthal 2007). These deposits are currently the thickest in the west and central parts of the Delta (i.e., the plan area) and grade to thinner accumulations inland toward the Delta margins (California Department of Water Resources 1995).

As base levels increased in response to sea-level rise, the lower reaches of stream and river channels became choked with sediment that spilled onto the surface of existing fans and floodplains, forming large alluvial plains (Meyer and Rosenthal 2007:3). The plan area expanded in response to higher sea levels and the decomposition, compaction, and subsidence of inter-tidal deposits. As a result, many older land surfaces were covered by at least 6.6–9.8 feet of Holocene-age alluvial deposits. These older buried land surfaces usually are marked by well-developed soils that represent a significant stratigraphic boundary in the region, typically characterized by distinct A, B, and C horizons (Meyer and Rosenthal 2007:3, 6).

In general, the landscape history of the plan area represents alternate sequences of flooding and alluvial deposition as well as decomposition of organic matter. Holocene sea level rise led to estuarine transgression and burial of old surfaces as the estuary expanded upward and landward. Most likely, all major waterways (including the Sacramento and San Joaquin Rivers) occupied their present position during the Holocene period of organic matter accumulation (Bates 1977; Pierce 1988). Similar to the major waterways, tidal marshes tend to hold the planform position of their channels as they rise up (Siegel 2010). Finally, the various small streams entering the plan area probably would fall into two stability categories: (a) dynamic, where streams cross low-gradient alluvial fans like those in the northwest portion of the plan area, and (b) fairly stable, where they emerged out of the adjacent hillslopes, like those on the southeast side around Birds Landing and the Montezuma Hills.

Prehistoric Archaeology

The prehistory of the project vicinity has been described in the following sections in terms of archaeological patterns, following Fredrickson's (1973) system (Table 7.7-4). A pattern is a general mode of life characterized archaeologically by technology, particular artifacts, economic systems, trade, burial practices, and other aspects of culture. Fredrickson's (1973) periods also are employed in the discussion below:

- Paleoindian: 12,000–8000 B.P.
- Lower Archaic: 8000–5000 B.P.

- Middle Archaic: 5000–2500 B.P.
- Upper Archaic: 2500–950 B.P.
- Lower Emergent: 950–450 B.P.
- Upper Emergent: 450–150 B.P. (White et al. 2002:Figure 15.)

In Fredrickson's use, periods served as arbitrary intervals that could be used to compare patterns over space and time. Only with the clear identification of pervasive temporal patterns would periods acquire specific archaeological meaning.

Table 7.7-4. Characteristics of Archaeological Patterns in the Lower Sacramento Valley and Delta

Pattern	Windmiller	Berkeley	Augustine
Dates	~4500–2800 B.P.	2800–1200 B.P.	1200–100 B.P.
Characteristics	Sites in the lower Sacramento Valley are clearly concentrated on low rises or knolls within the floodplains of major perennial watercourses, doubtless to obtain protection from seasonal flooding while maintaining proximity to riverine, marsh, and valley grassland biotic communities. Most sites include cemeteries, suggesting a degree of sedentism, in which skeletons are typically extended ventrally, oriented toward the west, and accompanied by abundant mortuary accoutrements. Subsistence apparently focused on hunting and fishing, as evidenced by large projectile (spear or spear thrower) points, clay net sinkers, bone fishhooks and spears, and abundant faunal remains. Procurement of plant resources is inferred from handstone and milling slab fragments recovered from a few of the sites; milling slabs appear more frequently than mortars from 4500–2500 B.P. Other characteristic artifacts include charmstones, quartz crystals, bone awls and needles, *Haliotis* spp. and *Olivella* spp. shell beads and ornaments. Trade is reflected in the material from which utilitarian, ornamental, and ceremonial objects were produced.	Sites are more widely distributed than Windmiller Pattern sites. Sites are typified by deep midden deposits, suggesting intensified occupation. The abundance of millingslabs, mortars, and pestles indicates a dietary emphasis on vegetal resources—especially the acorn, as evidenced by the greater frequency of mortars and pestles relative to millingslabs and handstones. Fishing technology improved and diversified, suggestive of greater reliance on riverine foodstuffs. Artifacts similar to the Windmiller Pattern items include types of mortars and millingslabs, quartz crystals, charmstones, projectile point styles, shell beads, shell ornaments, and bone tools. New material culture items include steatite beads, tubes and ear ornaments and slate pendants. The dead were buried in flexed positions with variable orientation or cremations accompanied by fewer grave goods.	Possible affiliation with the southward expansion of Wintuan populations into the Sacramento Valley. Represents peoples engaged in intensified hunting, fishing, and gathering subsistence strategies. An even greater number of sites than in the previous 1,600 years imply that regional population was large, with people participating in highly developed trade networks. Ceremonial and mortuary practices reach their height of elaboration and mortuary treatments evince social stratification. The base technology and specific manufactures of the preceding patterns are retained, but new elements appear in the material record: shaped mortars and pestles, bone awls for basketry, bone whistles and stone pipes, clay effigies, small notched and serrated projectile points—the latter evidence for the introduction of the bow and arrow, which occurs at this time throughout the western United States. Pottery is also found at a few sites. Burials were flexed with variable orientation and generally lacked grave goods.

Source: ICF Jones & Stokes 2009a:Table 7.

The plan area is situated at the southeastern margin of the North Coast Ranges between two regions of California that have seen intensive archaeological research: the San Francisco Bay area and the Delta. The Suisun Marsh vicinity, however, witnessed little archaeological research until the advent of environmental impact review legislation in the 1960s. The greatest concentration of nearby archaeological excavations is in Green Valley, north of the plan area, with seven sites excavated (Jones & Stokes 2004:9).

Work in Green Valley produced assemblages from a cluster of sites: CA-SOL-356, CA-SOL-355/H, CA-SOL-315, and CA-SOL-69. These sites are all clustered around Green Valley Creek, north of the present town of Cordelia (Wiberg 1992, 1993, 1996). Excavations at CA-SOL-356 revealed a range of dates spanning the Upper and Lower Emergent Periods. Time markers included clamshell and magnesite disk beads. The faunal and floral assemblages suggested a diversification of diet commensurate with expectations for a growing population: mollusk, acorn, migratory bird, fish, and mammalian remains all were recovered from the site. Nearby CA-SOL-355/H produced obsidian hydration measurements revealing occupation from 4650 to 450 B.P.—spanning from the Middle Archaic to Lower Emergent Periods. Grave goods included bone tube beads, atlatl spurs, unmodified faunal bone, olive snail shell saddle beads, circular abalone beads, obsidian lanceolate points, and red ochre. These materials showed Berkeley Pattern affiliations (Wiberg 1993:4). Work at nearby CA-SOL-69 produced six burials with no associated artifacts. Obsidian hydration analysis revealed a span of occupation at CA-SOL-69 spanning from 4550 to 1500 B.P. (Wiberg 1992:4–5). The comparatively rich assemblage at CA-SOL-315 produced 51 burials, 43 projectile points, a rich collection of large basalt cores and core tools, and 300 mortar and millingstone fragments. The mortuary assemblage had only five associated non-diagnostic bone tools—thus lacking data revealing affiliations with existing patterns. Obsidian hydration dates indicated an occupation from 7950 to 1450 B.P. Radiocarbon dates by comparison suggested an occupation spanning 950 to 1450 B.P. Overall, materials recovered from CA-SOL-315 did not allow placement with existing central California archaeological taxa, as described in Table 7.7-4 above).

Work in Vacaville and the immediate surroundings has focused largely on two sites, CA-SOL-320 and CA-SOL-270 (Jones & Stokes 2004:12). The assemblage recovered from CA-SOL-320 included unassociated human bone fragments, Napa Valley obsidian debitage, numerous fragmentary faunal remains, and clamshell disk beads. This assemblage evinces an Upper Emergent age deposit. By contrast, work at CA-SOL-270 produced evidence of occupation spanning the Archaic to Emergent periods, with the strongest presence in the Middle and Upper Archaic. Excavation efforts at CA-SOL-270 (the Cook Site) identified three distinct midden strata beneath a 1.5-foot lens of sterile alluvium. (Jones & Stokes 2004:13.) The Cook Site yielded approximately 45 burials. Of these, 75% were flexed, one individual was extended, and the remaining burials were too fragmentary and disturbed to infer positioning. A rich assemblage of grave goods and non-funerary artifacts also was recovered, including atlatl spurs, mortar fragments, olive snail shell beads, baked clay cooking balls, and flaked stone. Analysis of the combined assemblage and obsidian hydration data

suggests that the greatest population density and period of use occurred during the Upper Archaic Period and conformed to the Berkeley Pattern (Bennyhoff and Fredrickson 1994; Moratto 1984:184).

Ethnographic Setting

The plan area falls within the territory of the Patwin, whose language (Patwin) is part of the Wintuan language family (consisting of Nomlaki, Patwin, and Wintu). The Wintuan language family, in turn, belongs to the Penutian linguistic stock (Milliken et al. 2007:Figure 8.1). In addition to the Wintuan languages, the Penutian linguistic stock is made up of the Utian, Maiduan, and Yokutsan language families (Milliken et al. 2007:Figure 8.1; McCarthy 1985:Map 5). The word patwin is a native word meaning "people" that was used by several tribelets in reference to themselves, but has since been used to distinguish southern Wintun from their linguistic and cultural relatives to the north (Johnson 1978). Like all central California indigenous people, the Patwin probably moved seasonally within their territory between a small number of semi-permanent villages and a great number of temporary campsites. Their territory ranged from the Sacramento River to the east and within 5 miles east of Clear Lake to the west and from the town of Princeton in the north to San Pablo and Suisun Bays in the south (Johnson 1978:Figure 1). In all, this territory encompassed an area approximately 90 miles north to south and 40 miles east to west. Most of the population was concentrated along the river in large villages, and because most of the plains were submerged in winter and dry in the summer, occupation of this region was sparse and seasonal. Tribelets in the hills lived in the numerous intermontane valleys, particularly along the drainages of Cache and Putah Creeks (Johnson 1978:351).

The Patwin people on the north shore of Suisun Bay in the Fairfield area were known as the Suisuns and Malacas and were not culturally identical to their neighbors to the north, with whom they shared the Patwin language. Mission register evidence shows that the Suisuns were heavily intermarried with the Bay Miwok–speaking Chupcans across Suisun Bay to the south. (Milliken 1995:241, 247, 255.)

The main Patwin political unit was the tribelet, consisting of one primary and several satellite villages, with a definite sense of territoriality and autonomy (Johnson 1978:354). Four types of permanent structures were typical within the Patwin village. The family house could be placed anywhere; the ceremonial dance house was built at a short distance to the north or south end of the village; the sweathouse was built to the east or west of the dance house; and the menstrual hut was placed on the edge of the village, farthest from the dance house. All of the structures were earth-covered, semi-subterranean structures in either an elliptical or circular form. The family house was built by the paternal relatives, and all the other structures were built with the help of everyone in the village. The men commonly wore no clothing, and the women wore skirts of animal skin or shredded plant fiber. (Johnson 1978:357–358.)

Hunting and fishing were done by either individuals or small groups. Fish, including salmon, trout, and steelhead, were caught using nets, and mussels were collected from the river bed. Many other animals, including tule elk, deer, antelope, bear, ducks, geese, quail, and other birds, were hunted, using the bow and arrow and, in some cases, decoys. Acorns were a primary staple among the Patwin, who would gather two types of valley oak acorns, along with the hill and the mountain oak acorns. Baskets mostly were used in the gathering of acorns, buckeye, pine nuts, juniper berries, manzanita berries, blackberries, wild grapes, brodiaea bulbs, and tule roots. Sunflower, alfilaria, clover, bunch grass, and wild oat, all which grew on the open plains, provided seeds that were parched or dried and then pounded into meal. Each village had its own locations for gathering these various resources, and the village chief was in charge of assigning particular families to collection areas. (Johnson 1978:355.)

Tools most commonly were made from bone, wood, and stone. Obsidian and chert were used to make arrow points, drill points, and spearheads, as well as scrapers and knives for butchering animals. Bows and arrows were made from buckeye, juniper, dogwood, and elderberry wood. Mortars and pestles were used to process acorns and other seeds or to pound meat. Mussel shells were used as knives to cut fish and other meats into strips. Tule boats were constructed of bundles of round tule bound together to form crafts up to 20 feet long and 6 feet wide. Baskets were used for food collection and preparation and to hold burial goods. More than 40 types of baskets were used by the Patwin, including a mush boiler, winnowing tray, burden basket, cooking basket, fish traps, and mortar hoppers (Johnson 1978:356).

The southern Patwin traded salmon, river otter pelts, game, cordage, feathered headbands, and shell beads with the Pomo, Nomlaki, Wappo, and Southern Maidu groups (Johnson 1978:352). Bows were also a common trade item from the Southeastern Pomo and from the Nomlaki to the north. Obsidian either was brought in or was retrieved from the west and east.

The Southern Patwin were dislocated from their homeland immediately following Spanish contact, and many were forced into subjugation at the missions. By 1821, nearly all Patwins had been removed from their homeland and were baptized at Mission San Francisco. In 1824, many of these converts were moved to Mission San Francisco Solano in Sonoma Valley to form a core population at the new mission. Euroamerican settlement of the area in the 1850s resulted in the dislocation of the remaining Patwin and assimilation to a white labor economy. By 1972, the Bureau of Indian Affairs census listed only 11 Patwin individuals (Johnson 1978:352). By 2001–2003, Bureau of Indian Affairs survey data indicate that there are 313 individuals of Patwin descent among the three federally recognized tribes of Cachil DeHe Band of Wintun Indians, the Cortina Indian Rancheria of Wintun Indians, and the Yocha Dehe Wintun Nation (formerly Rumsey Indian Rancheria of Wintun Indians) (Bureau of Indian Affairs 2003:10–11).

Historic Setting

Because of its distance from San Francisco Bay, the project vicinity was of minor importance to the Spanish and Mexican governments in California. The earliest overland exploration of the Bay Area was completed in 1772 by the Fages-Crespi Expedition. Subsequent to additional overland and waterborne expeditions, more lasting Spanish influence reached the plan area vicinity through the establishment of Bay Area missions and proselytizing efforts among interior tribes. The most visible effects of missionary efforts were disease and decimation of the Native American populations in the area. Many punitive and exploratory expeditions were made into the project vicinity by the Spanish, both to "convert" those who had not been Christianized and to pursue runaway mission neophytes. (ICF Jones & Stokes 2009b:37.)

In the 1840s, Mexico took over rule of California from Spain, and the mission system was abandoned. Mission lands were divided, and land grants or ranchos were established. These lands were used predominantly for cattle grazing and the raising of livestock. In Solano County, Rancho Suisun was the first of six Mexican land grants that were established in the area. The land, consisting of 17,754 acres west of the present day city of Fairfield, was granted to a Suisun chief named Sem-Yeto, later baptized as Francisco Solano, in 1845. (Hoover et al. 1990:463.)

Deterioration of relations between the United States and Mexico resulted in the Mexican War, ending with the relinquishment of California to the United States under the Treaty of Guadalupe Hidalgo in 1848. The formation of the new state of California and the onset of the American Period were to bring rapid change to the region. The California Gold Rush of 1848 brought an increase in population to the region, and the focus of land use changed from ranching to agriculture in order to feed the swelling population of miners in the Sierra Nevada foothills. (ICF Jones & Stokes 2009b:37–38.)

Suisun City

Named for its original indigenous inhabitants, the Suisun area had few European residents until the 1860s. Within the boundaries of the original Suisun Township lay land that General Vallejo purchased from Francisco Solano in 1849, and land that Antonio Armijo inherited from his father, Francisco Jose Armijo. In 1850, as Dr. John Baker and Curtis Wilson sailed through Suisun Slough, they became the first Americans to visit the island upon which Suisun City took shape (Gregory 1912:73; Hoover et al. 1990:471; Munro-Fraser 1879:288–289). Development of the geographically well-situated island began in 1851 when Captain Josiah Wing raised Suisun's wharf and its first building, a warehouse. Suisun quickly became a port for boat shipments of locally grown grain and meat to San Francisco (Gregory 1912:73; Hoover et al. 1990:471; Hunt 1926:238; Keegan 1989:37; Munro-Fraser 1879:290, 298–300).

