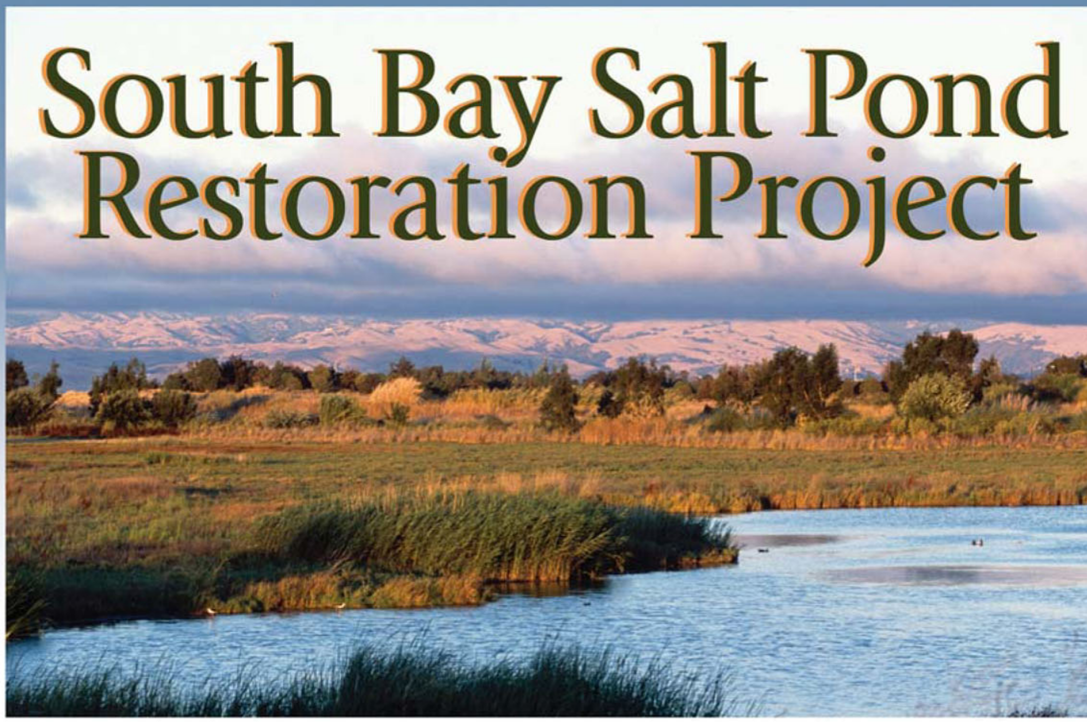

Final Alternatives Report

Submitted to:
California State Coastal Conservancy
U.S. Fish & Wildlife Service
California Department of Fish and Game

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ABBREVIATIONS AND ACRONYMS

ACFCWCD	Alameda County Flood Control and Water Conservation District
ACFCC	Alameda Creek Flood Control Channel
ADF	Alternatives Development Framework
aka	also known as
Bay	San Francisco Bay
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
Corps	U.S. Army Corps of Engineers
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
far South Bay	portion of the South Bay south of Dumbarton Bridge
FEMA	Federal Emergency Management Act
ISP	Initial Stewardship Plan
NEPA	National Environmental Policy Act
MHHW	mean higher high water
MLLW	mean lower low water
PMT	Project Management Team
ppt	parts per thousand
PWA	Philip Williams & Associates, Ltd.
SBSP	South Bay Salt Pond
SCVWD	Santa Clara Valley Water District
Shoreline Study	South San Francisco Bay Shoreline Study
South Bay	South San Francisco Bay south of Coyote Point and the San Leandro Marina
USFWS	United States Fish and Wildlife Service

1. EXECUTIVE SUMMARY

This report describes the final alternatives proposed for NEPA/CEQA analysis for the South Bay Salt Pond (SBSP) Restoration Project. The overarching project goal is the restoration and enhancement of wetlands in the South San Francisco Bay while providing for flood management and wildlife-oriented public access and recreation. The alternatives are being planned at a program level, to be followed by more detailed project-level planning as individual pieces of the program proceed to implementation. The alternatives were developed with input from the Project Management Team, Science Team, Regulatory and Trustee Agency Group, and the public through a series of workshops and meetings. The planning process for formulating and evaluating the alternatives is described in the Alternatives Development Framework (ADF) document (PWA and others 2004a).

The final alternatives are:

- Alternative A: No Action
- Alternative B: Managed Pond Emphasis (50:50 Tidal Habitat to Managed Pond by area)
- Alternative C: Tidal Habitat Emphasis (90:10 Tidal Habitat to Managed Pond by area)

The mix of habitats in the restoration alternatives is expected to benefit a diversity of wildlife, including special-status species and migratory birds, and to increase the overall abundance and diversity of native species in South San Francisco Bay. The restoration alternatives are designed to improve existing levels of flood protection and provide high quality public access and recreation opportunities.

Alternative A (Figure 1), the No Action Alternative, is included for NEPA/CEQA comparison to the two restoration alternatives, Alternatives B and C. Alternative B (Figure 2) and Alternative C (Figure 3) have been formulated to explore different responses to the project objectives by varying the extents of tidal habitat and managed pond restoration.

The alternatives represent potential “end states” at year 50. Alternatives B and C will be analyzed in the NEPA/CEQA assessment as “bookends,” representing a range of outcomes from a 50:50 ratio by area of tidal habitat to managed pond, to a 90:10 ratio. In fact, the optimal configuration that best meets the project objectives may be a solution somewhere between the two bookends.

The project will use adaptive management as an integral part of the planning and implementation process to guide selection of the ultimate endpoint. The adaptive management process will consist of monitoring, implementing experiments, actively learning, and adjusting actions as the restoration proceeds. Project implementation will be phased over many years; learning from early phases will guide implementation of the later phases.

The alternatives were rated to provide an early assessment of how well each alternative responds to the project goals and objectives. Both restoration alternatives (Alternatives B and C) perform substantially better than the No Action Alternative (Alternative A) overall. The habitat tradeoffs between tidal marsh and managed ponds are reflected in the ratings for Alternatives B and C, with Alternative B performing better for managed pond species, and Alternative C performing better for tidal-marsh dependent species. Both restoration alternatives perform well for flood management due to a proposed levee that will provide coastal flood protection and due to strategic placement of the tidal restoration to enhance fluvial flood conveyance. Both restoration alternatives also perform well with respect to public access and restoration, due to the completion of the Bay Trail in the Project area and the inclusion of a variety of high quality land-based and water-based public access and recreation opportunities. Both restoration alternatives also perform better than the No Action Alternative with respect to water quality.

The first phase of project implementation, Phase 1, is expected to begin construction in mid-2008. The Phase 1 actions are identified in this report and will be detailed fully at the project level in the EIS/R. The Phase 1 actions (shown in Figure 4) consist of tidal habitat restoration and pond management in each of the three pond complexes, plus improvements in public access. The habitat actions collectively cover approximately 2800 acres. The Phase 1 actions have been proposed based on funding, certainty of success, ability to test key uncertainties, and visibility and access to the public. The Phase 1 actions will incorporate adaptive management experiments to test key uncertainties and inform future management decisions.

2. INTRODUCTION

This document presents the final alternatives proposed for NEPA/CEQA analysis for the SBSP Restoration Project. The final alternatives will be evaluated pursuant to NEPA/CEQA in the Environmental Impact Statement / Report (EIS/R).

The process for formulating and evaluating alternatives for the SBSP Restoration Project is outlined in the Alternative Development Framework (ADF) (PWA and others 2004a). Formulation of the final alternatives builds on previous steps in the alternatives development process: identification of project goals and objectives, opportunities and constraints assessment, identification of initial options for restoration at each pond complex, formulation and refinement of preliminary alternatives, and evaluation of how well the refined alternatives respond to the project objectives. Related project documentation is provided in the Existing Conditions Reports (Brown and Caldwell and others 2005; EDAW and others 2005; H. T. Harvey & Associates and others 2005; PWA and others 2005a; PWA and others 2005b), Initial Opportunities and Constraints Summary (PWA and others 2004b), the Preliminary Program Alternatives Memorandum (PWA and others 2005c), and the Draft Adaptive Management Plan (Trulio and Clark 2005).