In the summer of 1851, John W. Owens and A. W. Hall opened the town's first store. In 1854, Suisun City's streets were laid out. That year, J. G. Edwards and S. C. Reed built a mill that was expanded in 1858 into a three-story steam-

powered grain processor. Robert Waterman, acting on behalf of the estate of Archibald Ritchie and his own one-third interest in the Suisun Rancho, had sold off much of the nearby land by 1860.

By 1862, Suisun City had a fire company, an engine and a firehouse. In 1868 a large main constructed by the Suisun and Fairfield Water Company began delivering water from Fairfield to the south side of Suisun City. Known popularly as the "Cal P," the California Pacific Railroad began passenger service from Vallejo to Suisun in 1868. That year, the County Board of Supervisors approved the city's incorporation petition (Gregory 1912:73; Hunt 1926:239; Keegan 1989:37, 46, 49–50; Munro-Fraser 1879:290).

Over the next two decades, Suisun thrived amid change. Public support and anti-monopoly sentiment could not keep the Cal P from being purchased in 1871 by the Central Pacific Railroad, whose leaders resented competition from the smaller upstart railroad and refused to allow it access to Sacramento. Now Suisun City had shipping access to distant markets via the transcontinental railroad. In 1878 the Central Pacific added a new line from Benicia to Suisun. A wood-plank path linking Suisun City and Fairfield was removed and the marsh underneath filled in, ending Suisun's days as an island. Nevertheless, the two cities remained separate entities, and, to a certain extent, rivals.

In 1876 the Bank of Suisun was established under the directorships of R. D. Robbins, C. F. D. Hastings, E. P. Hilborn, W. H. Turner, and J. B. Hoyt. By 1878 the town had three lawyers, five physicians, three dentists, three warehouses, two wagon factories, seven dry-goods and grocery stores, two hardware stores, two harness shops, two boot and shoe shops, three drug stores, a newspaper, a printer, and a livery stable. As of 1880, 600 people resided in Suisun City. The town's streets were first lighted by electricity in 1888, the same year during which a major fire destroyed eight of the city's blocks (Gregory 1912:73; Kaplan 1976:3, 10; Keegan 1989:49–50; Lucy 1987:7; Munro-Fraser 1879:290, 298; Thompson & West 1878:14).

Suisun City's period of major prosperity took place from roughly 1880 to 1920. Replacing ranching and wheat farming, fruit cultivation flourished in the Suisun Valley, aided by the development of refrigerated railcars and large-scale fruit drying and canning operations. The combination of railroad access and a slough wharf allowed Suisun-area growers to benefit from favorable shipping rates compared to Vacaville. By 1888, Saunders & Reeves Lumber Yard (later the Suisun Lumber Company) operated along the Suisun Slough with offices, storage sheds, and a lumber yard on Main Street. Main Street also offered specialty stores selling goods and services such as dry goods, clothing, banking, and laundry. In 1903, the city received telephone service. Reclaimed marshland at Grizzly and Joyce Islands on the outskirts of Suisun was profitably devoted to dairy farming. Located approximately 6 miles northwest of Suisun City, the cement production facilities of the Pacific Portland Cement Company added a new industrial element to the local economy. Pacific Portland constructed a company town that housed 500 resident workers adjacent to its factory.

In the 1910s, the federal government deepened the waterway connecting Suisun City to the bay, in part to enable larger shipments from the Portland Cement plant. In 1913, the new Northern Electric Railroad initiated passenger and freight service between Suisun and Vacaville (Gregory 1912:74–75; Kaplan 1976:4–5; Keegan 1989:58, 62, 67–68, 70–71).

Suisun City retained its status as a shipping and banking center for several decades, but the Great Depression brought hard times locally. Even before the onset of economic depression, the nearby Pacific Portland Cement Plant ceased operations in 1927. A rapidly declining national fruit market resulted in closure of both the California Packing Company's drying facilities and the Armsby cannery in Fairfield. Some growers in the Suisun-Fairfield area lost their land to foreclosure while others endured. A substantial number of retail stores also closed in Suisun City during the Great Depression. The Works Progress Administration brought some relief to the area's jobless by employing local residents in the reconstruction of sidewalks in Suisun City and Fairfield (Bates 1982:14–15; Kaplan 1976:9; Keegan 1989:74–75; McElvaine 1984).

World War II brought generalized economic recovery to the area and marked Fairfield's final eclipse of Suisun City as the preeminent municipality in central Solano County. The founding of the Fairfield-Suisun Army Airfield in 1942 and the subsequent development of what became Travis Air Force Base brought an abundance of new jobs to the Fairfield-Suisun area. A revived national fruit market generated prosperity for growers who survived the Great Depression, but no sizable cannery again operated in the area. Instead, fruit that was not devoted to the market for fresh produce was sent to increasingly large industrialized canneries in Sacramento and the Bay Area. Over time, area orchardists tailored their crops to the preferences of such large canneries, investing more and more of their land in Bartlett pears, Royal apricots, and Elberta peaches. These growers also benefited from water development undertaken by the Solano Irrigation District, which included a partnership with Reclamation to carry out the Solano Project, including construction of Monticello Dam and Lake Berryessa.

Striking heavy blows to waterway shipping out of Suisun City, trucking activity was boosted in northern California and Solano County by bridge construction in the Bay Area during the 1930s, and by the expansion of U.S. Highway 40 through Fairfield into a modern, multi-lane freeway during the 1960s (present-day Interstate 80). The Suisun City wharf never regained its status as a shipping point central to the local agricultural economy. Now it serves mainly as a launch for recreational boaters (Bates 1982; Kaplan 1976:14; Keegan 1989:79–84).

In the late 1970s, city officials embarked on an effort to revitalize the historic core of Suisun City centered on Main Street and surrounding streets. City officials encouraged businesses fronting Main Street to maintain an "Old West" look that represented how Main Street looked in the 1880s (Drew 1986:B6). In 1982, the city drafted a Specific Plan to revitalize Old Town and the harbor (Terrain.org 2009). The plan was not fully implemented and was revised in 1990 (City of Suisun 1999:I-1). The Specific Plan proposed keeping the historic character of Old Town and the Main Street commercial district. On Main Street,

city officials wanted to create businesses that sold present-day specialty items (e.g., clothing, jewelry, and antiques) just as the original businesses did during the turn of the century (butcher, bakers, shoe shops, etc.) (City of Suisun 1999:IV-13).

Suisun Marsh continues to support a 150-year-old recreational institution: the duck club. San Francisco duck hunters started conducting expeditions to the Marsh in 1859. A hunting report dating to 1879 stated that one person could shoot 100–200 ducks every day during the September–November hunting season. The accessibility of the Marsh was improved for duck hunters in 1879, at which time the California Pacific Railroad train tracks ran within the Marsh connecting Benicia and Fairfield. Several whistle-stop stations were established in the marsh, including Teal, Cygnus, and Jacksnipe stations. The tracks subsided at least 1 foot each year despite constant upkeep. Currently more than 150 hunting clubs occupy the marsh. The typical club consists of a frame building on piers with a veranda. (EDAW/AECOM 2006:15.)

Distribution of Cultural Resources in the Plan Area

The foregoing background information demonstrates that numerous natural and historical factors influenced human uses of the plan area, as well as the location and character of the remains of those uses on the modern landscape. The archaeological record is a product of both cultural and geologic factors. Where and when people engage in activities and leave behind artifacts are cultural phenomena. Once a site is abandoned, however, its preservation or destruction is influenced by natural and cultural processes unrelated to previous uses. Equally important in assessing the archaeological record is the potential for younger deposits to bury sites and prevent their detection. These two processes—erosion (destruction) and burial (preservation and potentially concealment)—profoundly shape the archaeological record as well as perceptions of that record. In some cases, geomorphic processes (e.g., erosion, fluvial transport, burial) can move, disturb, or bury culturally deposited artifacts, sometimes leading to pronounced misreading of the archaeological record (Rosenthal et al. 2007:151). Moreover, geomorphic processes can result in patterned natural deposits resembling cultural ones, also leading to potential misinterpretation of archaeological materials. Geoarchaeology is the study of these processes and the application of geological principles to attempt to locate buried archaeological resources.

Buried Prehistoric Site Sensitivity

Because buried sites typically lack visible features or artifacts indicating their presence to a field observer, they are often not identified during surface surveys. This issue is partially resolved by assessing the probability of discovering buried sites in different parts of a study area using geoarchaeological investigation. The ability to locate buried sites ultimately depends on a number of factors, particularly the presence of depositional or stable landforms and/or appropriate soils. In the Bay Area, where Holocene-aged alluvial fans and floodplains often

obscure or cover archaeological deposits, and where such features are causally related to the area's ample rainfall and associated runoff, depositional processes are of particular interest.

Different landscapes, landforms, and locations have differential probabilities of: (1) ever being used by humans; (2) preserving archaeological remains; and (3) containing buried archaeological sites. These factors are important in assessing the sensitivity of different areas for the presence of buried archaeological sites. Accordingly, this analysis assesses the plan area for the presence of buried archaeological sites using relevant geoarchaeological datasets (i.e., age of landform, soils, settlement pattern data).

Buried archaeological deposits can be present only in landforms that developed during the Holocene (10,000 B.P. to present), based on the known duration of human presence in California. Meyer and Rosenthal (2007:Figures 6, 8) map the following landforms in the plan area:

- Holocene- to historic-age (10,000–150 B.P.) estuarine deposits (comprises the majority of the plan area;
- undifferentiated pre-Holocene landforms (Kirby and Potrero hills);
- latest Pleistocene- to historic-age (30,000–150 B.P.) alluvial fans (northwestern portion of the plan area); and
- historic and modern (<150 B.P.) cut-and-fill areas (cuts and canals).

Of these landforms, the undifferentiated pre-Holocene deposits have minimal potential to contain buried cultural resources because these landforms developed before human presence in the plan area. Pre-Holocene landforms may, however, contain archaeological materials and other cultural resources (prehistoric and historic) on the surface. Holocene- to historic-age depositional landforms have a generally high potential to contain buried archaeological deposits; the sensitivity of latest Pleistocene- to historic-age and historic and modern landforms is more variable and poorly understood by comparison (Meyer and Rosenthal 2007:26).

The likelihood of encountering surface and buried archaeological resources in the plan area can be assessed better through regional geotechnical and soils data, as well as the distribution of known archaeological sites with respect to landform and soil types. Because it was conducted on a regional scale using relatively coarse-grained chronological data for landforms, it is important to refine Meyer and Rosenthal's (2007:Figure 6) landform age assignments with local chronological and stratigraphic data. Such data have been collected from nearby Green Valley Creek and Brown Island (ICF Jones & Stokes 2009c:6; Meyer and Rosenthal 2007:Figure 4). Bates (1977) provides additional stratigraphic information, albeit without chronological control.

In 2008, radiocarbon samples were collected from two geotechnical borings—C08 and C09. Both are near Green Valley Creek, just north of I-80, approximately 5 miles from the plan area. Fibrous charcoal samples from a depth of approximately 29 feet resulted in an 11,980–11,320 cal B.P. date from

Boring 08. The sample was collected in silty sand, about 15 feet below bay mud. The sample from Boring 09 was collected in sand with gravel from approximately 30 feet below the surface. The calibrated date for this sample is 13,260–12,970 B.P. These dates further confirm that the age of soils is conducive to the accepted timeframe for human habitation in this area and indicate that buried soils may be present at depths less than 30 feet. The radiocarbon samples are also important in that they appear to date the river valley (marked by silty sand) that preceded the marsh (indicated by bay mud) to the latest Pleistocene. (ICF Jones & Stokes 2009c:6.)

Cores obtained at Brown Island, just southeast of Van Sickle Island, indicate that Suisun Bay changed from a freshwater tidal flat to a more brackish-water tidal flat as a result of the rise in sea level about 6,000 years ago, during the middle to late Holocene. This development coincided with a period of soil formation between ca. 6000 and 4000 B.P. (Meyer and Rosenthal 2007:Figure 4).

Six soil types in the plan area have been identified as having the potential to contain buried soils, representing former land surfaces. These soil types were identified by reviewing a soil survey of Solano County and regional archaeological studies. In the Solano County soil survey, Bates (1977) describes the various soils series and variants throughout the county, including the plan area. In this soil survey, four soil variants in the plan area are described as containing buried soils (buried A horizons, abbreviated "Ab"):

- Alviso silty clay loam (An);
- Joice muck, clay subsoil variant (Jb);
- Sycamore silty clay loam, saline (St); and
- Valdez silty clay loam, clay substratum (Ve) (Table 7.7-5).

Additionally, buried archaeological deposits (CA-SOL-69, SOL-263, SOL-391, and SOL-355/H) have been identified in two soil variants that Bates (1977:16) did not identify as containing Ab horizons: Clear Lake clay (CeB) and Rincon clay loam (RoA) (Table 7.7-5). These sites are situated 4–5 miles north of the plan area, in the Green Valley vicinity (ICF Jones & Stokes 2009b).

Table 7.7-5. Soil Series in the Plan Area That Contain Buried Soils

Soil Series	Description of Buried Soil	Map Sheet(s) (after Bates 1977)	SMP Region	Acreage within Plan Area
Alviso silty clay loam (An)	Silt clay loam buried 19–60 inches below ground surface	35, 47, 52	1	1,380.70
			2	2.51
			3	184.74
			4	36.13
Clear Lake clay, 0 to 2% slopes (CeB)	28 inches below ground surface	30, 31, 35, 36, 42	2	143.72
			3	0.79
			4	18.60
Joice muck, clay subsoil variant (Jb)	Buried mineral clay at 25–35 inches below ground surface	31	1	785.43
			2	6.44
			3	453.56
Rincon clay loam, 0 to 2% slopes (RoA)	Buried	34, 35		
Sycamore silty clay loam, saline (St)	Buried silty clay loam 20–36 inches below ground surface	30, 47	1	1,894.77
Valdez silty clay loam, clay substratum (Ve)	Buried clay at 35–50 inches below ground surface	36, 48, 53, 54	4	6,866.46

The presence of buried soils in six plan area soil variants at depths of 19 to 60 inches suggests that buried landforms are located in the plan area and, by extension, buried archaeological resources may be present. One must make this inference cautiously, however, because Bates (1977:1–2) does not report where or at what intervals soil test pits were dug. Additionally, the soil survey generally characterizes only the top 5 feet of soil; no data are provided on deeper deposits. These limitations are highlighted by the fact that four known archaeological sites in the region (CA-SOL-69, SOL-263, SOL-391, and SOL-355/H) have buried archaeological materials in Clear Lake clay (CeB) and Rincon clay loam (RoA). Given Meyer and Rosenthal's (2007:27) observation that stratigraphy—including buried soils—often occurs at the scale of landforms, it is probable that buried soils are contained in the soil series or variants at depths comparable to those reported by Bates (1977).