The final alternatives update and refine the preliminary alternatives presented in the Preliminary Program Alternatives Memorandum in January 2005 (PWA and others 2005c). The alternatives have been refined based on the following: [1]

- Input from the landowners (California Department of Fish and Game [CDFG] and the U.S. Fish and Wildlife Service [USFWS]) and other members of the Project Management Team (PMT), Stakeholders, and Regulatory and Trustee Agencies, including the USFWS Endangered Species Program,
- Assessment of how well the alternatives respond to the evaluation criteria,
- More detailed assessment of phasing and Phase 1 actions,
- Additional development of the Adaptive Management approach.

The next step will be to evaluate the final alternatives pursuant to NEPA/CEQA beginning in early 2006. The final alternatives will continue to be refined in terms of features and phasing as they progress through NEPA/CEQA assessment. The draft EIS/R is expected to be released in the fall of 2006.

This memorandum is organized into the following sections:

Section 3. Project Goals and Objectives
Section 4. Overview of Alternatives Approach
Section 5. Target Habitats
Section 6. Final Alternatives

[1] See the SBSP Restoration Project website (southbayrestoration.org) for a complete list of participants and workshop and meeting schedules

Section 7. Adaptive Management
Section 8. Response to Evaluation Criteria
Section 9. Phase 1 Actions
Section 10. Next Steps

3. PROJECT GOAL AND OBJECTIVES

The project goal and objectives were developed by the PMT with input from the Stakeholder Forum, Science Team, and Regulatory and Trustee Agency Group (PWA and others 2004a). The overarching project goal and six project objectives, as adopted by the Stakeholder Forum on February 18, 2004, are as follows:

Goal: The overarching project goal is the restoration and enhancement of wetlands in the South San Francisco Bay while providing for flood management and wildlife-oriented public access and recreation.

Objectives:

1. Create, restore, or enhance habitats of sufficient size, function, and appropriate structure to:
    a. Promote restoration of native special-status plants and animals that depend on South San Francisco Bay habitat for all or part of their life cycles.
    b. Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees.
    c. Support increased abundance and diversity of native species in various South San Francisco Bay aquatic and terrestrial ecosystem components, including plants, invertebrates, fish, mammals, birds, reptiles and amphibians.
2. Maintain or improve existing levels of flood protection in the South Bay area.
3. Provide public access and recreational opportunities compatible with wildlife and habitat goals.
4. Protect or improve existing levels of water and sediment quality in the South Bay, and take into account ecological risks caused by restoration.
5. Implement design and management measures to maintain or improve current levels of vector management, control predation on special-status species, and manage the spread of non-native species.
6. Protect the services provided by existing infrastructure (e.g., power lines, railroads).

As specified in Objective 1b, the Project is committed to maintaining use of the restored salt ponds by the full range of migratory bird species that currently use the salt ponds. Maintenance of use by these *species* does not necessarily require maintenance of the existing *abundance* (number of individuals) of these species. Though the Project will strive to maintain both species and abundance to the extent possible, it recognizes that meeting some of the project objectives, particularly those related to tidal-marsh dependent native species, may require trade-offs in abundance for birds currently using the ponds.

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4. OVERVIEW OF ALTERNATIVES APPROACH

This section describes the overall approach to alternatives development: the level of detail at which the alternatives are being developed (program-level versus project-level); approach to habitat restoration, flood management, and public access project elements; and integration of adaptive management.

4.1 Planning Level of Detail: Program-Level Alternatives and Project-Level Phased Actions

The final alternatives presented in this report are defined at a *program* level of detail, to be followed by more detailed *project*-level planning as individual phases of the overall program proceed to implementation. A program-level alternative is an integrated plan for habitat restoration, flood protection, and public access, coupled with adaptive management. Each alternative includes identification of Phase 1 actions and a description of the overall phasing for full implementation.

The EIS/R will be a combined document with program-level assessment of the long-term alternatives and project-level (detailed) coverage of Phase 1. Subsequent EIS/R supplements – documents which tier off of the program-level document – will be prepared for future phases. Tiering refers to the coverage of general environmental issues in broad EIS/Rs (such as the SBSP Programmatic EIS/R) with subsequent narrower EIS/Rs concentrating on more specific issues. The subsequent EIS/Rs are excused from repeating the analysis of the broad environmental issues examined in the programmatic EIS/R.

At the program level, the alternatives are defined broadly. Table 1 provides example levels of detail for program-level alternatives and project-level phases. It is important to maintain some flexibility in the alternatives at the program level. For example, specific locations of managed pond vs. tidal habitat may need to be adjusted to provide for flood management based on subsequent detailed project-level flood studies.

Table 1. Level of Detail for Program versus Project

Planning Component	Program Alternative	Project Action (e.g. Phase 1)
Habitat Restoration	• Approx. locations & total extent of habitat types • Types of habitat to be restored and conceptual schematic of design features to create each habitat type • General operations and management regimes for the managed ponds	• Exact locations of habitat types • Pond-specific layout of design features - *e.g.*, exact breach locations • Specific operations and management regimes for the managed ponds
Flood Management	• Approximate levee alignments • Maintain flexibility pending detailed modeling & assessment	• Specific levee alignments • Detailed flood modeling and assessment

Table 1. Level of Detail for Program versus Project

Planning Component	Program Alternative	Project Action (e.g. Phase 1)
Public Access/ Recreation	• Types of access/ recreation, *e.g.*, trails, hunting, kayak launches • General trail alignments	• Detailed descriptions of access (e.g., exact locations, dates) • Exact trail alignments, parking lot locations, etc.
Adaptive Management	• Overall framework and institutional structure for adaptive management • Identification of key uncertainties for testing • Development of a Monitoring Plan, with a time frame for implementation	• Detailed adaptive management structure • Site-specific experimental design • Specific monitoring locations, methods, and frequencies

4.2 Ecosystem Restoration

The SBSP Restoration Project will restore a mosaic of tidal and managed-pond habitats over a 15,000-acre footprint. Tidal habitats will be affected by the twice-a-day inundation of bay water, and marsh establishment will rely primarily on estuarine sedimentation and natural vegetative colonization. Successful restoration of tidal habitats will contribute to the recovery of endangered, threatened, and other special-status, tidal-marsh-dependent species, as well as the recovery of South Bay fisheries. Managed ponds will encompass a range of water depths and salinity regimes through the use of flow control structures, grading, and other means. Many of the ecological benefits of the former salt production ponds will be maintained within a reduced salt pond habitat area by grading and managing water and salinity regimes for target bird species and waterfowl.

The mix of tidal habitat and managed pond habitat restoration will seek to balance the trade-offs between project objectives. Restoration of tidal habitat benefits special-status and native species (Project Objective 1a). Maintenance of managed pond habitats helps maintain migratory bird species that utilize the existing ponds (Project Objective 1b). Both habitat types support increased abundance and diversity of the native species of the South Bay (Project Objective 1c).

The project will restore a continuous band of tidal marsh (a "tidal corridor") along the edge of the Bay to provide connectivity of habitat for tidal marsh dependent species, particularly the endangered salt marsh harvest mouse. Fill placement and grading will be used to create transitional habitats from marsh to upland habitat along portions of the upland edge, providing high tide refugia for tidal marsh species. In addition, tidal habitat will be restored adjacent to the major sloughs that serve as migration corridors for anadromous fish. Where possible, large tidal marsh systems will be restored to provide broad areas isolated from human and predator access.

The restored managed ponds will be located in accessible areas, to provide for ease of operations and maintenance. Their proposed distribution on the landscape will consider the benefits of clustering the ponds for ease of maintenance, and the need to disperse the ponds so they are readily available to birds traveling between the ponds and other habitats throughout the South Bay. The project relies on gravity flow structures as much as possible to minimize the costs of pumping while providing adequate pond habitat to support high densities of birds. Ponds near interpretive opportunities, such as the historic salt works, will be managed, as appropriate, to preserve the resource of interest.