Holocene-age sediments in the plan area are expected to be thick. Geologic studies and cores, as well as archaeological studies, indicate that the middle Holocene marsh dates to approximately 6000 B.P. and is located approximately 6–9 feet below ground surface (Meyer and Rosenthal 2007:3). The buried soils identified in Table 7.7-5, therefore, are Holocene in age and represent landforms that once could have supported human occupation prior to the onset of a new depositional cycle. Figure 7.7-1 depicts soils within the plan area that are sensitive for the presence of buried archaeological resources. Figure 7.7-1

Study Area

492-Foot Hydrological Bu er

Soil Units Correlated with Buried Sites

An, Alviso silty clay loam

Jb, Joice muck, clay subsoil variant

Ss, Sycamore silty clay loam, drained

Ve, Valdez silty clay loam, clay substratum

Soil Units Correlated with Surface Sites

AoA, Antioch-San Ysidro complex, 0 to 2 percent slopes

HaF, Hambright loam, 15 to 40 percent slopes

Pc, Pescadero clay loam

Sr, Sycamore silty clay loam

Td, Tidal marsh

Soil Units Correlated with both Surface and Buried Sites

CeB, Clear Lake clay, 2 to 5 percent slopes

RoA, Rincon clay loam, 0 to 2 percent slope

St, Sycamore silty clay loam, saline

Source: USGS Topo Quads Vine Hill, Honker Bay, Fair ield South, and Denverton (1980). Accessed via ESRI (2010)

N

GRIZZLY BAY

SUISUN BAY

SUISUN CUTOFF

SOLANO CO

CONTRA COSTA CO

Grizzly Island

Montezuma Hills

Morrow Island

Simmons Island

Pelican Point

Garnet Pt

Pt Buckler

Roe Island

Preston Pt

Gillespie Pt

Middle Ground

Snag Island

Point Pala Alto

Dutton Island

Van Sickle Island

Chipps Island

Honker Bay

Benicia-Martinez Bridge (TOLL)

Suisun Marsh

Potrero Hills

Bradmoor Island

Tyler Island

Ryer Island

Simmons Island

Pt Wall

Middle

Graphics\Project_Graphics_2006_Project_Graphics\06888.06 Suisun Marsh Project\6-EIS\EIR (07-10) SS\Fig_7_7-1_Soils.indd\Fig_7_7-1_Soils (August 24, 2010 2:01 PM) SS

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Figure 7.7-1
Suisun Marsh Plan Area Showing Soils Correlated with Surface and Buried Sites

indicates that approximately 11,848 acres of the plan area are sensitive for the presence of buried archaeological resources (see Table 7.7-6).

All 11,848 acres of the plan area, however, are not equally sensitive for the presence of buried archaeological resources. Prehistoric settlement decisions were made with respect to the presence of valued resources such as the distribution of freshwater sources. In a previous study north of the plan area, ICF Jones & Stokes (2009b) found that of the 25 archaeological sites located within 2 miles of the I-80/I-680/SR 12 Interchange Project, 14 are located 0–492 feet from a waterway. Eight of these sites are recorded as having a buried component of some kind (ICF Jones & Stokes 2009b:Table 5); however, many sites have not been excavated using modern techniques, and some have not been excavated at all. The majority of buried sites or sites with a buried component are mapped within Clear Lake clay (also found in the plan area) or Yolo loam (not found in the plan area), although one site each is located in Brentwood and Rincon clay (ICF Jones & Stokes 2009b:Figure 17). Based on these patterns, the highest potential for archaeological sites in the plan area occurs within the following soil units within 492 feet of a prehistoric waterway[2] (Figure 7.7-1):

- Alviso silty clay loam (An) [19–60 inches below ground surface];
- Clear Lake clay, 2 to 5% slopes (CeB) [about 28 inches below ground surface];
- Joice muck, clay subsoil variant (Jb) [25–35 inches below ground surface];
- Rincon clay loam, 0 to 2% slope (RoA) [depth unknown];
- Sycamore silty clay loam, saline (St) [20–36 inches below ground surface]; and
- Valdez silty clay loam, clay substratum (Ve) [35–50 inches below ground surface].

[2] This 984-foot-wide band (492 feet on either side of streams) is termed the hydrological buffer throughout this section.

Table 7.7-6. Portions of the Plan Area Sensitive for the Presence of Buried Archaeological Resources

Map Unit Symbol	Description	Region	Within Hydrologic Buffer?	Acres
An	Alviso silty clay loam	1	No	1,325.57
An	Alviso silty clay loam	1	Yes	55.13
An	Alviso silty clay loam	2	No	2.51
An	Alviso silty clay loam	3	No	179.59
An	Alviso silty clay loam	3	Yes	5.15
An	Alviso silty clay loam	4	No	36.13
CeB	Clear Lake clay, 2 to 5% slopes	2	No	143.72
CeB	Clear Lake clay, 2 to 5% slopes	3	No	0.79
CeB	Clear Lake clay, 2 to 5% slopes	4	No	18.60
Jb	Joice muck, clay subsoil variant	1	No	785.43
Jb	Joice muck, clay subsoil variant	2	No	6.44
Jb	Joice muck, clay subsoil variant	3	No	384.26
Jb	Joice muck, clay subsoil variant	3	Yes	69.30
RoA	Rincon clay loam, 0 to 2% slope	1	No	194.07
St	Sycamore silty clay loam, saline	1	No	1,764.45
St	Sycamore silty clay loam, saline	1	Yes	10.20
Ve	Valdez silty clay loam, clay substratum	4	No	6,544.08
Ve	Valdez silty clay loam, clay substratum	4	Yes	322.39
				11,847.79

The hydrologic buffer runs parallel to freshwater streams and extends 492 feet to either side of the streams.

In addition, the soil variants named immediately above are moderately sensitive for the presence of buried prehistoric archaeological resources outside the hydrological buffer (Figure 7.7-1). At depths of 6–9 feet below the present ground surface, the entire plan area is expected to contain a buried landform that represents an earlier form of Suisun Marsh (Meyer and Rosenthal 2007:3). Portions of the plan area within the hydrological buffer are highly sensitive for the presence of buried prehistoric archaeological resources to a minimum depth of 6–9 feet, whereas areas outside of the hydrological buffer are moderately sensitive for buried archaeological resources.

Prehistoric Site Sensitivity on the Plan Area's Surface

The historic-period and present-day suite of plant and animal resources in the plan area presented numerous opportunities for the Patwin. Whereas hydrological and topographic conditions in the plan area may have constrained human occupation of the Marsh, the presence of prehistoric archaeological site

CA-SOL-13 along Nurse Slough suggests that such constraints were not prohibitive. Rather, the low number of prehistoric archaeological sites recorded in the plan area is likely a product of survey bias. Of the approximately 35% of the plan area that has been surveyed, the most extensive surveys have been in reclaimed areas on the eastern margin of the plan area and in uplands such as Potrero Hills (EDAW 2003; Jones & Stokes Associates 1974, 1985; Jones & Stokes Associates and Geier and Geier Consulting 1995; Theodoratus et al. 1980; William Self Associates 1993). Table 7.7-7 summarizes information on 30 prehistoric archaeological sites in the Suisun region: landform, soil type, and whether they contain buried or surface manifestations. Of these resources, only eight are situated on soils that are not represented in the plan area and the location of one prehistoric resource (ISO-19) is unknown. The remaining 22 resources are located in soils present in the plan area, suggesting that the distribution of surface prehistoric sites may be tied to similar soil contexts and landforms in the plan area.

Table 7.7-7. Regional Prehistoric Archaeological Sites and Soil Context

Site #	Landform (Meyer and Rosenthal 2007:Figure 8)	Soils (Bates 1977)	Buried/Surface	Site in Plan Area?	Soil Unit in Plan Area?
CA-SOL-391	Alluvial fan/levee	Clear Lake clay (CeB)	Buried	No	Yes
ISO-19	N/A	N/A	Surface	No	Unknown
ISO-20	Alluvial fan/levee	Pescadero clay loam (Pc)	Surface	Yes	Yes
CA-SOL-13	Estuarine deposits	Tidal marsh (Td)	Surface	Yes	Yes
CA-SOL-14	Alluvial fan/levee	Conejo clay loam (Cr)	Surface	No	No
CA-SOL-18	Alluvial fan/levee	Yolo loam (Yo)	Surface	No	No
CA-SOL-22	Pre-Holocene, undifferentiated	Sycamore silty clay loam, saline (St)	Surface	No	Yes
CA-SOL-24/H	Alluvial fan/levee	Hambright loam (HaF)	Surface	No	Yes
CA-SOL-25/H	Alluvial fan/levee	Hambright loam (HaF)	Surface	No	Yes
CA-SOL-60	Alluvial fan/levee	Sycamore silty clay loam (Sr)	Surface	No	Yes
CA-SOL-66	Bay mud (at contact with Holocene fan deposits)	Sycamore silty clay loam (Sr)	Surface	No	Yes
CA-SOL-68	Late Pleistocene to Holocene fan deposits	Rincon clay loam (RoA)	Surface	No	Yes
CA-SOL-71/H	Alluvial fan/levee	Hambright loam (edge of Brentwood clay loam) (HaF)	Surface	No	Yes
CA-SOL-239	Alluvial fan/levee	Clear Lake clay (CeB)	Surface	No	Yes
CA-SOL-242	Alluvial fan/levee	Clear Lake clay (CeB)	Surface	No	Yes
CA-SOL-242S	Alluvial fan/levee	Clear Lake clay (CeB)	Surface	No	Yes
CA-SOL-247	Alluvial fan/levee	Sycamore silty clay loam (Sr)	Surface	No	Yes

Site #	Landform (Meyer and Rosenthal 2007:Figure 8)	Soils (Bates 1977)	Buried/Surface	Site in Plan Area?	Soil Unit in Plan Area?
CA-SOL-262	Late Pleistocene to Holocene fan deposits	Rincon clay loam (RoA)	Surface	No	Yes
CA-SOL-263	Alluvial fan/levee	Rincon clay loam (RoA)	Surface	No	Yes
CA-SOL-268	Alluvial fan/levee	Antioch-San Ysidro complex (AoA)	Surface	No	No
CA-SOL-273	Pre-Holocene, undifferentiated	Rincon clay loam (RoA)	Surface	No	Yes
CA-SOL-310	Alluvial fan/levee	Brentwood clay loam (BrA)	Surface	No	No
CA-SOL-315	Alluvial fan/levee	Clear Lake clay (CeB)	Surface	No	Yes
CA-SOL-364	Alluvial fan/levee	Brentwood clay loam (BrA)	Surface	No	No
CA-SOL-69	Alluvial fan/levee	Clear Lake clay (CeB)	Surface with buried component	No	Yes
CA-SOL-243	Alluvial fan/levee	Brentwood clay loam (BrA)	Surface with buried component	No	No
CA-SOL-263	Alluvial fan/levee	Rincon clay loam (RoA)	Surface with buried component	No	Yes
CA-SOL-355/H	Alluvial fan/levee	Clear Lake clay (CeB)	Surface with buried component	No	Yes
CA-SOL-356	Alluvial fan/levee	Yolo loam (Yo)	Surface with buried component	No	No
CA-SOL-363	Alluvial fan/levee	Yolo loam (Yo)	Surface with buried component	No	No

Table 7.7-7 shows that previously recorded prehistoric sites occur on eight soil series or variants. The same soils series and variants occupy about 7,388 acres of land within the plan area (Table 7.7-8). Figure 7.7-1 shows that these soil series and variants are located at the margins of the modern Marsh (primarily on alluvial fan uplands) and tidal flats fronting on Suisun Bay, Honker Bay, and Nurse Slough. Although other soil variants in the plan area may be sensitive for the presence of surface prehistoric sites, the soil series and variants in Table 7.7-8 and the Pleistocene-aged Potrero and Kirby Hills are regarded as highly sensitive for the presence of such resources. Additional survey outside these areas may indicate that other areas have heightened sensitivity.

Table 7.7-8. Portions of the Plan Area Sensitive for the Presence of Surface Prehistoric Sites

Map Unit Symbol	Description	Region	Within Hydro Buffer?	Acres
AoA	Antioch–San Ysidro complex, 0 to 2% slopes	1	No	211.366
AoA	Antioch–San Ysidro complex, 0 to 2% slopes	2	No	503.245
AoA	Antioch–San Ysidro complex, 0 to 2% slopes	2	Yes	6.856
AoA	Antioch–San Ysidro complex, 0 to 2% slopes	3	No	567.169
AoA	Antioch–San Ysidro complex, 0 to 2% slopes	4	No	755.667
CeB	Clear Lake clay, 2 to 5% slopes	2	No	143.723
CeB	Clear Lake clay, 2 to 5% slopes	3	No	0.785
CeB	Clear Lake clay, 2 to 5% slopes	4	No	18.605
HaF	Hambright loam, 15 to 40% slopes	1	No	102.725
Pc	Pescadero clay loam	1	No	314.464
Pc	Pescadero clay loam	3	No	177.729
Pc	Pescadero clay loam	4	No	254.107
RoA	Rincon clay loam, 0 to 2% slope	1	No	194.066
Sr	Sycamore silty clay loam	1	No	541.965
St	Sycamore silty clay loam, saline	1	No	1,764.453
St	Sycamore silty clay loam, saline	1	Yes	10.196
Td	Tidal marsh	1	No	175.004
Td	Tidal marsh	2	No	51.332
Td	Tidal marsh	2	Yes	172.513
Td	Tidal marsh	3	No	97.473
Td	Tidal marsh	3	Yes	60.910
Td	Tidal marsh	4	No	1,094.925
Td	Tidal marsh	4	Yes	168.483
				7,387.76

Historic-Period Cultural Resources in the Plan Area

Table 7.7-2 demonstrates that a variety of historic-period cultural resources is present in the plan area: ranch properties; railroad grades, stations, and trestles; refuse scatters; pump houses; levees; fish screens; water conveyance features; landings; utility lines; duck clubs; roads; and a historic district (Montezuma Slough Rural Historic Landscape). The majority of known historic-period cultural resources in the plan area are located along sloughs and levees, bays, or within 492 feet of sloughs, levees, and bays. The distribution of historic-period resources in the plan area is largely predictable from historic maps and aerial photographs of the Marsh.

Cultural Resources Sensitivity of the Plan Area: A Summary

The preceding Affected Environment for cultural resources described human use of the plan area from prehistoric to recent times, as well as the range of cultural resources expected to be present in the Marsh. The Affected Environment section indicates that the plan area is not homogenous with respect to cultural resource sensitivity (see Table 7.7-9). Regions 1 and 4 have more sensitivity for the presence of buried archaeological resources than they do for surface archaeological sites. Regions 2 and 3, on the other hand, are more sensitive for the presence of surface archaeological resources than buried ones. Historic-period cultural resources are distributed relatively evenly across the plan area, and the majority are evident on historic maps (see Owens 1991).

Table 7.7-9. Summary of Cultural Resource Sensitivity in the Plan Area

Region	# Recorded Resources	High Buried Site Potential (ac)	Moderate Buried Site Potential (acres)	High Surface Site Potential (acres)	Moderate Surface Site Potential (acres)
1	7	65.33	4,069.51	10.20	3,304.04
2	1	0	152.68	179.37	698.30
3	2	74.45	564.63	60.91	843.16
4	25	322.39	6,598.81	168.48	2,123.30

Regulatory Setting

Federal

Under NEPA, federal agencies must "preserve important historic, cultural and natural aspects of our national heritage" (Section 101 [b][4]). Section 106 of NHPA (16 USC 470f) requires federal agencies to take into account the effect(s) of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. For tidal wetland restoration, the Section 106 lead agency would be the USFWS, whereas Reclamation would be the lead agency for the managed wetland activities (including activities funded by the PAI fund). The Section 106 process normally includes the following steps:

1. Initiate the Section 106 process.
2. Identify and evaluate historic properties.
3. Assess the effects of the undertaking on historic properties within the area of potential effects (APE).
4. If historic properties are subject to adverse effects, Reclamation, the State Historic Preservation Officer (SHPO), and any other consulting parties

(including Native American Tribes) continue consultation to seek ways to avoid, minimize, or mitigate the adverse effect. A memorandum of agreement (MOA) is usually developed to document the measures agreed upon to resolve the adverse effects.

5. Proceed in accordance with the terms of the MOA.

The standard Section 106 process for assessing effects on historic properties entails a thorough program of research, consultation, fieldwork, and reporting, commensurate with the scale of the undertaking and its effects. This is the process outline in the list above. On the other hand, where property access is restricted, undertakings are unusually large or complex, or the effects of the undertaking or group of undertakings are repetitive and predictable in nature, 36 CFR 800.14(b) permits the federal agency to implement a phased approach to historic properties management, codified in a programmatic agreement (PA). Such a document identifies the parties responsible for various cultural resource management tasks, standards, and procedures for all expectable management tasks, and reporting and monitoring procedures.