4.3 Flood Management

A key element of the restoration project is to ensure that flood hazards to adjacent communities and infrastructure are not increased as a result of the restoration. Therefore, the proposed restoration alternatives contain provisions to manage flood hazards from both fluvial (stream) and coastal flood sources. One feature consistent across restoration alternatives is an inboard levee system to reduce the hazards of coastal flooding. This proposed line of flood protection may include existing levees (where adequate), high ground, and new flood protection levees. Some of the existing inboard levees consist of interior salt pond levees that are typically smaller than the outboard levees. While some of these existing levees have been modified or raised to improve flood protection, they may not meet standards that would make them acceptable as flood protection levees. Long-term flood protection may be provided by retrofitting existing levees to meet current standards or constructing new engineered levees. Flood modeling and analyses (in progress) will help further define the proposed flood levees.

The restoration project is committed to ensuring that future flood protection with the project is comparable to, or better than existing conditions. Beyond this, it is desirable by all entities to develop a flood management program around the entire project area that would provide a consistent level of flood hazard management with flood protection measures (levees, flood walls, high ground) meeting both FEMA and US Army COE criteria.

Following implementation, all levees will require some ongoing inspection and maintenance to sustain their intended level of protection. Maintenance of a single engineered inboard levee system is expected to require a lower level of effort and cost than maintaining the existing complex of Cargill levees, since most of the new levees will be stronger, and have an outboard extent of vegetated marshplain to dissipate erosive wave energy.

Flooding is possible from the major stream channels that flow from the surrounding watersheds through the salt ponds to the Bay. During large rainstorms, these channels convey flood flows to the Bay. Because the channels are constricted, these flood flows can produce high water levels upstream, resulting in levee overtopping and local flooding. If flood events occur concurrent with high tides, flood hazards are increased. From a fluvial flood-management perspective, there are two approaches to reducing flood hazards: providing increased channel-flow conveyance or providing increased flood storage (detention). The project uses a conveyance approach where possible, though both approaches may be utilized within the project alternatives.

Conveyance can be increased by removing, breaching, or setting back the existing channel levees, widening the channel and providing additional cross-sectional area for flow. Conveyance can also be increased using regular tidal scour to enlarge the channel cross-section. Breaching slough levees will route more tidal flow through the sloughs/channels, resulting in channel deepening and widening downstream of the breaches. The expansion of the cross-section will increase channel flood flow conveyance and thereby reduce upstream water levels and flood hazards without requiring repeated dredging.

In existing channels confined on one or both sides by levees, the channel scour described above could result in the erosion of existing downstream levees. This will be addressed in the project design in one of several ways. In many locations where channel scour is expected, the levees on either one or both sides will no longer be needed and can be removed or allowed to scour. Where levees are to be maintained, they will either be relocated to accommodate the expected channel enlargement or levee armoring may be required to ensure that the levee remains intact. It is recognized that these types of changes (channel expansion by scour, possible levee erosion) would occur gradually in response to the restoration plan implementation, and it will be important to provide a consistent level of flood hazard management throughout all phases of the project.

Flooding impacts may also be reduced by providing temporary storage of flood water within the managed ponds. Conversion of ponds to muted tidal or seasonal wetland with flood-flow diversion will increase storage of fluvial flood waters, resulting in decreased water levels and reduced flood hazards in the tributary channels.

4.4 Public Access and Recreation

The integration of public access and recreation features into the project area addresses the objectives for public access, as presented in three public workshops held in September and October 2004 and documented in Section 6. Additional field tours and a design workshop held in September and October of 2005, as well as comments received from stakeholders, formed the basis for revisions to define the final alternatives presented herein. The proposed public access and recreation features include an interrelated system of trails and viewing platforms, interpretive stations, hunting, access to and interpretation of cultural resource features, opportunities for field education and interpretation, non-motorized boat launching points and associated staging and parking areas. The goal for the future design of these features will be to integrate all aspects of the project into a coherent theme that provides a clear sense of place within the context of the South Bay and surrounding communities.

The trails component of public access and recreation will form a hierarchy with certain segments helping to complete the Bay Trail spine, some spur segments that will also be part of the Bay Trail regional system, and some local trail connectors that may be part of an existing local trail. Land and water-based trails form the network of interconnection between the project area and other recreation and public access features. As possible, new loop trails are proposed near areas where the restoration may result in the removal of existing loop trails. Trail segments will vary in size, width, surfacing and the types of users they can accommodate and when visitors will have access.

Trails may be designed to accommodate vehicular use in some locations to provide access to a staging area or launching point, or for disabled access. Trails will also provide hunting and fishing access to areas that accommodate these activities. Trail location and type will be further developed for the project-level actions; however, they are relevant for the program-level alternatives to ensure the trail system will function as an integrated system.

Cultural features will be accessible as part of the larger trail network and where interpretive signage and guided or self-guided walks can be accommodated. The history of landscape change in the South Bay provides a wealth of possible themes to develop as part of the public access plan. The history of the many salt works operating in the South Bay or the use of the Bay for duck hunting are examples of themes that could be developed for interpretive and educational value. Historical as well as future landscape change will be considered in the final design of public access features.

Interpretive stations are proposed at strategic locations along the trail network within the project area. These are envisioned to be of varying sizes and scope and may be interactive features that can operate independently or can be enhanced with the assistance of docents. Viewing platforms will be located at vista points where important information about the landscape can be viewed. These may also incorporate interpretive panels or signage to link the viewer with the site location. Water-based activities such as non-motorized boating will be incorporated into the public access plan as well as access for hunters and anglers.

Public access, flood management, and habitat features will be developed in concert with each other to maximize the ability to manage these resources over time. Trails and other access features that are developed on existing or proposed levees will be integrated with the levee structure, without interrupting the flood control function. Tidal access and recreation areas will be designed to withstand periodic inundation, if appropriate, and may be in locations that will have more limited access or use, depending on tidal location and habitat requirements. Public access and recreation features will be designed to respect habitat requirements and therefore may be seasonal or limited in the number of visitors that can be accommodated. In general, trail access is considered to be less compatible with tidal habitat restoration than with managed pond restoration because of the sensitive nature of endangered species associated with tidal habitats and, to a lesser extent, the costs of maintaining access in areas that are open to tidal action. The final alternatives are subject to change and alteration as more is understood about the effects of human interface with the different elements of restoration.

Public access and recreation features will provide a variety of aesthetic experiences, including access to the Bay and access away from urbanized areas; will encourage recreation for a variety of visitors, including multi-use trail users, kayakers, hunters, anglers, school and other interested groups; and will close gaps in the Bay Trail spine for the South Bay. Access will be designed to be as barrier-free as possible to provide access for visitors of varying abilities and to comply with the Americans with Disabilities Act. The design will consider city and county standards and will strive to harmonize with existing facilities.

4.5 Adaptive Management

The project will be implemented in phases, with implementation of the later phases informed by lessons learned in the earlier phases. Adaptive management is the process of collecting relevant information and using it to improve future phases of project implementation. Adaptive management acknowledges that uncertainties exist and provides an operational framework for updating management plans based on improved understanding of the cause-and-effect linkages between restoration actions and the physical and biological response of the ecosystem. As new insight emerges through periodic monitoring and analysis, this information is fed back into the planning process.

Adaptive management will be used to guide the ecosystem restoration, public access, and flood management elements of project implementation. Adaptive management decisions will affect the ultimate mix of tidal and managed pond habitats, as well as the time required to reach this endpoint. The preferred alternative will progress from ISP conditions and, through adaptive management, is expected to result in a mix of tidal and managed ponds habitat somewhere between the two bookends depicted in Alternatives B and C. Adaptive management will also affect decisions about public access timing (*e.g.*, seasonal closures) and location of features such as trails. Flood management decisions will be informed by adaptive management findings related to rates of channel scour following restoration and other geomorphic processes.