Historic properties are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP (36 CFR 800.16[1]). For federal projects, cultural resource significance is evaluated in terms of eligibility for listing in the NRHP. The NRHP criteria for evaluation are defined at 36 CFR 60.4 as follows: The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that

A. are associated with events that have made a contribution to the broad pattern of our history;

B. are associated with the lives of people significant in our past;

C. embody the distinct characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. have yielded, or are likely to yield, information important in prehistory or history (36 CFR 60.4).

State

CEQA requires that public agencies (in this case, DFG) that finance or approve public or private projects must assess the impacts of the project on cultural resources. CEQA requires that alternative plans or mitigation measures be considered if a project would result in significant impacts on important cultural resources. However, only impacts on significant cultural resources need to be addressed. Therefore, prior to the development of mitigation measures, the

importance of cultural resources must be determined. The steps that normally are taken in a cultural resources investigation for CEQA compliance are listed below.

1. Identify cultural resources.
2. Evaluate the significance of resources.
3. Evaluate the impacts of a project on all resources.
4. Develop and implement measures to mitigate the impacts of the project only on significant resources, namely historical resources and unique archaeological resources.

The State CEQA Guidelines define three ways that a cultural resource may qualify as a historical resource for the purposes of CEQA review.

1. The resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR).
2. The resource is included in a local register of historical resources, as defined in Public Resources Cord (PRC) 5020.1(k), or is identified as significant in a historical resource survey meeting the requirements of PRC 5024.1(g) unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. The lead agency determines the resource to be significant as supported by substantial evidence in light of the whole record (14 California Code of Regulations [CCR] 15064.5[a]).

A cultural resource may be eligible for inclusion in the CRHR if it:

- is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
- is associated with the lives of persons important in our past;
- embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values; or
- has yielded, or may be likely to yield, information important in prehistory or history.

In addition, CEQA distinguishes between two classes of archaeological resources: archaeological resources that meet the above definition of a historical resource, and unique archaeological resources. An archaeological resource is considered unique if it:

- is associated with an event or person of recognized significance in California or American history or of recognized scientific importance in prehistory;
- can provide information that is of demonstrable public interest and is useful in addressing scientifically consequential and reasonable research questions; or

- has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind. (PRC 21083.2.)

Local

Solano County General Plan

The Solano County General Plan contains two policies concerning Historical and Archaeological Features.

1. The County shall identify and preserve its significant historical structures and features.
2. The County shall establish a mechanism for the identification, review and protection of significant archaeological sites. (Solano County Planning Department 1992:47.)

Environmental Consequences

Assessment Methods

Impact assessments for cultural resources focus on properties eligible for listing in the NRHP (historic properties) or the CRHR, or considered significant resources or unique archaeological resources under CEQA. The criteria described immediately below are used to determine whether the impacts of the proposed project on cultural resources are significant.

Significance Criteria

Federal

According to 36 CFR 800.5, an undertaking would have an adverse effect on historic properties if the effect alters the characteristics[3] that make a property eligible for inclusion in the NRHP. Such effects also would be considered significant under NEPA. Adverse effects can occur when prehistoric or historic archaeological sites, structures, or objects listed in or eligible for listing in the NRHP are subjected to the following phenomena:

[3] Cultural resource managers often refer to these characteristics as character-defining elements or features. Character-defining features are those characteristics of a historic property, historical resource, or unique archaeological resource that convey its significance; the loss of character-defining elements impedes a property's ability to convey its historical significance. The importance of character-defining elements in cultural resource assessments is made clear in National Register Bulletin 15, which mentions "character" in this context 42 times (Andrus and Shrimpton 1997).

1. Physical destruction of or damage to all or part of the property.
2. Alteration of the property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 CFR 68) and applicable guidelines.
3. Removal of the property from its historic location.
4. Change in the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
5. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.
6. Neglect of the property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization.
7. Transfer, lease, or sale of the property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

State

This analysis uses criteria from 14 CCR 15064.5(b)(1) and (2) that identify a significant impact as one with the potential to cause a substantial adverse change in the significance of a historical resource or unique archaeological resource. *Substantial adverse change in the significance of a resource* means the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the resource would be materially impaired. The significance of a historical resource is materially impaired when a project results in demolition or material alteration in an adverse manner of those physical characteristics of a resource that:

- convey its historical significance and that justify its inclusion in, or eligibility for inclusion in, the CRHR;
- account for its inclusion in a local register of historical resources pursuant to PRC 5020.1(k) or its identification in a historical resources survey meeting the requirements of PRC 5024.1(g), unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
- convey its historical significance and that justify its eligibility for inclusion in the CRHR as determined by a lead agency for purposes of CEQA.

Local

No local significance criteria have been established by the County of Solano or the City of Suisun.

Environmental Impacts

No Action Alternative

Under the No Action Alternative, the SMP would not be implemented. As a result, the amount of restoration in the Marsh likely would be limited.

The No Action Alternative includes the following assumptions related to activities and associated impacts:

- It is assumed for purposes of this No Action Alternative evaluation that approximately 700 additional acres could be restored without the SMP.
- Managed wetland activities may become less frequent as a result of permitting difficulty. This could result in fewer ground-disturbing activities within the plan area.
- Any levee breaches that occur in inaccessible areas would not be fixed and passive restoration would occur in these areas. Such events would result in damage to recorded and as-yet-unidentified cultural resources (at a minimum including any failed historic-era levees).

Although damage to or loss of cultural resources likely would occur under the No Action Alternative, the expected minimal habitat restoration and levee maintenance likely would engender fewer impacts on cultural resources than would Alternatives A–C.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

The locations of restoration activities, which could be implemented by the Principal Agencies or other agencies, are presently unknown. Tidal restoration activities in the plan area would engender several effects on cultural resources. These activities are:

- maintenance of levee and water control features,
- levee lowering or breaching,
- upgrading or constructing new exterior levees adjacent to restoration areas, and

- inundation of restoration areas.

Impact CUL-1: Damage to Montezuma Slough Rural Historic Landscape as a Result of Ground-Disturbing Activities along Montezuma Slough

Ground-disturbing activities such as levee modifications, conversion of managed wetlands and uplands to managed wetlands, replacement of infrastructure, and enhancement of vernal pool and riparian habitat may result in damage to character-defining features of the Montezuma Slough Rural Historic Landscape. Character-defining features of this historic district include the slough levees, landscaping elements that define existing and former historic landings, pilings and piers, standing structures, archaeological sites, and shipwrecks. Damage to or the loss of one or more character-defining elements of the district may constitute an adverse impact on the resource as a whole. Such impacts may be restricted in scope; the impact need not be at an extensive, "landscape" level to constitute an adverse impact on the Montezuma Slough Rural Historic Landscape but may affect individual elements that contribute to the landscape. The Montezuma Slough Rural Historic Landscape is potentially eligible for listing in the NRHP and CRHR and therefore is a likely candidate for designation as a historic property under Section 106 of the NHPA and a historical resource for the purposes of CEQA.

The historic site of Mein's Landing provides an example of the effects that tidal restoration activities would have on the Montezuma Slough Rural Historic Landscape. Levee breaching and inundation at Mein's Landing would result in damage to or the destruction of the historic site, which Esser (1999:4–5, Figure 2) identifies as both a site and a constituent element of the Montezuma Slough Rural Historic Landscape. Mein's Landing also could qualify as a historic property, historical resource, or unique archaeological resources on its own merit.

Inundation would create an aqueous environment in the vicinity of Mein's Landing. Such environments are known to hasten the degradation of character-defining elements of cultural resources, such as historic buildings and structures and archaeological sites. The effects of prolonged and repeated flooding include structural degradation (oxidation and weakening of metals) and the decay of archaeological site constituents. (Thorne 1991:Figure 1.) A levee breach would affect Mein's Landing by changing the land–water interface—a potential character-defining feature of Mein's Landing—between the resource and Montezuma Slough. The loss of or damage to character-defining features of Mein's Landing, if it is determined to be a historic property, historical resource, or unique archaeological resource, would constitute an adverse effect under NEPA and a significant impact under CEQA. Implementation of Mitigation Measure CUL-MM-1 would reduce the severity of Impact CUL-1, although not necessarily to a less-than-significant level.

Conclusion: Significant and unavoidable.

Mitigation Measure CUL-MM-1: Document and Evaluate the Montezuma Slough Rural Historic Landscape, Assess Impacts, and Implement Mitigation Measures to Lessen Impacts

No formal evaluation of the Montezuma Slough Rural Historic Landscape to determine resource significance under the NRHP criteria and CEQA has been undertaken to date; Esser (1999) identifies the presence of this rural historic landscape, but this study does not constitute complete documentation of the resource nor does it evaluate its significance. Similarly, the exact locations of the effects described above (Impact CUL-1) are unknown, as are the frequency and severity of impacts on the Montezuma Slough Rural Historic Landscape. Because this impact is defined only conceptually in this EIS/EIR (commensurate with the detail of the project description), mitigation measures for this impact can be posed only conceptually.

During subsequent project-level environmental impact analyses conducted for the programmatic plan actions identified herein, the state or federal lead agency (as applicable) will conduct an inventory and significance evaluation of the Montezuma Slough Rural Historic Landscape. The inventory and evaluation will be conducted according to the following standards.

- The implementing regulations for Section 106 of the NHPA (36 CFR 800.4).
- The State CEQA Guidelines (14 CCR 15064.5[a]).
- *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (48 Federal Register [FR] 44716–44742).
- *The Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to the National Historic Preservation Act* (including the Guidelines for the Treatment of Cultural Landscapes).
- Applicable NRHP bulletins and National Park Service technical briefs (Andrus and Shrimpton 1997; Birnbaum 1994; McClellan et al. 1995).

If, based on the findings of the inventory, the Montezuma Slough Rural Historic Landscape does not constitute a historic property or historical resource, implementation of the mitigation measure would reduce the severity of Impact CUL-1 to a less-than-significant level.

On the other hand, if the Montezuma Slough Rural Historic Landscape constitutes a historic property or historical resource, the lead federal or state agency, as applicable, will devise measures to reduce the severity of significant effect(s) on the property and will require implementation of the measures prior to implementation of the proposed project. Under CEQA, the lead agency will propose such mitigation measures in an EIR. For federal actions or undertakings, the lead federal agency will resolve any adverse impacts through the provisions of 36 CFR 800.6, which would be codified in an MOA and in the proposed action's EIS and ROD. Implementation of the mitigation measures would reduce the severity of the impact, although not necessarily to a less-than-significant or non-adverse level. Implementation of the measures would reduce the severity of the impact, though not necessarily to a less-than-significant or non-adverse level.

Impact CUL-2: Damage to or Destruction of Known Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas

Twenty-four previously recorded cultural resources are located in lowland and marsh areas and therefore could be affected by tidal marsh restoration in these areas (Table 7.7-10). Restoration activities could damage or destroy these cultural resources by displacing or breaking artifacts or demolishing structural features. With the exception of ISO 20[4], the cultural resources listed in Table 7.7-10 are considered historic properties and historical resources for the purposes of the proposed project.

Table 7.7-10. Previously Recorded Cultural Resources Affected by Impacts CUL-2 and CUL-3

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance[5]
CA-SOL-13	Burial and village site	High elevation tidal marsh, managed wetland area	2	Undetermined
CA-SOL-366H	Historic refuse scatter	Lowland grassland	4	Undetermined
CA-SOL-368H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-369H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-370H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-371H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-372H	Historic pump house	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-373H	Historic pump house and refuse	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-374H	Historic refuse scatter	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-375H	Historic dump	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
Ca-SOL-376H	Ranching related	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-377H	Historic railroad grade, trestles, and station	Farmed bayland, managed wetland area, uplands	4	Recommended eligible (NRHP/CRHR)
CA-SOL-378H	Ranching debris	Grazed bayland	4	Recommended ineligible (NRHP/CRHR)

[4] Isolated artifacts are rarely considered historic properties, historical resources, or unique archaeological resources because of their limited information potential.

[5] Cultural resources recommended as ineligible for NRHP/CRHR listing are included in this table because a federal agency and the SHPO have not made formal significance determinations concerning them. The previous recommendations would need to be taken into account, not taken at face value, when assessing effects on cultural resources in the plan area.

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance[5]
CA-SOL-415H	Montezuma Wetlands flume structure	Managed wetland area	4	Undetermined
P-48-207	Historic ditch	Managed wetland area	1	Undetermined
P-48-209	Southern Pacific Railroad	Managed wetland area	1	Undetermined
P-48-442	Utility line	Managed wetland area	1	Undetermined
P-48-443	Lingos Landing	Major slough	4	Undetermined
P-48-513	Birds Landing Dock and Road	Managed wetland area	4	Undetermined
P-48-514	Dutton's Landing	Ruderal	4	Undetermined
P-48-549	Central Pacific Railroad	Marsh, upland	1	Undetermined
ISO 20	Isolated projectile point	Managed wetland area	4	Ineligible
None	Mein's Landing	Major slough	4	Undetermined
None	Montezuma Slough Rural Historic Landscape	Major slough, marsh	3, 4	Undetermined

Conclusion: Less than significant with Mitigation Measure CUL-MM-2 incorporated.

Mitigation Measure CUL-MM-2: Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Resources prior to Ground-Disturbing Activities

The lead federal or state agency, as applicable, will evaluate previously recorded cultural resources located in restoration areas for NRHP and CRHR eligibility. The lead federal or state agency will ensure that all NRHP- and CRHR-eligible properties are fenced prior to start of ground-disturbing activities; no further action will be required for ineligible properties. The lead federal or state agency will use the maps contained in the site records for the eligible properties to establish site boundaries in the field. The lead federal or state agency will demarcate the site boundaries using t-stakes and orange fencing. Signs marking the fenced area as an environmentally sensitive area will be placed at suitable intervals along the fence. The lead federal or state agency will examine the fencing periodically to ensure that the barrier is not crossed and clearly delimits the site boundaries throughout the duration of ground-disturbing activities. Implementation of this mitigation measure would reduce Impact CUL-2 to a less-than-significant level.

Impact CUL-3: Damage to Known Cultural Resources as a Result of Inundation

Twenty-four previously recorded cultural resources are located in lowland and marsh areas and therefore could be affected by inundation of such areas (Table 7.7-10). Inundation would create an aqueous environment in the vicinity of these cultural resources, which is known to hasten the degradation of character-defining elements of cultural resources, such as historic buildings and

structures and archaeological sites. The effects of prolonged and repeated inundation include structural degradation (oxidation and weakening of metals) and the decay of archaeological site constituents[6] (Thorne 1991:Figure 1). The loss of or damage to character-defining features of historic properties, historical resources, or unique archaeological resources would constitute a significant effect under NEPA and a significant impact under CEQA. With the exception of ISO 20[7], the cultural resources listed in Table 7.7-10 are considered historic properties and historical resources for the purposes of the proposed project. Implementation of Mitigation Measure CUL-MM-3 or CUL-MM-4 would reduce Impact CUL-3, but not necessarily to a less-than-significant level.

Conclusion: Significant and unavoidable.

Mitigation Measure CUL-MM-3: Protect Known Cultural Resources from Damage Incurred by Inundation through Plan Design (Avoidance)
The lead federal or state agency, as applicable, will evaluate the significance of the cultural resources listed in Table 7.7-10 prior to inundation of lands in the restoration areas. For cultural resources that the lead federal or state agency determines ineligible for listing in the NRHP and CRHR, no further action would be required. The lead federal or state agency will, on the other hand, avoid damaging NRHP- and CRHR-eligible cultural resources through plan design, using detailed maps of the cultural resources concerned and field reviews to avoid any eligible properties. Implementation of Mitigation Measure CUL-MM-3 would reduce Impact CUL-3 to a less-than-significant level. In the event that implementation of CUL-MM-3 is infeasible, the lead federal or state agency will implement Mitigation Measure CUL-MM-4.