A detailed Adaptive Management Plan is currently being developed (Trulio and Clark 2005). In addition to the institutional framework required to implement the program, the adaptive management plan will identify key uncertainties that currently prevent the project from achieving the project objectives with a reasonable amount of certainty. Adaptive management experiments designed to answer specific hypotheses posed by these uncertainties will be integrated in each phase of the restoration project.

4.6 Planning Considerations

A set of Planning Considerations (considerations) was developed to help guide the location of specific habitat restoration, flood management, and public access/recreation elements within the landscape and within each pond complex. The considerations, presented in Appendix A, detail the design approach presented above.

The considerations are based on a draft set of science-based conceptual models that link project actions to achievement of the project objectives. The considerations were developed with input from the PMT and the consultant team, and were refined with input from the public and the Science Team.

There can be linkages or, in some cases, conflicts between considerations. Restoration of tidal marsh along the major sloughs provides an example of linkages. Tidal restoration along the major sloughs provides habitat for anadromous fish. At the same time, it provides flood protection benefits by enlarging and deepening the mouths of major creeks, allowing conveyance of larger flood flows. Public access has the potential to conflict with ecological restoration through visitor disturbance of sensitive adjacent habitats. Public access must consider the location and siting of features to reduce habitat disturbance.

Because trade-offs must often be made between desirable land uses, the considerations guide, but don't dictate, a particular layout of the design features.

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5. TARGET HABITATS

The habitats to be created by the SBSP Restoration Project include a mix of managed pond habitats and restored tidal habitats. Tidal habitat to be created by this project includes tidal brackish and salt marsh, tidal mudflat, subtidal flats and channels, marsh ecotones and upland transitional zones, salt pans and ponds. Multiple options for pond reconfiguration and water regime management will be used to enhance and create ponds with a variety of depths (including salt flats, very shallow ponded areas, and deep-water areas) and salinities (*e.g.*, ponds with salinity close to bay water as well as higher salinity brine ponds), and associated levees and islands.

5.1 Tidal Habitats

Tidal habitat is a general term that refers to a range of tidally-inundated habitats between subtidal bay and uplands. These primarily consist of unvegetated mudflats, emergent marsh, tidal channels, tidal ponds, salt pans, salt marsh, and upland transition zones. Each of these tidal habitats has unique functions and values that contribute to the health of the estuary. For example, *salt marsh* and *upland transition zones* are critical for the salt marsh harvest mouse, while *emergent marshes* comprised of pickleweed and cordgrass with complex dendritic *tidal channel* networks are important for the California Clapper Rail and estuarine fish. Meanwhile, shorebirds, waterfowl, and other waterbirds will utilize the *unvegetated mudflats, salt pans, tidal channels* and associated *tidal ponds*.

Emergent marsh vegetation will colonize in the higher elevation tidal areas. Some areas of the ponds are at elevations where vegetation such as cordgrass and pickleweed will colonize rapidly. Other areas will require the build up of mudflats through sedimentation before vegetation will colonize. Planting of native marsh plant species can facilitate *salt marsh* establishment, if necessary.

In large natural marsh systems, low natural levees along higher-order (*i.e.*, 4^{th} and 5^{th} order) *tidal channels* provide nesting habitat for California Clapper Rails and serve as intra-marsh refugia for salt marsh harvest mice, rails, and other species during spring tides. Placement of fill to block borrow ditches will prevent these artificial ditches from dominating the tide's ebb and flow within a restored marsh, allowing for faster and more complete rejuvenation of remnant *tidal channels.*

Upland transitional zone habitat areas can be created at the upper edge of marshes by importing fill to produce broad, gently sloping areas adjacent to flood control levees or adjoining upland habitat. These unique marsh-associated habitats, including the upland ecotone as well as natural *salt pan* areas within upper *salt marshes*, are critical components of bay wetlands and require thoughtful restoration design. Excavation of shallow depressions in the upper *salt marsh* can facilitate the formation of *salt pans*.

Moist grasslands restoration was considered as part of the alternatives development, but was not included in the final alternatives because the probability of achieving the habitat objectives was considered to be relatively low, restoration would require large amounts of fill, and the only area for potential moist grasslands restoration (Pond A22) is well suited for restoration of other habitat types such as broad tidal transitional habitat or managed ponds for plovers.

Unvegetated mudflat may persist as part of a mosaic of intertidal habitats until marsh vegetation establishes. These mudflats support benthic organisms and provide habitat for shorebirds and waterfowl. Mudflats will persist longest where the existing grades are low relative to the tidal elevations, sediment availability is limited, and wind-wave action is strong. In some circumstances it may be desirable to restore portions of restoration sites as sustainable or permanent mudflat habitat.

5.2 Managed Ponds

Managed pond is a general term that refers to a range of habitat types and management characteristics, as well as the level of pond management provided. The following sections describe the critical habitat variables and the managed pond types included in the final alternatives.

5.2.1 Habitat Types

Several habitat variables are critical to bird use, including water depth, salinity, seasonality of ponding, and presence/extent of islands for nesting and roosting.

Water depth is important primarily for foraging birds. Most shorebirds forage on moist sediment or in water less than 4 cm in depth (large shorebirds may forage in water up to 10-15 cm deep) (Isola and others 2000). Dabbling ducks are also limited to shallow waters, generally preferring water depths from 10 to 30 cm (Page 2001 in Life Science 2004), while diving ducks generally prefer water at least 30 cm and up to several meters deep (Life Science 2004). Larger swimming birds, such as larger grebes, pelicans, and cormorants, also generally swim and forage in deeper water. Terns tend to nest more readily on islands surrounded by deeper water than shallow water, perhaps because deeper water around nesting islands inhibits mammalian predation.

Salinity strongly influences aquatic plant, invertebrates, and vertebrate species and communities. Ponds can be managed to support a diversity of salinity ranges targeted at specific species. Lower-salinity ponds (e.g., salinities below 40 ppt) support diverse benthic invertebrate communities and several species of fish, which occasionally reach fairly high densities. Because most of these fish cannot tolerate salinity greater than 70-80 ppt (Carpelan 1957; Lonzarich 1989), piscivorous birds generally forage only in the lower salinity ponds. Dabbling ducks are also usually present in highest concentrations in the lower-salinity ponds, where they feed on both invertebrates and aquatic vegetation. In higher-salinity ponds, brine shrimp (*Artemia franciscana*), brine flies (*Ephydra* spp.), and reticulate water boatman (*Trichocorixa reticulata*) provide an abundant food source for shorebirds, gulls, and other birds where water depths are conducive to efficient foraging on these invertebrates. High-salinity ponds would be managed for the optimal salinity ranges for these invertebrates (generally greater than 70 ppt). Salinities greater than 150 ppt would be avoided to eliminate the precipitation of gypsum.

Seasonality of ponding is important for some species. Seasonal ponds provide aquatic habitat for invertebrates and for a variety of waterbirds when ponds fill with winter rains. Ponds that are flooded in the fall (via managed tidal inflow through culverts) provide foraging habitat for migratory birds. Ponds that are dry in the spring and summer provide nesting habitat for a few pond-associated species, most notably the Western Snowy Plover (*Charadrius alexandrinus nivosus*). Active management of seasonal ponds is important to ensure that desired habitat conditions are present at the appropriate time of year. For example, actively flooding a pond via water-control structures in early fall, rather than relying on rain for ponding in late fall, would provide foraging habitat for fall migrant shorebirds. Similarly, actively drawing down a pond via water-control structures in spring, rather than relying on evaporation alone, would facilitate the development of dry Snowy Plover nesting habitat. Periodically deeper or longer-duration flooding may be required to inhibit the development of dense vegetation within seasonal ponds, which would reduce the open pond conditions preferred by many pond-associated birds. For these reasons, unmanaged seasonal ponds, which may become vegetated and/or may not provide the desired habitat conditions at the appropriate season are not expected to provide the same benefits to pond-associated species as managed seasonal ponds.