Mitigation Measure CUL-MM-4: Resolve Adverse Effects prior to Construction
Prior to approval and final design of restoration activities, the lead federal or state agency, as applicable will resolve adverse effects in accordance with Section 106 of the NHPA and CEQA, as applicable. Such effects resolutions may include Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation of historic buildings and structures, data recovery excavations of archaeological sites, preparation of public interpretive documents, and documentation of these actions. Additional mitigation work would reduce the severity of Impact CUL-3, although not necessarily to a less-than-significant level.

Impact CUL-4: Inadvertent Damage to or Destruction of As-Yet-Unidentified Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas

Cultural resource professionals have surveyed little of the plan area, yet 34 cultural resources have been identified to date and more than 11,000 acres of the plan area are sensitive for the presence of buried prehistoric archaeological

[6] Affected site constituents include animal bones, shell, plants, charcoal, granular stone artifacts, and ceramics.
[7] Isolated artifacts are rarely considered historic properties, historical resources, or unique archaeological resources because of their limited information potential.

resources (Tables 7.7-2, 7.7-5, and 7.7-6). In the absence of professionally conducted cultural resource inventories, tidal marsh restoration has a high probability of damaging or destroying cultural resources, inclusive of the historic built environment and archaeological resources. Because of multiple property-access prohibitions, the conceptual nature of the actions in the proposed project, and because not all portions of the plan area would be affected by these activities, it is not feasible to conduct a cultural resources survey of the plan area in support of this EIS/EIR. Impact analysis therefore must be conceptual in nature, with detailed impact analyses transpiring during project-specific implementation.

To estimate the likelihood that restoration activities would affect as-yet-unidentified surface and buried cultural resources, Table 7.7-11 compares the extent of restoration activities to the pervasiveness of archaeologically sensitive areas in the plan area. The table treats the plan area regions separately because these regions differ in size, acreage slated for restoration, and archaeological potential. The scope of potential effects on cultural resources is assessed by comparing the amount of restoration within each region to the extent of archaeologically sensitive areas in each region. The amounts given in Table 7.7-11 are expressed as percentages of regional acreage.

Table 7.7-11. Comparison of Restoration Areas to Archaeologically Sensitive Areas, Alternative A

Region	Total Acreage	Restoration Acreage	Percent Slated for Restoration	High Buried Site Potential (%)	Moderate Buried Site Potential (%)	High Surface Site Potential (%)	Moderate Surface Site Potential (%)
1	11,905	1,000	8.4	0.6	34.2	0.1	27.8
		1,500	12.6				
2	7,302	920	12.6	0.0	2.1	2.5	9.6
		1,380	18.9				
3	2,975	360	12.2	2.5	19.0	2.1	28.3
		540	18.2				
4	28,667	1,720	6.0	1.1	23.0	0.6	7.4
		2,580	9.0				

Table 7.7-11 suggests that the probability of restoration areas being located in areas that are highly sensitive for the presence of buried and surface-manifested prehistoric archaeological resources is low. Moderately sensitive areas, on the other hand, are prevalent throughout the plan area, with the exception of Region 2. Historic-period archaeological and built-environment resources in the plan area, however, are almost exclusively located along existing waterways; this proximity renders historic-period resources vulnerable to damage from restoration activities. These resources include duck clubs, levees, water conveyance and drainage features, and transportation features; their locations largely can be predicted through the use of historic maps (see Owens 1991).

Comparatively speaking, Region 1 possesses the highest percentage of restoration activities occurring within areas sensitive for the presence of buried archaeological resources (34.8%), even considering that a larger proportion of Region 3 would see restoration activities than would Region 1. Region 2 has the lowest percentage (2.1) of areas sensitive for buried archaeological resources. The likelihood of restoration activities being situated in areas sensitive for the presence of surface-manifested prehistoric resources is highest in Region 3 (30.4%), lowest in Region 4 (8.0%).

Given the above information, construction in unsurveyed areas likely would result in damage to or destruction of cultural resources that may meet the criteria of historic property, historical resource, or unique archaeological resource. Damage to or destruction of historical resources and unique archaeological resources constitutes a significant impact under CEQA (14 CCR 15064.5) and an adverse effect under Section 106 of the NHPA.

Conclusion: Significant and unavoidable.

Mitigation Measure CUL-MM-5: Conduct Cultural Resource Inventories and Evaluations and Resolve Any Adverse Effects
Prior to ground-disturbing activities in restoration areas, the lead federal or state agency, as applicable, will conduct a cultural resources inventory of the restoration areas according to the standards cited in Mitigation Measure CUL-MM-1. Identification methods will include surface surveys and, for areas likely to contain buried archaeological resources, subsurface testing methods commensurate with the scale of ground disturbance.

If any cultural resources are determined to be historic properties and ground-disturbing activities are found to result in adverse effects, the lead federal or state agency will resolve the effects in accordance with Section 106 of the NHPA or CEQA, as applicable.

If no cultural resources are identified in specific restoration areas, or identified resources are not determined to be significant, implementation of CUL-MM-5 would reduce this impact to a less-than-significant level.

If significant cultural resources are present in the restoration areas, the post-mitigation significance of Impact CUL-4 would depend on the magnitude of the physical effect. In cases where small portions of the resources are affected by the project, CUL-MM-5 would reduce this impact to a less-than-significant level. In the event of major damage or complete destruction of any significant cultural resources, CUL-MM-5 would reduce the severity of the impact, although it would still be significant.

Impact CUL-5: Damage to or Destruction of Human Remains as a Result of Ground-Disturbing Activities

Human remains have been identified in the plan area at previously recorded Native American archaeological sites. Human remains can constitute a special class of cultural resource and are protected by state and federal legislation. In

addition, human remains, particularly those of Native Americans, are sometimes found in levees because of the incorporation of archaeological sites into levees or the inadvertent use of borrow material obtained from archaeological sites. Much of the plan area has not been surveyed for the presence of cultural resources, leaving moderate potential for ground-disturbing activities to unearth and damage human remains. Tidal marsh restoration, creation, and protection; conversion of managed wetlands and uplands; vernal pool habitat enhancement; riparian habitat enhancement (passive flooding, setback and perimeter levee building); and levee management have the potential to damage or destroy human remains during ground-disturbing activities. Implementation of the Environmental Commitment Inadvertent Discovery of Cultural Resources (Chapter 2) that complies with applicable state and federal laws and regulations concerning human remains would reduce this impact to less than significant.

Conclusion: Less than significant. No mitigation required.

Managed Wetland Activities

Managed wetland activities will be undertaken by landowners in the Marsh. The location of these activities within the plan area is presently unknown.

Impact CUL-6: Damage to or Destruction of Shipwrecks[8] or Other Submerged Resources as a Result of Channel Dredging

A review of the California State Lands Commission's (CSLC's) California Shipwreck database failed to indicate the presence of known shipwrecks in tidal sloughs in the plan area, although one is reported in Collinsville (Esser 1999:62). Nevertheless, the CSLC's website does not provide information concerning the comprehensiveness of the database or the methods employed in compiling it. The database likely does not include all shipwrecks in the project vicinity but only those reported or whose location could be reconstructed from navigational data. Therefore, channel dredging in project-area tidal sloughs may damage or destroy shipwrecks that have not yet been identified. Historic-era shipwrecks may qualify as historic properties under Section 106 of the NHPA as well as historical resources or unique archaeological resources for the purposes of CEQA.

Conclusion: Less than significant with Mitigation Measure CUL-MM-6 incorporated.

[8] Delgado and A National Park Service Maritime Task Force (1992:3) define a shipwreck as a "submerged or buried vessel that has foundered, stranded, or wrecked. This includes vessels that exist as intact or scattered components on or in the sea bed, lake bed, river bed, mud flats, beaches, or other shorelines." As submerged or buried examples of historic vessels, a shipwreck may be "any craft built to navigate a waterway…regardless of type of construction or motive of power employed" (Delgado and A National Park Service Maritime Task Force 1992:3). In short, a shipwreck may range in size and complexity from canoe to battleship; shipwrecks in the relatively shallow Suisun Marsh waterways are likely to represent the smaller end of this range.

Mitigation Measure CUL-MM-6: Stop Ground-Disturbing Activities, Evaluate the Significance of the Discovery, and Implement Mitigation Measures as Appropriate

In the event that a shipwreck is encountered during channel dredging, all channel-disturbing activities within a minimum of 100 feet of the shipwreck must cease. Reclamation, DFG, or DWR (as appropriate) will notify and commission a qualified maritime or underwater cultural resource specialist to inspect the find. The cultural resource specialist will record the location of the shipwreck, the circumstances leading to the inadvertent discovery, the condition and character of the shipwreck, and the degree of damage incurred as a result of channel dredging. The cultural resource specialist also will make recommendations as to the appropriate distance from the shipwreck at which channel dredging may continue. The cultural resource specialist will evaluate the shipwreck to determine whether it constitutes a historic property, historical resource, or unique archaeological resource. The cultural resource specialist and all work associated with documentation and evaluation of shipwrecks must meet the Secretary of the Interior's Standards for professional archaeologist or historian (48 FR 44720–44723) and incorporate the National Park Service's guidance concerning the nomination of shipwrecks to the NRHP (Delgado and A National Park Service Maritime Task Force 1992).

Impact CUL-7: Damage to or Destruction of Known Cultural Resources Resulting from Managed Wetland Activities

Fifteen previously recorded cultural resources are located in managed wetland areas and therefore could be affected by discing, construction of new interior ditches, and construction of new interior levees in these areas (Table 7.7-12, 7-13). These activities would damage or destroy these cultural resources by displacing or breaking artifacts or demolishing structural features.

Table 7.7-12. Previously Recorded Cultural Resources That Could Be Affected by Discing, Construction of New Interior Ditches, and Construction of New Interior Levees in Managed Wetland Units

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance
CA-SOL-13	Burial and village site	High elevation tidal marsh, managed wetland area	2	Undetermined
CA-SOL-368-H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-369-H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-370-H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-371-H	Historic refuse scatter	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-372-H	Historic pump house	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)

Resource Designation	Description	Environmental Context	Suisun Marsh Region	Significance
CA-SOL-373-H	Historic pump house and refuse	Managed wetland area	4	Recommended ineligible (NRHP/CRHR)
CA-SOL-377-H	Historic railroad grade, trestles, and station	Farmed bayland, managed wetland area, uplands	4	Recommended eligible (NRHP/CRHR)
CA-SOL-415-H	Montezuma Wetlands flume structure	Managed wetland area	4	Undetermined
P-48-207	Historic ditch	Managed wetland area	1	Undetermined
P-48-209	Southern Pacific Railroad	Managed wetland area	1	Undetermined
P-48-442	Utility line	Managed wetland area	1	Undetermined
P-48-513	Birds Landing Dock and Road	Managed wetland area	4	Undetermined
ISO 20	Isolated projectile point	Managed wetland area	4	Ineligible for listing (NRHP/CRHR)
None	Montezuma Slough Rural Historic Landscape	Major slough, marsh	3, 4	Undetermined

Conclusion: Less than significant with Mitigation Measure CUL-MM-7 incorporated.

Mitigation Measure CUL-MM-7: Prepare and Implement a Programmatic Agreement and Historic Properties Treatment Plan; Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Properties prior to Ground-Disturbing Activities

Programmatic Agreement and Historic Properties Treatment Plan
The proposed project will be implemented over 30 years in several phases. The current level of detail in the project description is insufficient to discuss project impacts, knowledge of which would influence with certainty the level of inventory effort with respect to the historic landscape. Similar problems with other project effects identified in this section (see below) confound attempts to inventory and evaluate cultural resources in the plan area according to the standard Section 106 process described at 36 CFR 800. Therefore, a Programmatic Agreement (PA) and Historic Properties Treatment Plan (HPTP) are the most effective ways to accommodate both the program requirements and compliance with CEQA, NEPA, and Section 106 of the NHPA. Under Section 106, a PA can be used:

i. when effects on historic properties are similar and repetitive or are multi-state or regional in scope;

ii. when effects on historic properties cannot be fully determined prior to approval of an undertaking;

iii. when nonfederal parties are delegated major decision-making responsibilities;

iv. where routine management activities are undertaken at federal installations, facilities, or other land-management units; or

v. where other circumstances warrant a departure from the normal Section 106 process. (36 CFR 800.14[b][1].)

The proposed project meets the first four criteria for use of a PA. First, certain effects, particularly under the managed wetland activities (see impact discussion later herein), would be implemented repeatedly. Second, the present project description is not in a stage of development that is sufficient to complete historic property identification efforts. Third, nonfederal parties likely will have major decision-making responsibilities with respect to implementation of the SMP. Finally, routine management (maintenance) activities will be undertaken at federal facilities under the SMP.

Reclamation will prepare the PA, which will identify standards, responsible parties, and timeframes for identifying and resolving effects on historic properties. The purpose of the PA is to document the fact that all responsible parties to the project understand there will be adverse effects on historic properties and that they agree on methods by which to resolve those adverse effects. The HPTP, on the other hand, will explain just how adverse effects will be resolved. The HPTP will provide a tailored program for historic property identification and treatment for the undertaking. The HPTP will contain research themes for expected property types (prehistoric archaeological properties, historic built environment properties, etc.) to guide all aspects of cultural resources inventories conducted for the undertaking. The research themes will be geared specifically to frame NRHP and CRHR evaluations of identified properties. The PA and HPTP will contain provisions for project activities undertaken by nonfederal entities such as DWR and SRCD. Preparation and implementation of the PA and HPTP will be completed prior to implementation of the SMP.

The PA and HPTP discussed in Mitigation Measure CUL-MM-1 will stipulate evaluation procedures for the determination of, and consultation regarding, NRHP and CRHR eligibility. Reclamation will ensure that any eligible properties are fenced prior to commencement of ground-disturbing activities; no further action will be required for ineligible properties. Reclamation will use the maps contained in the site records for the eligible properties to establish site boundaries in the field. Reclamation will demarcate the site boundaries using t-stakes and orange fencing. Signs marking the fenced area as an environmentally sensitive area will be placed at suitable intervals along the fence. Reclamation will examine the fencing periodically to ensure that the barrier is not crossed and clearly delimits the site boundaries throughout the duration of ground-disturbing activities. Implementation of this mitigation measure would reduce Impact CUL-7 to a less-than-significant level.

Impact CUL-8: Damage to or Destruction of As-Yet-Unidentified Cultural Resources in Uninspected Areas as a Result of Other Ground-Disturbing Managed Wetland Activities

Impact CUL-8 is similar to the impact described for the project under Impact CUL-4. The management activities proposed could result in damage or destruction of unknown cultural resources. In addition, some current activities would be modified and some additional activities created. The activities and the types of cultural resources likely to be affected by each activity are summarized in Table 7.7-13 below.