Numerous waterbirds use islands and levees for roosting, either at night or during high tide when their preferred foraging habitats are submerged. Large mixed-species flocks of shorebirds, gulls, terns, cormorants, pelicans, herons, and other birds roost on islands within ponds. A few species, including the Black-necked Stilt (*Himantopus mexicanus*), American Avocet (*Recurvirostra americana*), Western Snowy Plover, Caspian Tern (*Sterna caspia*), Forster's Tern (*Sterna forsteri*), and California Gull (*Larus californicus*), nest on islands within managed ponds.

Different combinations of water depth, salinity, seasonality of ponding/drying, and islands benefit different wildlife species or groups:

- Shallow, lower salinity ponds – fish, shorebirds, dabbling ducks, herons and egrets
- Shallow, high-salinity ponds – high densities of foraging shorebirds, including migratory species such as western sandpipers, salt-pond associated species such as Wilson's (*Phalaropus tricolor*) and Red-necked Phalaropes (*Phalaropus lobatus*), breeders such as American Avocets and Black-necked Stilts, Eared Grebes (*Podiceps nigricollis)*, Bonaparte's Gulls (*Larus philadelphia*)
- Deep, low-salinity ponds – fish, diving ducks, pelicans, Western (*Aechmophorus occidentalis*) and Clark's Grebes (*Aechmophorus clarkii*), Double-crested Cormorants (*Phalacrocorax auritus*), terns
- Deep, high-salinity ponds – Bonaparte's Gulls, Eared Grebes, Red-necked Phalaropes
- Seasonal ponds – shorebirds and waterfowl in winter, Snowy Plovers in summer
- Islands – nesting by Snowy Plovers, avocets, stilts, terns, gulls; roosting by all waterbirds

5.2.2 Pond Types

Two types of managed ponds are incorporated within the alternatives and discussed in the sections below: "enhanced" and "reconfigured".

Enhanced ponds will be improved for use by nesting, roosting, and foraging birds, but will not be extensively graded. Although the degree of management specifically for birds is constrained by discharge requirements, funding, and other considerations, all ponds under active management, even under the ISP, are expected to be managed with at least some consideration for use by target bird species. Therefore, all ponds that are actively managed for target bird species under the ISP, and all managed ponds under the project alternatives that are not "reconfigured" ponds, are considered enhanced ponds. Under ISP management, water levels in enhanced ponds may be actively regulated through intake/discharge and/or pumping to provide habitat for target species. Habitats may also be varied seasonally to target habitat for different species during different seasons; for example, some enhanced ponds may be managed as seasonal ponds to provide dry substrate for Snowy Plover nesting during the spring and summer, then flooded in fall and winter to provide foraging habitat for migratory birds. However, under the ISP, little or no grading to manipulate water depths is expected to occur, and few islands are to be constructed or replenished.

In contrast, enhanced ponds under the project alternatives may undergo limited grading, and may have some island construction, maintenance, and replenishment. Additionally, management activities such as vegetation control, predator control, and pumping, monitoring of the effects of certain activities on target bird numbers, and adaptive management of pond conditions are expected to occur at enhanced ponds at a significantly greater level under the project alternatives than under the ISP.

Reconfigured ponds will be more extensively graded than enhanced ponds, and will be intensively managed to achieve a highly productive habitat for foraging, roosting, and breeding. Reconfigured ponds will be graded to create low berms and checkdams to provide finer control of water depths and salinities within the ponds. In addition, reconfigured ponds will be graded to create extensive nesting islands for high quality breeding habitat.

To the extent practicable, gravity management of water levels will be used for flooding and draining in all the managed pond types to allow water levels to be controlled without the need for pumping. However, active pumping may be required to manage water levels in ponds with bottom elevations that are not conducive to the use of gravity flow (*i.e.*, ponds that are deeply subsided and thus can not be easily drained or ponds that are elevated well above mean tide level and thus can not be easily flooded). In a given set of ponds, managing for high salinity (with higher residence time) rather than lower salinity will require less frequent pumping.

As mentioned above, management activities such as vegetation control, predator control, and pumping, monitoring of the effects of certain activities on target bird numbers, and adaptive management of pond conditions are expected to occur at reconfigured ponds at a significantly greater level under the project alternatives than at managed ponds under the ISP.

The direct use of recycled fresh water to flood some ponds directly was considered, but was not recommended because it did not meet the project objectives as well as using bay water as the water source.

6. FINAL ALTERNATIVES

The final alternatives proposed for NEPA/CEQA analysis are:

- Alternative A. No Action
- Alternative B. Managed Pond Emphasis (50:50 Tidal Habitat : Managed Ponds by area)
- Alternative C. Tidal Emphasis (90:10 Tidal Habitat : Managed Ponds by area)

The mix of habitats in the restoration alternatives is expected to benefit a diversity of wildlife, including special-status species and migratory birds, and to increase the overall abundance and diversity of native species in South San Francisco Bay. The restoration alternatives are designed to improve existing levels of flood protection and provide high quality public access and recreation opportunities.

Alternative A, the No Action Alternative, is not being proposed by the project, but is included for NEPA/CEQA comparison to the two restoration alternatives, Alternatives B and C. Alternative B and Alternative C have been formulated to explore different responses to the project objectives by varying the extents of tidal habitat and managed pond restoration.

The alternatives represent potential "end states" at year 50. Alternatives B and C will be analyzed in the NEPA/CEQA assessment as "bookends," representing a range of outcomes from a 50:50 ratio of tidal habitat to managed pond, to a 90:10 ratio. The two ends of the range are reasonable end points to potentially meet the Project objectives and represent different trade-offs. The lower end of the tidal restoration range (50:50) was set at the minimum amount of tidal restoration considered necessary to achieve sufficient enhancement of tidal habitats to achieve the Project's objectives related to tidal habitat-associated species. The upper end of the tidal restoration range (90:10) was set by the minimum amount of managed pond area required to meet certain pond-associated objectives. The optimal configuration that best meets the overall project objectives may be somewhere between the two bookends. The project will use adaptive management (Section 7) as an integral part of the planning and implementation process to guide selection of the ultimate endpoint.

Figures 1 - 3 depict the three alternatives at year 50 for each pond complex, and Appendix B includes a brief summary of the changes that occurred between the preliminary alternatives and the final alternatives.

6.1 Alternative A: No Action

The No Action Alternative is the most likely outcome in the absence of implementing a long-term restoration plan. The No Action Alternative is based on the professional judgment of the landowners and project planners with respect to future levels of funding for land-management, the expected lifetime of existing levees and hydraulic structures, and other factors that are inherently difficult to estimate. The No Action Alternative may change somewhat in the future, as specific assumptions are refined. Figure 1 shows the most likely No Action Alternative at year 50. Appendix C provides a more detailed description of the No Action Alternative by pond complex.

The No Action Alternative assumes that the CDFG and USFWS will operate and maintain the ponds in a manner similar to the ISP (Life Science 2003), although ongoing operations and maintenance activities would be scaled back. The ISP is intended as an interim plan for the period while the long-term restoration plans are developed and implemented. In the absence of a long-term restoration plan, the ISP will be replaced by a smaller set of prioritized operations and maintenance actions. The No Action Alternative assumes that the CDFG and USFWS will not have funding to maintain full ISP operations over the 50-year planning horizon.

Initially under the No Action Alternative, pumping will be discontinued. Ponds that require pumping for water circulation in the ISP will be dewatered or allowed to evaporate, becoming seasonal ponds that fill and dry through rainfall and evaporation. The landowners will manage water circulation in some or all of the remaining ponds using gravity-flow control structures, with the extent of management depending on the funds available.

Over time, operations will become more limited. Water management will be discontinued on a pond-by-pond basis as hydraulic structures break, creating more seasonal ponds. The landowners will maintain, but not improve, the pond levees. With continued levee subsidence and sea level rise, the levees will be increasingly prone to failure. Stopgap measures such as sand bags and rock will be used to slow deterioration of key flood protection levees, as funding allows. Other levees will be allowed to erode, and tidal action will be restored to some ponds through uncontrolled breaching as shown in Figure 1.

Compared to the ISP conditions, ecosystem value to migratory shorebirds and waterfowl will be drastically reduced due to the decrease in managed pond habitat and eventual vegetation encroachment into the seasonal ponds. On the other hand, ecosystem value to species that use tidal habitats will improve due to the increase in tidally-inundated areas and the eventual establishment of salt marsh within some of the breached ponds. However, the uncontrolled nature of the breaching could limit the habitat benefits. Early unintentional breaches will create expansive new mudflats for potential vegetation colonization, and if these early breaches occur near areas with *Spartina alterniflora* and its hybrids, this could inadvertently help spread this invasive species. In addition, the unplanned evolution of the landscape could further endanger salt marsh harvest mouse populations if existing fringe marsh is lost through tidal scour before new marsh is established.

Flood risks and potential damages are expected to increase over time due to deteriorating levee conditions and future sea level rise. Uncontrolled breaching under this alternative may significantly impact existing infrastructure, such as causing instability and access problems for the PG&E towers, as well as inland flooding where interior levees are not sufficient to keep out tidal flood waters.

The landowners would coordinate with the local flood management agencies to focus their limited maintenance and improvement funds on pond levees with high priority to be maintained. At Eden Landing, CDFG would focus their levee maintenance on the levees along the east side of Ponds E4, E5, E6, and E6C, to reduce the potential for periodic overtopping into areas that currently provide flood detention for low-lying areas of Alameda County. They would also coordinate levee maintenance and land management activities with the proposed Alameda Creek Flood Control Channel project.

At Alviso, the No Action Alternative assumes that the levees along ponds A5, A6, and A7 are the least likely to be maintained and that the levee along the west side of Pond A8 would be raised to prevent frequent tidal overtopping. This approach maintains the existing flood detention storage in Pond A8, but not in Ponds A5, A6, and A7. This loss of flood detention storage has the potential to raise water surface elevations at the mouth of Guadalupe River/Alviso Slough. The implications of the No Action Alternative on predicted flood water elevations along the Guadalupe River/Alviso Slough are being assessed using hydraulic modeling (in progress). It should be understood that this assessment is being conducted only to assess what the consequences of the No Action Alternative might be and to compare the benefits of the restoration alternatives (Alternatives B and C) with the No Action Alternative. The importance of providing flood hazard management is widely recognized. The No Action Alternative is not being proposed by the Project and is included in the final set of alternatives for comparative purposes only.
Existing public access and recreational value will ultimately decrease due to the deteriorating condition of the levees.

6.2 Alternative B: Managed Pond Emphasis (50:50 Tidal Habitat : Managed Pond)

Alternative B (Figure 2) emphasizes managed pond habitat and provides an approximately 50:50 mix by area of tidal habitat and managed pond.

This lower tidal habitat bookend was formulated by estimating the minimum amount of tidal restoration needed to provide significant, large-scale tidal habitat and flood-management benefits. Tidal habitat restoration includes creating continuous bands of broad tidal marsh, large marsh complexes (e.g., 500+ acres) with large channel networks, broad upland transition zones, and tidal restoration along major creeks and sloughs for flood protection and to benefit anadromous fish. The end result of this configuration was an alternative with approximately 50% of the area dedicated to tidal restoration. With a 50% conversion of ponds to tidal habitats, it is expected that pond-associated species will be maintained, with limited effects on abundance for most pond-associated species. Maintaining pre-ISP bird populations on roughly half the managed pond footprint would require doubling the density of bird use on the remaining managed ponds. This is considered achievable, since the ponds will be managed for the benefit of birds, rather than for salt production. Alternatively, some proportion of the birds using the existing ponds may use other locations within the South Bay (*e.g.*, existing Cargill ponds) or elsewhere.

6.2.1 Ecosystem Restoration

Alternative B provides approximately 7,500 acres of tidal habitat and maintains continuous tidal marsh corridors from Greco Island (north of the Ravenswood ponds) to Mud Slough and along most of the length of the Eden Landing shoreline. The tidal corridor between Alviso Slough and Coyote Creek consists of a several hundred-foot-wide strip of fringe marsh outboard of Ponds A9, A14, and A15. It is possible that this existing fringe marsh may widen or narrow (scour) following restoration. If additional information (detailed hydrodynamic assessment and monitoring) suggests that the fringe marsh will scour, the alternative will be revised to maintain a functioning tidal corridor, most likely by relocating the Pond A9 levee slightly southward. This alternative restores large patches of tidal marsh with high-order drainage channels, most notably all of southern Eden Landing (south of Old Alameda Creek) and the Pond A5, A6, A7, and A8/A8S pond cluster. Tidal habitat is restored along at least one side of the major sloughs (*e.g.*, Old Alameda Creek, Alameda Creek Flood Control Channel, Alviso Slough, and others) via breaches in the levees along the sloughs. These connections will provide improved nursery habitat for various fish species. Because most tidal areas will require sheltered conditions to evolve from mudflat to vegetated marsh, the outboard levee will generally need to be maintained in these areas until tidal marsh develops.

Alternative B provides approximately 7,500 acres of managed ponds. Approximately 20% of the managed ponds by area (10% of the project area) will be reconfigured to significantly enhance foraging, roosting, and nesting opportunities for shorebirds, waterfowl, and other waterbirds. The remainder, which are considered enhanced ponds, will undergo little or no grading (though some island creation and replenishment is expected to occur in some ponds) but will have salinities, water depths, and/or seasonality that are actively managed for target bird species. The ponds are grouped for ease of management, with many of the pond groupings corresponding to those in the ISP. Management activities such as vegetation control, predator control, pumping, monitoring of the effects of certain activities on target bird numbers, and adaptive management of pond conditions are expected to occur at both reconfigured and enhanced ponds at a significantly greater level under Alternative B than under either pre-ISP or ISP conditions.

Precise management criteria for individual ponds have not yet been established. In Alternative B, it is possible that all habitat types may be represented in the managed ponds. Reconfigured ponds in this alternative would probably not include seasonal ponds, since the value of these ponds is limited to a few species (other than Snowy Plovers) during the summer and early fall. The actual mix of habitats in the managed ponds will be informed by adaptive management (Section 7) with respect to salinities, depths, and feasibility of water, vegetation, and predator management within certain pond types, and the mix of habitats may be adapted to target species or groups if monitoring indicates disproportionate declines in abundance.

6.2.2 Flood Management

The proposed flood management plan resulting from the restoration project will provide an integrated system of both coastal and fluvial flood elements. The coastal flood protection program will identify and implement a system of shoreline levees to provide flood management to coastal floods resulting from high bay waters and waves. These levees will connect with the levee system providing flood management along each of the fluvial channels. In addition, fluvial flood hazards are expected to be reduced where tidal restoration scours the lower reaches of flood control channels, resulting in increased flow conveyance and a lower water surface elevation. In locations subject to both fluvial and coastal flooding, levee elevations will be designed to accommodate the appropriate risk of both individual (*i.e.*

fluvial or coastal) as well as simultaneous high tide and high river flow flood occurrences. The resulting flood management program will provide a more consistent and higher level of flood protection compared to existing conditions.

Various scenarios have been proposed to meet the project objectives for flood management for the Alameda Creek Flood Control Channel. These scenarios are currently being evaluated by the Alameda County Flood Control and Water Conservation District (ACFCWCD). One scenario is to breach the north levee along the Alameda Creek Flood Control Channel, but leave the levee otherwise intact. Another scenario is to entirely remove much of the north levee along the flood control channel. Alternative B assumes the first scenario; Alternative C assumes the second.

The preferred scenario will be selected by the ACFCWCD in coordination with the SBSP Restoration Project and will integrate both flood protection and habitat restoration elements.