Table 7.7-13. Managed Wetland Activities and Their Potential to Affect Cultural Resources

Marsh Management Activity	Likely Affected Resource Type	Applicable PAI Funding
Repairing existing interior and exterior levees	HBE	JUFI (interior levees only)
Coring existing interior levees	HBE	JUFI, PAI Fund 50/50
Grading pond bottoms for water circulation	HBE; PArch; HArch; BArch	JUFI, PAI Fund 50/50
Creating pond bottom spreader V ditches	HBE; PArch; HArch; BArch	JUFI, PAI Fund 50/50
Repairing existing interior water control structures	HBE	JUFI, PAI Fund 75/25, PAI Fund 50/50
Replacing pipe for existing water control structures or installing new interior water control structures	HBE	JUFI, PAI Fund 75/25, PAI Fund 50/50
Installing new blinds or relocating, replacing, or removing existing blinds	HBE; PArch; HArch; BArch	
Discing managed wetlands	HBE; PArch; HArch; BArch	
Installing drain pumps and platforms	HBE	JUFI, PAI Fund 75/25
Replacing riprap on interior levees	No, if screened	
Replacing riprap on exterior levees	No, if screened	
Coring of existing exterior levees	HBE	JUFI, PAI Fund 50/50
Repairing exterior water control structures (gates, couplers, and risers)	HBE	PAI Fund 75/25
Installing or replacing pipe for existing exterior flood or dual-purpose gate	HBE	
Installing, repairing, or re-installing water control bulkheads	HBE	PAI Fund 75/25
Removal of floating debris from pipes, trash racks, and other structures	No	
Installing alternative bank protection such as brush boxes, biotechnical wave dissipaters, and vegetation on exterior and interior levees	HBE	
Constructing cofferdams in managed wetlands	HBE; PArch; HArch; BArch	
Installing new fish screen facilities	HBE; Sub	

Marsh Management Activity	Likely Affected Resource Type	Applicable PAI Funding
Suisun Marsh salinity control gates repair and maintenance	HBE	
Roaring River distribution system fish screen cleaning	No	
Salinity monitoring station maintenance, repair, and replacement	HBE	
Salinity station relocation, installation, and removal	HBE	
Clearing existing interior ditches	HBE; PArch; HArch	JUFI, PAI Fund 50/50
Constructing new interior ditches	HBE; PArch; HArch; BArch	JUFI, PAI Fund 50/50
Repairing existing exterior levees	HBE	JUFI
Dredging from tidal sloughs as source material for exterior levee maintenance	Sub	
Placing new riprap in areas that were not previously riprapped	HBE; PArch; HArch	
Constructing new interior levees for improved water control and habitat management within the managed wetland units	PArch; HArch	

BArch = buried archaeological resource; HArch = historic-period archaeological resource; historic HBE = historic-period built environment; PArch = prehistoric archaeological resource (surface); Sub = submerged resource

The affected resource column of Table 7.7-13 identifies the broad class(es) of resource that most likely would be affected by each activity, although project-specific design specifications or work methods could result in effects to other classes of resource. The impacts identified in Table 7.7-13 likely would be significant, although some activities such as replacing riprap on interior and exterior levees could result in non-adverse effects. Construction staging and vehicular movement associated with riprap replacement, however, could result in cultural resource impacts off the levees. Such impacts could be significant.

If significant cultural resources are present in the managed wetland areas, the post-mitigation significance of Impact CUL-8 would depend on the magnitude of the physical effect. In cases where small portions of the resources are affected by the project, Mitigation Measure CUL-MM-8 would reduce this impact to a less-than-significant level. In the event of major damage or complete destruction of any significant cultural resources, Mitigation Measure CUL-MM-8 would reduce the severity of the impact, although it would still be significant.

If no cultural resources are identified in specific project areas, or identified resources are not determined to be significant, implementation of Mitigation Measure CUL-MM-8 would reduce this impact to a less-than-significant level.

Conclusion: Significant and unavoidable

Mitigation Measure CUL-MM-8: Prepare and Implement a Programmatic Agreement and Historic Properties Treatment Plan; Conduct Cultural Resource Inventories and Evaluations and Resolve Any Adverse Effects
Prior to implementation of managed wetland activities under the new SMP, Reclamation will implement the provisions of the PA and HPTP. These documents will clearly identify the lead agency responsible for PA/HPTP compliance for each class of activity (for instance, Reclamation for PAI-funded projects), as well as historic properties identification methods. If any cultural resources are determined to be historic properties and ground-disturbing activities are found to result in adverse effects, the lead agency for the subject activities will resolve the effects in accordance with the PA and HPTP.

Alternative B: Restore 2,000–4,000 Acres

Restoration Impacts

The character of Alternative B's impacts on cultural resources is identical to that described for Alternative A (Impacts CUL-1 through CUL-5). Similarly, Mitigation Measures CUL-MM-1 through CUL-MM-5 apply to Alternative B. Table 7.7-14, however, shows that the likelihood of restoration areas intersecting archaeologically sensitive areas is considerably lower under Alternative B, as the restoration target acreage for this alternative is half of the target for Alternative A. Restoration impacts under Alternative B, therefore, are expected to be fewer than under Alternatives A and C.

Table 7.7-14. Comparison of Restoration Areas to Archaeologically Sensitive Areas, Alternative B

Region	Total Acreage	Restoration Acreage	Percent Slated for Reclamation	High Buried Site Potential (%)	Moderate Buried Site Potential (%)	High Surface Site Potential (%)	Moderate Surface Site Potential (%)
1	11,905	500	4.2	0.6	34.2	0.1	27.8
		1,000	8.4				
2	7,302	460	6.3	0.0	2.1	2.5	9.6
		920	12.6				
3	2,975	180	6.1	2.5	19.0	2.1	28.3
		360	12.2				
4	28,667	860	3.0	1.1	23.0	0.6	7.4
		1,720	6.0				

Managed Wetland Activities

The cultural resources impacts of managed wetland activities under Alternative B are likely to be more intensive than under Alternative A because more of the plan area will remain or be subjected to managed wetland activities. Impacts CUL-6 through CUL-8 and Mitigation Measures CUL-MM-6, CUL-MM-7, and CUL-MM-8 apply to managed wetland activities under Alternative B.

Alternative C: Restore 7,000–9,000 Acres

Restoration Impacts

The character of Alternative C's impacts on cultural resources is identical to that described for Alternatives A and B (Impacts CUL-1 through CUL-5). Similarly, Mitigation Measures CUL-MM-1 through CUL-MM-5 apply to Alternative C. Table 7.7-15, however, shows that the likelihood of restoration areas intersecting archaeologically sensitive areas is considerably greater under Alternative C than under Alternatives A or B because the restoration acreage target for Alternative C is 50–75% greater than either Alternative A or B. Restoration impacts under Alternative C, therefore, are expected to be more severe than under Alternatives A and B.

Table 7.7-15. Comparison of Restoration Areas to Archaeologically Sensitive Areas, Alternative C

Region	Total Acreage	Restoration Acreage	Percent Slated for Restoration	High Buried Site Potential (%)	Moderate Buried Site Potential (%)	High Surface Site Potential (%)	Moderate Surface Site Potential (%)
1	11,905	1,500	12.6	0.6	34.2	0.1	27.8
		2,250	18.9				
2	7,302	1,380	18.9	0.0	2.1	2.5	9.6
		2,070	28.4				
3	2,975	540	18.2	2.5	19.0	2.1	28.3
		810	27.2				
4	28,667	2,580	9.0	1.1	23.0	0.6	7.4
		3,870	13.5				

Managed Wetland Activities

The cultural resources impacts of managed wetland activities under Alternative C are likely to be less intensive than under Alternatives A and B because less of the plan area will remain or be subjected to managed wetland activities. Impacts CUL-6 through CUL-8 and Mitigation Measures CUL-MM-6, CUL-MM-7, and CUL-MM-8 apply to managed wetland activities under Alternative C.

Section 7.8

Public Health and Environmental Hazards

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on public health and environmental hazards.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context against which the reader can understand the environmental changes caused by the action.

The environmental changes associated with the action are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.8-1 summarizes public health and environmental hazards impacts from implementing the SMP alternatives.

Table 7.8-1. Summary of Public Health and Environmental Hazard Impacts

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impacts				
HAZ-1: Increased Risk of Mosquito-Borne Diseases	A, B, C	Less than significant	None required	–
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-3: Release of Hazardous Materials into Surrounding Water Bodies during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–
HAZ-7: Increased Human and Environmental Exposure to Natural Gas and Petroleum	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way UTL-MM-3: Relocate or Upgrade Utility Facilities That Could Be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines That Have the Potential for Failure	Less than significant
Managed Wetland Activities Impacts				
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- *Central Valley Joint Venture Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands* (Central Valley Joint Venture 2004);
- Environmental Analysis of Tidal Marsh Restoration in San Francisco Bay (Jones & Stokes 2001);
- Solano County Mosquito Abatement District Website;
- Map of pipelines in the plan area (U.S. Department of Transportation 1999);
- Envirostor hazardous waste and substances site list (Envirostor 2007);
- California Integrated Waste Management Board. Facility/Site Listings (2008); and
- GeoTracker mapped cleanup sites (GeoTracker 2008).

Hazardous Materials

Hazardous materials and waste are those substances that, because of their physical, chemical, or other characteristics, may pose a risk of endangering human health or safety or of endangering the environment (California Health and Safety Code Section 25260). Types of hazardous materials include petroleum hydrocarbons, pesticides, and volatile organic carbons (VOCs). In the Suisun Marsh area, potential hazardous waste sites may be associated with historical agricultural or managed wetland and vegetation control activities and may include storage facilities contaminated with fertilizers, pesticides, or herbicides. Underground pipelines that carry natural gas and other products are present in the study area.

The locations of various pipelines in the plan area were mapped using data from the U.S. Department of Transportation (USDOT) (Figure 7.3-1). USDOT, Research and Special Projects Administration (RSPA), and the Office of Pipeline Safety (OPS) are working with other federal and state agencies and the pipeline industry to create a national pipeline mapping system (NPMS). The NPMS is a full-featured geographic information systems (GIS) containing the location and selected attributes of the major natural gas transmission lines and hazardous liquid trunklines, and liquefied natural gas (LNG) facilities operating in the United States and other offshore entities. Source data are contributed by pipeline operators to the National Repository.

Pipelines

Natural gas, product, natural gas liquids, and empty liquid pipelines run through the Marsh, into Suisun Bay, and into Contra Costa County (Figure 7.3-1). The majority of pipelines that run through the Marsh and cross the sloughs are product and natural gas lines. On the western side of the Marsh, a product pipeline crosses under Peytonia and Boynton Sloughs, and two product pipelines cross under Goodyear Slough. On the eastern side, natural gas and product pipelines occur under Nurse and Montezuma Sloughs.

One leaking underground fuel tank (LUFT) site was identified in an isolated pond off of Montezuma Slough (GeoTracker 2008). Additionally, the plan area has a history of agricultural use and may have areas of previously unknown contamination related to the use or storage of agricultural compounds such as pesticides, fertilizers, or fuels. Potrero Hills Landfill is located east of Suisun Bay near Nurse Slough. It is approximately 0.2 mile from the slough (California Integrated Waste Management Board 2008).

Waste Sites

A search of Solano County was done for all Superfund, state response, voluntary cleanup, school cleanup, permitted, and corrective action sites (Envirostor 2007). No hazardous waste sites were identified in the plan area.

Emergency Response/Evacuation Plans

Hazardous Materials

The Solano County Office of Emergency Services (OES) is responsible for planning emergency response actions to hazardous material incidents. Area response plans incorporate hazardous materials inventory data, training for emergency responses, and plans for evacuation.

Pipelines

While emergency response procedures are company specific, they are all developed to protect sensitive resources to the maximum extent practicable. In general, the procedures would include shutting down the pipeline operations, de-pressurizing the line, notifying local emergency response providers, evacuating people to a safe distance, monitoring for flammable vapors, setting up material collection sites (low elevation spots where product has settled), and recovering the product with vacuum trucks. In spills that occur in streams or waterways, additional dams and absorbent booms would be deployed to control the release of product into the ecosystem.

Law Enforcement

The Solano County Sheriff's Department provides law enforcement on waterways in the county, including Suisun Marsh. By authority and responsibility, the Sheriff's office is the designated "scene manager" for any disaster, from hazardous materials spills to major flood activity. Emergency response is carried out using vehicles or boats, depending on the location's accessibility, predicted response time, and availability of resources. Sheriffs have access to all gates and may use fields as well as levee roads to access channel areas in the Delta.

The Solano County Marine Patrol Program provides public safety resources to recreational boaters and commercial vessels operating on the navigable waterways in the county of Solano. The Marine Patrol Program is staffed with four full-time deputies. The program is operational 10 hours each day, 7 days each week, year-round, providing professional public safety services to the community. The Marine Patrol deputies are subject to callout 24 hour a day, 7 days a week, to provide search-and-rescue operations on the waterways of Solano County.

U.S. Coast Guard

In addition to the Sheriff's Department, the U.S. Coast Guard provides search-and-rescue and emergency response by boat to those areas of the Delta not accessible by vehicle. Because of the Delta's many meandering sloughs and canals, response is typically faster by driving to the nearest boat launch. The U.S. Coast Guard Station in Vallejo is the primary coast guard station responding to emergencies in the Marsh. They coordinate closely with the Suisun City Police Department and the CHP as needed. They typically respond with a boat launched from Vallejo Marina, but if weather or access to the emergency site is an issue, aircraft could be used or boats could be trailered and launched from Suisun City or Grizzly Island Marinas. The typical response time is approximately 35 minutes (Villa pers. comm.).

The U.S. Coast Guard station in Rio Vista is the primary responder to a very small portion of the eastern Marsh area and maintains two boats at the Rio Vista station dock. When responding to emergencies in Suisun Marsh, a boat is taken from the dock to the Marsh, which takes approximately 20 minutes (Flagerty pers. comm.).

In 2006 (the most recent year for which complete data are available), there were 71 accidents in the Delta, four of which occurred in Solano County. Of the four accidents in Solano County, two included fatalities (California Department of Boating and Waterways 2007).

Health Hazards

Water Quality

Potential sources that could compromise water quality are two-stroke boat engines (which use an oil-gas mixture) and four-stroke boat engines (which use pure gasoline). These petroleum products could be accidentally discharged into Suisun Marsh, compromising water quality. Continuous testing and monitoring of water by federal, state, and local agencies minimize the impact of hazardous waste discharges on public health.

Mosquito Breeding Conditions, Habitat, and Disease Transmission

Mosquitoes as Vectors of West Nile Virus

The California Health and Safety Code defines a *vector* as "…any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury…" (Division 3, Chapter 1, Article 1, Section 2002 (k).

The CDC has documented the presence of West Nile virus in samples of all the species described above in data for 2006. *Culex tarsalis* is considered to be the primary vector of West Nile virus in Solano County based on test results since 2005. The life cycle of West Nile involves the transmission of the virus from infected mosquitoes to people and animals. Wild birds serve as the main source of virus for mosquitoes which can transmit it to other birds or "Accidental Hosts" such as humans and horses which can become ill, but do not serve as sources of the virus at adequate levels to infect other mosquitoes. In Suisun Marsh, current mosquito control efforts focus on species that are capable of transmitting West Nile virus or that occur in such large numbers that they create a "public nuisance" by limiting outdoor activities not only in the Marsh, but in urban parks and the residential areas surrounding it. The West Nile virus is now considered to have become established in California since its arrival in 2003. In 2009 and 2010, there were no reported human cases of West Nile Virus in Solano County, although there has been in previous years and the disease remains active in the county (California West Nile Virus Website 2010).

General Mosquito Biology

Mosquitoes have four distinct life stages: egg, larva, pupa, and adult. The first three stages are aquatic, and therefore all mosquito species require standing water to complete their growth cycles. As such, any body of standing water that remains undisturbed for more than 3 days represents a potential mosquito breeding site. Most species of mosquitoes lay their eggs on the surface of fresh

stagnant water, though some species use damp soil. Areas that are flushed daily by tidal action generally do not create problems unless they contain depressions or cracked ground that holds water for at least 5 days after being inundated by extreme high tides. These tides occur during nine months of the year in Suisun and San Pablo Bay Marshes and have the potential to produce billions of *Aedes* mosquitoes. Suisun Marsh has a number of tidal areas that can be problematic after extreme high tides.

Although most species of mosquitoes lay their eggs on the surface of stagnant water, those of the genus *Aedes* deposit their eggs singly (up to 150) on soil or at the base of grasses where they may remain dormant for months or a number of years before hatching. Most eggs laid by *Aedes*, known as floodwater species, must undergo a drying period before hatching occurs upon inundation. The other two genera commonly associated with Suisun Marsh are *Culex* and *Culiseta*. These genera deposit eggs on standing water in groups called rafts that contain 150 or more eggs. The egg of an *Aedes* mosquito can hatch within hours of coming in contact with water, while those of *Culex* and *Culiseta* generally require 2 to 3 days.