6.2.3 Public Access

Public access and recreation are described by pond complex below. Additional detail is presented in Appendix D. Many public access and recreation features are interchangeable and can be part of either Alternative B or C. Features identified as part of Alternative B or C in the final alternatives may be interchanged once a preferred alternative is developed, or adaptively as the project is implemented.

Eden Landing. Figure 2a shows the public access and recreation features of Alternative B for the Eden Landing pond complex. Key provisions of this trail system are links between the existing Bay Trail spine north and south of the pond complex, as well as increased visitor access into the site. A year-round trail along the flood control levee on the eastern portion of the site provides key missing links in the Bay Trail spine in this area. The Bay Trail spine continues through the pond complex south to join the Alameda Creek Regional Trail along the north side of the Alameda Creek Flood Control Channel. From this point, a proposed bridge, to be constructed in cooperation with the Alameda County Flood Control and Water Conservation District, will connect this portion of the Bay Trail spine with Coyote Hills Regional Park in the south. From the Bay Trail spine, several “spur” trails provide access into the site. The northern portion of the pond complex is to serve as a new formalized entry with a staging area and future field office/information center. This will provide key visitor contact to learn about the use of the site, the restoration projects that are underway and the level and intensity of access provided. It will also serve as shelter for CDFG staff and public rest rooms. The main spur trail from the staging area has three branches: (1) a seasonal trail south of Ponds E10 and E11 leading to the Bay, (2) a trail north of Pond E12 providing year-round access to the Oliver Salt Works Historical Site, and (3) a seasonal loop trail along the perimeter of Ponds E12 and E13 culminating at the Oliver Salt Works Historical Site. Kayak and human-powered boat launching will be provided on Mount Eden Creek. Fishing and hunting access will be available from this main staging area, as per CDFG regulations for these activities. A viewing platform and interpretive information will be provided along the Bay Trail spine north of Pond E6A. A second spur trail is located on the north side of Old Alameda Creek, on the southern edges of Ponds E8 and E6A. This year-round trail will provide viewing access to the Alvarado Salt Works Historical Site. In this location, the viewing platform would need to be raised above existing grade to provide optimum visitor experience. An additional spur trail is located in the southeastern part of the pond complex on the southern edges of Ponds E5C and E4C. A viewing platform is located at the end of this year-round trail. Alternative B assumes that the levee along the north side of the Alameda Creek Flood Control Channel would remain largely intact, with pedestrian/equestrian bridges constructed across the proposed breaches. The existing trail that is part of the Alameda Creek Regional Trail, managed by East Bay Regional Park District, would remain along this existing levee. The existing staging area at the Alameda Creek Stables could continue to be used for access to this segment of trail.

Alviso. Figure 2b shows the public access and recreation features of Alternative B for the Alviso pond complex. Public access and recreation features at Alviso will provide key links in the Bay Trail system and provide strategically placed spur trails for education and interpretation of the site and the ongoing restoration. Additionally, a series of multi-use trails, viewing platforms, interpretive signage and stations, non-motorized boat launching, and hunting and fishing access will be designed to be compatible with adjacent wildlife habitat and conform to the USFWS Refuge use-compatibility requirements.

In the southwestern region, the existing Bay Trail exits the pond complex at Pond A2W, heading south to become the Stevens Creek Trail. A proposed seasonal trail extends north from its point of departure to access a viewing area located in Pond A2W, at the terminus of Stevens Creek as it enters the Bay. South of Pond A2W within the City of Mountain View, an interpretive station is proposed in cooperation with the City. This station would be accessible utilizing existing spur trails within the Park to the proposed Bay Trail Spine at Pond A2W. A year-round trail extends east from the Stevens Creek Trail, along a proposed flood control levee connecting it to proposed and existing trails around the Sunnyvale Treatment Ponds and north to a viewing area located on the northeast corner of Pond A3N. A staging area providing kayak, fishing and hunting access will be accessible from this trail. Vehicular access is provided along the southerly side of the Sunnyvale Treatment Ponds (to be done in cooperation with the City of Sunnyvale) and along the southeast edge of Pond A3W (to be done in cooperation with Cargill) to the staging area for boaters, hunters, and for persons with disabilities to access these portions of the restoration area. The paved access road at Pond A3W is owned by Cargill and the terminus was previously used for duck hunters and other boating access. A renovation of this area could provide access to the spur trails proposed along A3W, AB2 and A3N as well as water access to Guadalupe Slough.

In the east-central region of the Alviso Complex, a proposed year-round trail provides access to a viewing platform and interpretive signage on the west edge of Pond A8S and connects the existing San Tomas Aquino Trail to the Guadalupe River Trail. This trail is part of the San Jose Bay Trail Master Plan on a parcel known as the Legacy property. An interpretive trail and fishing and kayak access point is located on the southern edge of Pond A12, accessible from the Alviso Marina County Park. The existing Bay trail in this region provides access to the Don Edwards Environmental Education Center, south of Pond A16. Portions of the existing trail around Pond A16 will remain to provide access to a proposed viewing platform on the northeastern corner of Pond A16. Outside of the project area, a proposed trail will connect the Coyote Creek Trail westerly to the project area and the Guadalupe River Trail. This serves as another option for the Bay Trail spine from the City of San Jose to the project area spur trails, in addition to the north-south Drawbridge option at Ponds A13, A15 and A21.

Ravenswood. Figure 2c shows the public access and recreation features of Alternative B for the Ravenswood pond complex. Key provisions of this trail system are links between the site and the existing Bay Trail surrounding the complex, and to increase visitor access and interpretive opportunities within the site. Two proposed trails that extend north from the existing Bay Trail Spine provide year-round access to a viewing platform at the northwestern corner of Pond R4, with views to Greco Island, South San Francisco Bay, and Pond R4. A viewing platform at the northeast corner of the City of Menlo Park's Bayfront Park is accessible via this proposed trail. Establishment of this platform will require coordination and agreement with the City of Menlo Park. An additional viewing platform is accessible via this trail, located on the levee dividing Ponds R3 and R4. A year-round loop trail is proposed along the perimeter of Pond R3 to follow the existing levee that will remain. This will connect to the existing spur trail along the bayside of the Sun Microsystems complex and to the Bay Trail spine along Highway 84. It will also connect to the proposed spur trail along Pond R5 and Bayfront Park. A viewing platform is proposed where this trail meets Ravenswood Slough. A proposed year-round trail along the eastern and southern edges of Pond SF2 connects the Bay Trail spine along Highway 84 with a proposed north-south segment of the Bay Trail Spine (outside of the project area). This proposed trail allows visitors to view restored managed pond and tidal marsh, as well the Bay. A proposed viewing platform is located at the junction of the year-round trail and the Bay Trail spine along Highway 84. An additional viewing platform is proposed on the southeastern corner of the pond complex, accessed via an existing spur trail at the northeastern edge of Pond SF2, at the water's edge. In both alternatives, an existing trail around Ponds R1 and R2 is designated for removal once these ponds are breached and restored to tidal habitat. An interpretive display is offered at the historic Red Barn site, located in the southwest corner of Bayfront Park, which again will require partnership with the City of Menlo Park.

6.3 Alternative C: Tidal Emphasis (90:10 Tidal Habitat : Managed Pond)

Alternative C (Figure 3) emphasizes tidal restoration and provides an approximately 90:10 ratio by area of tidal habitat to managed pond.

The 90:10 alternative was selected as the upper bookend because it maximizes the benefits of tidal restoration while providing habitat for pond-associated species. Based on nesting densities achieved in managed ponds elsewhere (H. T. Harvey & Associates 1996, unpublished data), existing populations of stilts and avocets in the SBSP project area, and the contribution to the recovery plan goal for Western Snowy Plovers attributable to the SBSP project area (250 adults), it was estimated that 10% is the minimum pond area required to support breeding pond-associated birds (e.g., Snowy Plovers, stilts, and avocets). This estimate assumes that the 10% of ponds (approximately 1600 acres) will be reconfigured to provide shallow water habitat and numerous islands, thus providing breeding and foraging habitat. This upper bookend assumes intensive water level management, and successful predator and vegetation control in the ponds.