A larva hatches by cutting its way out of the egg by means of the egg breaker on the top side of the head. During growth the larva sheds its skin or molts four times; the stages between molts are called instars. Mosquito larvae breathe at the water surface at frequent intervals. Small organic particles and microorganisms suspended in the water are fed upon either at the bottom or near the water surface.

At the end of the larval stage, the mosquito molts and becomes a pupa. Although aquatic, the pupa of Aedes species can survive on damp soil for 2 days. The pupa is active only if disturbed, for this is the resting stage when no feeding occurs. After this transformation has been completed, the adult swallows some of the air in the pupal skin, which enables it to exert enough internal pressure to split it and emerge. It takes from 7 to 10 days for the newly hatched larvae to emerge as adults, depending upon the environmental conditions.

Mosquito Species in the Primary and Secondary Management Areas of Suisun Marsh

Six species of mosquitoes have the potential to be found in the primary Marsh area—*Aedes dorsalis* (pale marsh mosquito), *Aedes melanimon* (dark marsh mosquito), *Aedes squamiger* (California saltmarsh mosquito), *Culex tarsalis* (encephalitis mosquito), *Culex erythrothorax* (tule mosquito) and *Culiseta inornata* (winter mosquito). The prevalent species in the secondary area are *Culiseta incidens* (cool weather mosquito), *Culiseta inornata*, *Culex tarsalis*, and *Culex pipiens* (northern house mosquito). A brief life history of each of these species follows.

In general, the potential for mosquito breeding habitat increases with more emergent vegetation and within water bodies with water levels that slowly

increase or recede compared to water levels that are stable or that rapidly fluctuate.

***Aedes dorsalis* (pale marsh mosquito)**—The larvae are found primarily along the coastal areas in both saline and brackish tidal marshes and ponds as well as freshwater marshes and temporary pools in overflow areas. The adults are vicious biters in both daytime and evenings. They have been known to fly in excess of 20 miles.

***Aedes melanimon* (dark marsh mosquito)**—The larvae are found primarily in irrigated pastures (alone or in association with *Ae. nigromaculis*), alfalfa fields, duck clubs, and waterfowl areas. Duck clubs and waterfowl areas provide habitat for *Ae. melanimon* alone or in association with *Ae. dorsalis* (in brackish water areas of the Delta). At a concentration of 1% salt, equal numbers of both species can be found. As the percentage rises to 2%, *Ae. melanimon* disappears (Bohart 1956). This species is capable of flights of 10 miles or more from a source when assisted by prevailing winds.

***Aedes squamiger* (California salt marsh mosquito)**—The larvae are found in salt marsh areas resulting from tidal overflow or rains. Adults are vicious daytime and early dusk biters, and undergo an annual flight from their larval sources.

***Culex erythrothorax* (tule mosquito)**—The larval populations occur in ponds, lake margins, irrigation and drainage canals, swamps, and marshes, all of which usually contain heavy growth of tule-type vegetation. The adults are active at dusk, but will bite readily during the day when their habitat is invaded.

***Culex tarsalis* (encephalitis mosquito)**—The larvae may be found in a variety of water sources, including rain pools, irrigated pastures, rice fields, stream margins, brackish and sewage waste sources, and seasonal waterfowl habitat. This species is the primary vector of West Nile and western encephalitis viruses in Solano County.

***Culiseta incidens* (cool weather mosquito)**—The larvae are found in a wide variety of sources such as streams, brackish water pools, stagnant and polluted pools, clear or semi-clear pools with partial shade, and artificial containers. In some areas the adults bite humans but ordinarily feed on fowl and domestic animals. Cool weather mosquitoes are most abundant during the seasons of cool, moderate temperatures and most numerous in early spring and late fall.

***Culiseta inornata* (winter mosquito)**—The larvae are found in stream pools, marshes, temporary rain pools, and occasionally in artificial containers and have been found in brackish water with *Ae. squamiger*. Adults will bite humans readily in brackish marsh areas. They are particularly bothersome to livestock in most areas.

Mosquitoes breed year-round in Suisun Marsh, but breeding of *Culex* and *Aedes* species diminishes (with the exception of *Aedes squamiger*) substantially during

cooler weather, typically from late November through March. *Culiseta inornata* has population peaks in November and February.

Construction Worker Safety

Federal and state laws contain occupational safety standards to minimize safety risks from physical and chemical hazards in the workplace. The federal Occupational Safety and Health Administration (OSHA) and California Division of Occupational Safety and Health (CalOSHA) are the agencies responsible for assuring worker safety in the workplace. CalOSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices and requires that employers evaluate potential health hazards in the workplace and communicate the results and appropriate protective measures to employees.

The California Environmental Protection Agency (CalEPA) is directly responsible for administrating a Unified Program consolidating and coordinating permits, inspections, and enforcement activities for environmental and emergency management programs. The Unified Program is intended to provide relief to businesses complying with overlapping and sometimes conflicting requirements and is implemented at the local level by Certified Unified Program Agencies (CUPA).

The Solano County Environmental Health Department has been certified by CalEPA to implement the Unified Program as a CUPA. As a CUPA, the department is responsible for administering/overseeing compliance with state and federal regulations and has established a program that consolidates and coordinates administrative requirements, permits, inspection activities, enforcement activities, and associated fees into a consolidated permit for use throughout the county.

Bioaccumulation of Mercury

Mercury can enter Suisun Marsh from four primary pathways: the Delta, coastal marine embayments, local watershed runoff, and the atmosphere. Mercury enters the Delta in the form of contaminated sediment deposits and contaminated runoff from the Coast Range and Sierra Nevada (Davis et al. 2003; Heim et al. 2003; Slotten et al. 2002; Weiner et al. 2003). The origin of the mercury contamination stems from the historical mining of mercury in the Coast Range and the subsequent use of elemental mercury for gold and silver extraction in the Sierra Nevada (Heim et al. 2003; Marvin-DiPasquale and Agee 2003; Slotten et al. 2002; Weiner et al. 2003). Recent studies have determined that about 350–750 kg of mercury is still being transported annually into the Bay-Delta from both the Coast Range and the Sierra Nevada (California Department of Water Resources 2005).

Mercury exposure poses health risks for both humans and wildlife. There are three forms of mercury: elemental, inorganic, and organic compounds, each with different toxicological characteristics (Goyer 1991). Methylmercury is the most important form of mercury in terms of toxicity and ability to biomagnify. Methylmercury concentrations increase with each step in the food chain, whereas inorganic mercury is not readily transferred between trophic levels (Weiner et al. 2003). Humans are exposed primarily through consumption of contaminated fish (Cooke et al. 2004; Heim et al. 2003; Johnson and Looker 2003). Concentrations of mercury found in the San Francisco estuary are high enough to warrant concern for the health of humans and wildlife. The Office of Environmental Health Hazard Assessment (2009) has posted an advisory limiting consumption of fish from the San Francisco Bay and Delta region because of mercury contamination (California Department of Water Resources 2005).

Mercury is a neurotoxicant, posing the greatest risk to developing embryos (Cooke et al. 2004; Goyer 1991). All forms of mercury cross the placenta to the fetus; however, methylmercury levels in fetal red blood cells are 30% higher than in maternal red blood cells. Exposure to mercury *in utero* or postnatally can cause irreversible neurotoxicity, resulting in delayed motor skills, seizures, and other mental symptoms (Goyer 1991). In adults, the major health effects are neurotoxic and include numbness and tingling in the extremities, inability to walk, difficulty in swallowing and talking, weakness and fatigue, vision and hearing loss, tremors, and finally coma and death (Cooke et al. 2004; Goyer 1991; California Department of Water Resources 2005).

Regulatory Setting

Regulations and policies considered relevant to the SMP alternatives are summarized below.

Federal

The principal federal regulatory agency responsible for the safe use and handling of hazardous materials is the EPA. Two key federal regulations pertaining to hazardous wastes are described below. Other applicable federal regulations are contained primarily in CFR Titles 29, 40, and 49.

Resource Conservation and Recovery Act

The federal Resource Conservation and Recovery Act enables the EPA to administer a regulatory program that extends from the manufacture of hazardous materials to their disposal, thus regulating the generation, transportation, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (also known as *Superfund*) was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, the act was amended by the Superfund Amendment and Reauthorization Act Title III (community right-to-know laws). Title III states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup, even if the material was dumped illegally when the property was under different ownership.

State

California regulations are equal to or more stringent than federal regulations. The EPA has granted the State of California primary oversight responsibility to administer and enforce hazardous waste management programs. State regulations require planning and management to ensure that hazardous wastes are handled, stored, and disposed of properly to reduce risks to human and environmental health. Several key laws pertaining to hazardous wastes are discussed below.

Hazardous Materials Release Response Plans and Inventory Act of 1985

The Hazardous Materials Release Response Plans and Inventory Act, also known as the Business Plan Act, requires businesses using hazardous materials to prepare a plan that describes their facilities, inventories, emergency response plans, and training programs. Hazardous materials are defined as unsafe raw or unused material that is part of a process or manufacturing step. They are not considered hazardous waste. Health concerns pertaining to the release of hazardous materials, however, are similar to those relating to hazardous waste.

Hazardous Waste Control Act

The Hazardous Waste Control Act created the state hazardous waste management program, which is similar to but more stringent than the federal Resource Conservation and Recovery Act program. The act is implemented by regulations contained in Title 26 CCR, which describes the following required aspects for the proper management of hazardous waste:

- identification and classification;
- generation and transportation;
- design and permitting of recycling, treatment, storage, and disposal facilities;

- treatment standards;
- operation of facilities and staff training; and
- closure of facilities and liability requirements.

These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of such waste. Under the Hazardous Waste Control Act and Title 26, the generator of hazardous waste must complete a manifest that accompanies the waste from generator to transporter to the ultimate disposal location. Copies of the manifest must be filed with the California Department of Toxic Substances and Control.

Emergency Services Act

Under the Emergency Services Act, the state developed an emergency response plan to coordinate emergency services provided by federal, state, and local agencies. Rapid response to incidents involving hazardous materials or hazardous waste is an important part of the plan, which is administered by the California OES. The office coordinates the responses of other agencies, including EPA, the CHP, RWQCBs, air quality management districts, and county disaster response offices.

Local and Regional Laws, Regulations, and Programs

Solano County Mosquito Abatement District

The Solano County Mosquito Abatement (SCMAD) was founded in 1930, specifically at the request of local taxpayers in order to control the pestiferous *Aedes* mosquitoes that were being produced in Suisun and San Pablo Bay Marshes. It was formed according to guidelines set forth by the Mosquito Abatement Act of 1915 and the California Health and Safety Code. Mosquito control in California has its origin in the San Francisco Bay Area, where efforts were undertaken to control this pest by ditching to enhance drainage and water circulation. The SCMAD, a county-wide agency, has jurisdiction over the primary marsh areas and secondary upland management areas. There are distinct management control practices in secondary upland areas as opposed to primary marsh areas. Mosquito control in secondary management areas relate to upland watershed, such as creekside and drainageway development, sedimentation, land development and agriculture. In primary areas, mosquito control practices are concerned with water management of seasonal waterfowl habitat (on privately and publicly owned land), irrigated livestock pasture lands, and tidal marshes. The SCMAD has been successful in reducing and suppressing the production of mosquitoes in primary management areas.

The SCMAD is empowered to and may, under the California Health and Safety Code (Division 3, Chapter 1, Article 1, Sections 2000 through 2093) abate

mosquitoes and other insect pests and collect the cost thereof from the property owners.

Other Laws, Regulations, and Programs

Various other state regulations have been enacted that affect hazardous waste management, including:

- Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), which requires labeling of substances known or suspected by the State of California to cause cancer; and
- California Government Code Section 65962.5, which requires the Office of Permit Assistance to compile a list of possible contaminated sites in the state.

State and federal regulations also require that hazardous materials sites be identified and listed in public records. These lists include:

- Comprehensive Environmental Response, Compensation, and Liability Information System;
- National Priorities List for Uncontrolled Hazardous Waste Sites;
- Resource Conservation and Recovery Act;
- California Superfund List of Active Annual Workplan Sites; and
- Lists of state-registered underground and leaking underground storage tanks.

Environmental Consequences

Assessment Methods

The evaluation of potential impacts on public health and environmental hazards addresses the potential for health and safety hazards during and after project construction. Information was collected through site visits; information regarding mosquito production and control; information gathered through the incorporation of findings from Sections 5.4, Flood Control and Levee Stability, and 5.2, Water Quality; and from assumptions made using the USDOT map. The analysis includes potential effects on workers related to construction activities, as well as general safety and hazards to both workers and the public.

Significance Criteria

Criteria used to determine the significance of an impact on public health and environmental hazards are based on the State CEQA Guidelines and professional

standards and practices. Impacts were considered significant if an alternative would:

- create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials to the environment;
- be located on a hazardous materials sites pursuant to California Government Code 65962.5, and as a result would create a significant hazard to the public or the environment;
- expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam;
- place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- expose people to a significant risk of contracting a disease; or
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Environmental Impacts

No Action Alternative

Suisun Marsh is susceptible to flooding during major storm events, and several miles of exterior levees are at risk of failure as a result of subsidence, wave erosion, climate change, and other factors. Suisun Marsh levees protect extensive private and public infrastructure, including wildlife habitat, infrastructure, residences, roads, and railways. The El Niño storms of February 1998 brought high tides and winds that caused 11 exterior levee breaches, threatened SWP and CVP facilities,[1] (California Department of Water Resources 2008) and completely inundated 22,000 acres of public and private lands on Van Sickle, Wheeler, Simmons, and Hammond Islands (and partially inundated Grizzly, Joice, and Lower Joice islands).[2] (GlobalSecurity.org 2008)

Currently, private landowners, local Reclamation Districts and DFG are primarily responsible for repairs and maintenance of Suisun Marsh levees. However, because of difficulties of importing and obtaining materials s for levee repair, maintenance efforts currently consist of using materials from managed wetland areas. This practice contributes to ongoing land subsidence from the microbial decomposition of organic soil. Because maintenance activities are not able to keep pace with the current rate of levee degradation, it is likely that the

[1] http://www.drms.water.ca.gov/
[2] http://www.globalsecurity.org/military/facility/suisun-bay.htm

No Action Alternative would result in a continued decrease in levee system integrity throughout the Marsh, potentially leading to natural breaching.

The No Action Alternative would rely on the existing level of maintenance to inspect, assess, and maintain the exterior levee system. In the event of a levee failure, it is not certain that levees would be repaired. Therefore, there is a potential for increased hazards over time attributable to deferred levee maintenance.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impacts

Impact HAZ-1: Increased Risk of Mosquito-Borne Diseases

Most species of mosquitoes lay their eggs on the surface of fresh stagnant water, although some species use damp soil. Any body of standing water represents potential breeding habitat, with the exception of areas that are flushed daily by tidal action and that are either too saline or not stagnant long enough to support mosquito larvae to maturity (Tietze 2001).

The greatest numbers of mosquitoes are produced in water bodies with poor circulation, high temperatures, and high organic content (Collins and Resh 1989). Typically, greater numbers of mosquitoes are produced in water bodies with water levels that slowly increase or recede, and fewer numbers of mosquitoes are produced in water bodies with rapidly fluctuating water levels (Jones & Stokes Associates 1995).

Control technicians routinely inspect sources within the SCMAD on a 7- to 10-day cycle. Areas affected by high tides or intentional flooding require more inspections because of the developmental time of the species of mosquitoes involved as well as climatic conditions.

Tidal restoration projects in Suisun Marsh generally have a potential for producing large numbers of mosquitoes. The extent of tidal flow depends on the relative elevation of the site to tide. Tidal flushing itself does not create mosquito problems. Mosquito problems arise if residual tidal and floodwaters remain in depressions and cracked ground. At least one mosquito species produced in these types of areas is an aggressive pest of man and is capable of flying in excess of 20 miles.

The tidal restoration occurring as part of the Proposed Project is restoring managed wetlands to tidal wetlands. Since managed wetlands more than tidal wetlands demonstrate the characteristics described above that can lead to increased mosquito production, the change from the baseline managed wetland condition to tidal wetlands along with appropriate tidal wetland design, and the implementation of mosquito abatement best management practices, as described

in the Environmental Commitments section of Chapter 2, will reduce the potential for mosquito production in the Marsh from baseline conditions. Overall there is not expected to be any increase in mosquito production that could result in increases in human exposure to diseases.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-2: Exposure to or Release of Hazardous Materials during Construction

Construction of the proposed action would not require treatment, disposal, or transport of significant quantities of hazardous materials. However, fuel and lubricant fluids associated with construction equipment could expose construction workers and the environment to hazardous materials if materials are improperly handled. This impact would be temporary.

Implementing the SMP would involve levee breaching. Digging could affect gas pipelines occurring below the ground level. If pipelines were damaged during digging, release of natural gas or other materials could expose construction workers and the environment to hazardous materials. The plan will be designed to avoid impacting existing pipelines and other facilities.

The standard design features and construction practices outlined in the Environmental Commitments section of Chapter 2 will be implemented at a site-specific level to mitigate short-term, construction-related impacts. Access points/staging areas will be established for equipment, storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants as outlined in Chapter 2. Additionally, no hazardous material would be used in reportable quantities unless approved in advance by the OES, and compliance reporting will be conducted and a risk management plan submitted as outlined in Chapter 2, Hazardous Materials Management Plan. In addition, a SWPPP will be prepared including BMPs for spill prevention and control and the storage and handling of hazardous materials and wastes.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-3: Release of Hazardous Materials into Surrounding Water Bodies during Construction

At least one LUFT is located in an isolated pond off of Montezuma Slough (GeoTracker 2008). Levee breaching in the area could flood the pond and connect it to Montezuma Slough. Any leaking fuel could spread into Montezuma Slough and other adjacent water bodies, causing water contamination. Restoration designs will avoid the LUFT area.

Additionally, the plan area has a history of agricultural use and may have areas of previously unknown contamination related to the use or storage of agricultural compounds such as pesticides, fertilizers, or fuels. Project construction or maintenance activities thus could encounter unknown contamination. As described in Chapter 2 (see Environmental Commitments), in the event that contamination is encountered during construction, all construction or

maintenance activities in the area of the find will stop and the proponent will conduct appropriate hazardous materials investigations to identify and delineate the extent and nature of the contamination. If clean-up or remediation is required, the proponent will ensure that any hazardous waste materials removed during construction are handled, transported, and disposed of according to federal, state, and local requirements. With these procedures in place, impacts related to the discovery of unknown hazardous waste or hazardous substance sites within the plan area are expected to be less than significant, and no mitigation is required.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times

Suisun Marsh waterways occasionally are used by emergency service providers. In-channel work, such as levee breaching, could slightly increase emergency response times if the channels used as access routes are blocked by these activities. Construction equipment is not expected to impede emergency access provided over levee roads. Upon completion of construction, no changes in emergency access or response times would occur. As described in the environmental commitments section of Chapter 2, project proponents will coordinate with the Coast Guard and the Solano County Marine Patrol prior to commencing any activities that may impede their boats to ensure that response times in Suisun Marsh are not affected.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-5: Increased Human and Environmental Exposure to Mercury

As described in Section 5.2, Water Quality, and Impact WQ-4: Increased Methylmercury Production from Suisun Marsh Tidal Channels, Tidal Wetlands, and Managed Wetlands, this impact would be less than significant.

Conclusion: Less than significant. No mitigation is required.

Impact HAZ-6: Reduction in Potential for Catastrophic Flooding

Alternative A includes a levee system integrity component that would result in the improvement of exterior levee stability throughout the Marsh. As such, the potential for catastrophic flooding would be reduced as specific levee improvements are made. This would reduce the risk to the public related to flooding.

Conclusion: Beneficial.

Impact HAZ-7: Increased Human and Environmental Exposure to Natural Gas and Petroleum

Tidal restoration has the potential to occur in areas where natural gas and petroleum pipelines exist. In some instances, these pipelines were installed under conditions in which the areas that would be restored were not tidally inundated.

Restoration would result in permanent tidal inundation, which would increase the potential for exposure of natural gas and petroleum to the environment and humans because, should a leak occur, it is more difficult to contain than under existing conditions.

Conclusion: Less than significant with Mitigation Measures UTL-MM-2, "Avoid Ground-Disturbing Activities within Pipeline Right-of-Way," UTL-MM-3, "Relocate or Upgrade Utility Facilities That Could Be Damaged by Inundation," and UTL-MM-4, "Test and Repair or Replace Pipelines That Have the Potential for Failure," incorporated.

Mitigation Measures UTL-MM-2, UTL-MM-3, and UTL-MM-4 are described in Section 7.3, Utilities and Public Services, and would minimize the potential for a failure of natural gas and/or petroleum pipelines.

Managed Wetland Activities Impacts

Impact HAZ-2: Exposure to or Release of Hazardous Materials during Construction

This impact would be similar to that described for restoration activities. Fuel and lubricant fluids associated with construction equipment used in managed wetland activities could expose construction workers and the environment to hazardous materials if materials are improperly handled. Most of the managed wetland activities would occur in the managed wetland areas, which would be dry at the time of construction activities. As such, they would be easily contained and the impact would be temporary.

The standard design features and construction practices outlined in the environmental commitments section of Chapter 2, including BMPs for spill prevention and control and the storage and handling of hazardous materials, will be implemented at a site-specific level to minimize the potential for short-term, construction-related impacts.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times

This impact would be similar to that described for restoration activities. In-channel work, such as dredging or placement of riprap, could slightly increase emergency response times if the channels used as access routes are blocked by these activities. Approximately 100,000 cubic yards of material would be dredged annually from throughout the Marsh. Some dredging would take place from the levee crown, disrupting minimal channel area, and some dredging would take place from a barge in the channel. Dredging conducted from a barge, especially in a narrow channel, has the potential to block emergency access to boats and other watercraft. As described in the environmental commitments section of Chapter 2, project proponents will coordinate with the Coast Guard and the Solano County Marine Patrol prior to commencing any activities that

may impede their boats to ensure that response times in Suisun Marsh are not affected.

Conclusion: Less than significant. No mitigation required.

Impact HAZ-5: Increased Human and Environmental Exposure to Mercury

As described in Section 5.2, Water Quality, and Impact WQ-8: "Increased Methylmercury Production from Suisun Marsh Tidal Channels, Tidal Wetlands, and Managed Wetlands," this impact would be less than significant.

Conclusion: Less than significant. No mitigation is required.

Impact HAZ-6: Reduction in Potential for Catastrophic Flooding

This impact would be similar to that described for restoration activities. Managed wetland activities that would result in the improvement of exterior levee stability throughout the Marsh would reduce the potential for catastrophic flooding as specific levee improvements are made. This would reduce the risk to the public related to flooding.

Conclusion: Beneficial.

Alternative B: Restore 2,000–4,000 Acres

Impacts under Alternative B are similar to those described under Alternative A. Under Alternative B, there would be less tidal restoration and, therefore, less potential for increased mosquito populations. However, hazards related to hazardous materials and worker safety would be similar, as there would be more managed wetland enhancement activities. Benefits related to levee system integrity would be the same. Alternative B would have the same significance findings as described for Alternative A.

Alternative C: Restore 7,000–9,000 Acres

Impacts under Alternative C are similar to those described under Alternative A. Under Alternative C, there would be more tidal restoration and, therefore, a slightly higher potential for increased mosquito populations. Mitigation Measure HAZ-MM-2 would reduce this impact to a less-than-significant level. Risks related to hazardous materials and worker safety would be similar to those under Alternative A. Hazards would be managed by environmental commitments at each individual project site. Benefits related to levee system integrity would be the same. Alternative C would have the same significance findings as described for Alternative A.

Section 7.9
Environmental Justice

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on environmental justice.

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing context against which the reader can understand the changes caused by the action. The setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts.

The changes associated with the action are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

Summary of Impacts

Table 7.9-1 summarizes impacts on environmental justice from implementing the SMP alternatives. There are no significant impacts on environmental justice from implementing the SMP alternatives.

Table 7.9-1. Summary of Impacts on Environmental Justice

Impact	Alternative	Significance before Mitigation	Mitigation Measures	Significance after Mitigation
Restoration Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–
Managed Wetland Activities Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–

Affected Environment

Sources of Information

The following key sources of information were used in the preparation of this section:

- Association of Bay Area Governments 2008,
- Solano County census data 2000 and 2006 (Bay Area Census 2008), and
- aerial photography of Suisun Marsh.

Regulatory Setting

Federal

Executive Order 12898, Environmental Justice is discussed in greater detail in Chapter 10.

State

The State of California passed a series of environmental justice regulations in 2001. These laws define environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental Setting

The SMP area is located in Solano County. In 2006, it was estimated that the county had a minority population of approximately 48%. The largest minority communities in the county have been identified as Black or African American (14.8%), followed by Asians (14.3%). (Association of Bay Area Governments 2008.)

Census data were also gathered for persons of Hispanic origin. An origin can be viewed as a heritage, nationality group, lineage, or country of birth of the person or person's parents or ancestors before their arrival in the United States. People that identify their origin as Spanish, Hispanic, or Latino may be of any race. Therefore, those who are counted as Hispanic are also counted under one or more race categories. Approximately 22% of the Solano County population was considered Hispanic in 2006 (Association of Bay Area Governments 2008).

Of the total population, approximately 43,000 residents income falls below the poverty level (Association of Bay Area Governments 2008).

Review of aerial photographs of the SMP area, and in particular areas within the SMP area in which levee improvements could occur or may be purchased and restored as tidal wetlands, indicates that these areas are open space and do not support urban development.

Environmental Consequences

Assessment Methods

Demographic information was gathered for Solano County to describe the extent of minority and low-income communities occurring in the county. Aerial photographs were evaluated to determine the location of any urban development within the SMP area that could suggest the presence of a low-income or minority community.

Significance Criteria

The following significance criteria were applied to determine whether the SMP alternatives would result in a disproportionate effect on a minority or low-income community:

- changes in the natural or physical environment that may also adversely affect minority or low-income populations, or
- changes in the natural or physical environment that may result in an adverse effect on minority or low-income populations that appreciably exceeds or is likely to appreciably exceed the effects on the general population.

Environmental Impacts

No Action Alternative

Under the No Action Alternative, there would be a decrease in managed wetland activities as a result of permitting difficulties. However, none of the effects associated with the No Action Alternative would result in disproportionate effects on minority or low-income communities.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Restoration Impact

Impact EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities

As discussed in Chapter 2, the proposed project includes upgrading or constructing new levees, and restoring up to 7,000 acres of tidal wetlands. Implementing these improvements would necessitate construction activities and purchase of private lands to allow restoration of tidal wetlands. Most, if not all, lands purchased for tidal wetlands restoration would be from hunting clubs or agricultural operations. No low-income or minority communities would be affected by activities associated with upgrading or constructing new levees or restoring tidal wetlands because none are located in the area encompassed by the SMP.

Implementing the proposed project would not result in a disproportionate adverse effect on minority or low-income communities.

Conclusion: No impact.

Managed Wetland Activities Impact

Impact EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities

This impact would be similar to that described for restoration activities. Managed wetland activities include infrastructure improvements, reconstructing existing levees, and constructing new levees. Implementing these improvements would necessitate construction activities. Modifications to infrastructure within the SMP area generally include improvements to existing levees and infrastructure required for management of water. No low-income or minority communities would be affected by improving the existing infrastructure because none are located in the area encompassed by the SMP.

Implementing the proposed project would not result in a disproportionate adverse effect on minority or low-income communities.

Conclusion: No impact.

Alternative B: Restore 2,000–4,000 Acres

Impacts on low-income or minority communities would be the same as described for Alternative A. Implementing Alternative B would not result in a disproportionate adverse effect on minority or low-income communities.

Alternative C: Restore 7,000–9,000 Acres

Impacts on low-income or minority communities would be the same as described for Alternative A. Implementing Alternative C would not result in a disproportionate adverse effect on minority or low-income communities.

Section 7.10
Indian Trust Assets

Introduction

This section describes the existing environmental conditions and the consequences of implementing the SMP alternatives on Indian Trust Assets (ITAs).

The Affected Environment discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context against which the reader can understand the environmental changes caused by the action. The environmental setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts.

The environmental changes associated with the action are discussed under Impact Analysis. This section identifies impacts, describes how they would occur, and prescribes mitigation measures to reduce significant impacts, if necessary.

ITAs are legal interests in property held in trust by the United States for federally recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally reserved hunting and fishing rights, federally reserved water rights, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The characterization and application of the United States trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historical treaty provisions.

Summary of Impacts

There are no impacts on ITAs from implementing the SMP alternatives.

Affected Environment

Regulatory Setting

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Reclamation assesses the effect of its programs on tribal trust resources and federally recognized tribal governments. Reclamation is tasked with actively engaging federally recognized tribal governments and consulting with such tribes on a government-to-government level (59 FR 1994) when its actions affect ITAs. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (U.S. Department of the Interior 1995). Part 512, Chapter 2 of the Departmental Manual states that it is the policy of the DOI to recognize and fulfill its legal obligations to identify, protect, and conserve the trust resources of federally recognized Indian tribes and tribal members.

All bureaus are responsible for, among other things, identifying any impact of their plans, projects, programs, or activities on Indian trust assets; ensuring that potential impacts are explicitly addressed in planning, decision, and operational documents; and consulting with recognized tribes who may be affected by proposed activities. Consistent with this, Reclamation's Indian trust policy states that Reclamation will carry out its activities in a manner that protects ITAs and avoids adverse impacts when possible, or provides appropriate mitigation or compensation when it is not. To carry out this policy, Reclamation incorporated procedures into its NEPA compliance procedures to require evaluation of the potential effects of its proposed actions on trust assets (Bureau of Reclamation July 2, 1993). Reclamation is responsible for assessing whether the SMP has the potential to affect ITAs and will comply with procedures contained in Departmental Manual Part 512.2 guidelines, which protect ITAs.

Reclamation's ITA policy states that Reclamation will carry out its activities in a manner that protects ITAs and avoids adverse impacts when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation. The USFWS does not have a specific ITA policy.

Sources of Information

The following key sources of information were used in the preparation of this section:

- GIS coverage of Indian reservations and rancherias for the State of California maintained by Reclamation, and
- maps of ITAs and their proximity to the plan area.

Indian Trust Assets

There are no ITAs in the vicinity of the proposed project area. The nearest ITA to the plan area is the Lytton Rancheria located 33 miles west-northwest away from the plan area in Healdsburg, California. The closest water body to this ITA is Dry Creek, a tributary to the Russian River. The Environmental Consequences subsection below concludes there are no adverse effects on the trust assets of the Lytton Rancheria.

Environmental Consequences

Assessment Methods

Reclamation maintains GIS coverage of Indian reservations and rancherias for the state of California. Impact assessments for ITAs were based on this GIS coverage and maps of ITAs for the area.

Significance Criteria

The presence of an ITA within the plan area or the potential effects of a project on an ITA (regardless of the project's proximity to it) trigger evaluation of potential impacts on ITAs. If during the course of this evaluation an impact on an ITA is determined, consultation with the potentially affected tribes would ensue to ensure that the affected tribe(s) may fully evaluate the potential impact of the proposed SMP alternatives on ITAs. Plan effects that conceivably could affect ITAs, such as water rights or other assets that might be located off-reservation, also trigger further evaluation and consultation with affected tribes.

Environmental Impacts

The proposed project and alternatives would not result in any direct or indirect impacts on Dry Creek, Russian River, or other resources used by the Lytton Rancheria. As such, there would be no impacts on ITAs resulting from the SMP.