6.3.1 Ecosystem Restoration

Alternative C provides approximately 13,400 acres of tidal habitat and creates the widest and most extensive tidal marsh corridor of the alternatives. This alternative maintains continuous tidal marsh corridors from Greco Island to Mud Slough and along most of the length of the Eden Landing shoreline. This alternative restores the largest patches of tidal marsh with high-order drainage channels. In addition to the large tidal areas restored in Alternative B (southern Eden Landing and the Pond A5, A6, A7, and A8/A8S pond cluster), Alternative C tidally restores the Pond A9 though A15 pond cluster. Tidal habitat is restored along at least one side, and generally along both sides, of the major sloughs with existing or potential spawning habitat for anadromous fish. Because most tidal areas will require sheltered conditions to evolve from mudflat to vegetated marsh, the outboard levee will generally need to be maintained in these areas until tidal marsh develops.

Alternative C provides approximately 1,600 acres of managed ponds. All the managed ponds in Alternative C will be reconfigured to significantly enhance foraging, roosting, and nesting opportunities for shorebirds, waterfowl, and other waterbirds. Reconfiguration is particularly important in Alternative C since it has the least area of managed pond of the three alternatives.

6.3.2 Flood Management

The proposed flood management plan will provide an integrated system of both coastal and fluvial flood elements, resulting in a more consistent and higher level of flood protection compared to existing conditions. As in Alternative B, the coastal flood protection program will identify and implement a system of shoreline levees to provide flood management to coastal floods resulting from high bay waters and waves. To a somewhat greater extent than Alternative B, fluvial flood hazards are expected to be reduced where tidal restoration scours the lower reaches of flood control channels, resulting in increased flow conveyance and a lower water surface elevation. As noted above in the discussion of Alternative B, Alternative C assumes that much of the north levee along the Alameda Creek Flood Control Channel is removed to meet flood management objectives.

6.3.3 Public Access

Public access and recreation are described by pond complex below. Additional detail is presented in Appendix D. As mentioned above, certain features identified as part of Alternative B or C in the final alternatives may be interchanged once a preferred alternative is developed, or adaptively as the project is implemented.

Eden Landing. Figure 3a shows the public access and recreation features of Alternative C for the Eden Landing pond complex. The features for Alternative C are largely the same as in Alternative B in the northern portion of the pond complex. One of the differences between the two alternatives is that the proposed year-round trail along Old Alameda Creek in Alternative C will follow the south side of the creek, culminating at the Alvarado Salt Works and viewing area. This is shown as an option to the alignment illustrated in Alternative B. Alternative C also has a year-round trail on the northern and western edges of Pond E6C extending south through E1C to the existing trail along the northern edge of Alameda Creek Flood Control Channel. Alternative C does not provide the trail along E4C and E5C that is shown in Alternative B. An additional difference between the alternatives is the proposed removal of segments of the existing Alameda Creek Regional Trail along the northern edge of Alameda Creek Flood Control Channel. The proposed trail configuration is based on the assumption that portions of the levee that the trail follows will need to be removed to meet the project objectives for flood management (see Sections 6.2.2 and 6.3.2). Subsequent flood analyses will test this assumption. If the levee is not removed, the existing trail configuration will be maintained.

Alviso. Figure 3b shows the public access and recreation features of Alternative C for the Alviso pond complex. The public access and recreation proposals are similar for both restoration Alternatives B and C, although there are some differences. Alternative C provides an option for the Bay Trail spine to utilize the existing Union Pacific rail corridor and cross through the historic remains of the Town of Drawbridge. This segment, from the northwest corner of Pond A22 to the northwest corner of Pond A17 is not shown in Alternative B, however could be developed in the managed pond alternative, if feasible. Alternative C also shows that the Bay Trail spine can be linked via existing and proposed trails (some outside the project boundary) to the east of the Alviso pond complex as in Alternative B. These options are interchangeable between alternatives and illustrate that both alternatives can provide alternate routes to complete the Bay Trail spine in the Alviso area. Another difference between Alternatives B and C is that with the full tidal restoration proposed in Alternative C, the Alviso loop trail around Ponds A9 through A15 will be removed. However, with the maintenance of Pond A3W as a managed pond and a new levee along its northern border, a new loop trail will be provided that will coincide with the adjacent staging area. This will provide a lengthy spur trail from the Bay Trail spine in this vicinity. Alternative C also includes an option for public access to coincide with PG&E access along the southern and eastern edge of Pond A3N and a spur trail and viewing platform between ponds A12 and A13.

Ravenswood. Figure 3c shows the public access and recreation features of Alternative C for the Ravenswood pond complex. Since Pond R3 is tidal in this alternative, Alternative C does not include the trail around the perimeter of Pond R3 that is included in Alternative B. Instead, Alternative C includes a proposed spur trail along the edge of R2 that would provide a viewing platform and non-motorized boat launch at Ravenswood Slough. An additional difference between the alternatives is that the proposed connection between the Ravenswood Open Space Preserve and Highway 84 at Pond SF2 is located on the southwestern and western edges of the pond, as opposed to through the central portion of the pond as in Alternative B. This proposed year-round trail in Alternative C will also connect to the Bay Trail spine along Highway 84, as in Alternative B. The location of the proposed viewing platform in Pond SF2 in Alternative C would shift accordingly as shown on Figure 3c to connect with this alignment.

6.4 Alternatives Considered and Not Recommended

Additional preliminary alternatives were considered but not recommended for further analysis based on the limited extent to which they satisfy the project objectives. These preliminary alternatives are briefly described below.

Continued ISP Management Alternative

The ISP could be completed and extended as a long-term management alternative. The main feature of the ISP includes circulating bay waters through small systems of ponds in order to prevent salt production and maintain water quality as described by Life Science (2003). In addition, some ponds would be dewatered and managed as seasonal wetlands, select ponds in the Alviso complex would be managed as high salinity ponds to support specific wildlife populations, and a limited number of ponds would be managed with different summer and winter water levels to optimize habitat for migratory shorebirds and waterfowl. Under the ISP, the only areas currently designated for tidal-habitat restoration are the Island Ponds (A19, 20, and 21) in the Alviso complex (Life Science 2003). The existing pond levees would be maintained to preserve existing levels of flood protection and public access afforded by the salt ponds. However, the pond levees, as well as much of the existing inboard levee system, do not meet the engineering criteria for flood protection levees, and therefore, are not certified or recognized by FEMA.

The ISP Management alternative was eliminated from consideration because it does not meet the project objectives. The quality of the managed pond habitat is not as high with respect to bird use as the more intensively graded and managed ponds habitat included in the final restoration alternatives. Extending existing ISP operations indefinitely would not satisfy project objective 1a (promote restoration of native special-status plans and animals) or 1c (support increased abundance and diversity of native species) because no restoration activities to improve the existing habitats would be planned. It is also unlikely that a long-term funding source would be identified to maintain a levee system that is not adequately designed for flood control. Although the ISP Management alternative is not considered further here, it is likely to be one of the alternatives considered for the South San Francisco Bay Shoreline Study (Shoreline Study). The Shoreline Study is intended to evaluate flood damage reduction and ecosystem restoration improvements to the South Bay shoreline, extending from the San Mateo Bridge on the eastern shore, to Redwood Creek, just north of the Ravenswood pond complex, on the western shore.

All Tidal Restoration Alternative

This alternative was identified as a potential long-term vision at the Project Charette conducted in February 2005. This alternative is desirable in that it relies on natural physical and biological processes to form and maintain sustainable habitats, with only limited ongoing operations and maintenance required. However, this alternative was not retained for further analysis because it is not expected to meet project objective 1b for maintaining migratory bird species that utilize the existing ponds or project objective 1c for supporting increased abundance and diversity of the native species of the South Bay. This expectation is predicated on the assumption that the salt pan habitat that would develop in the restored tidal marshes would not fulfill all the functions proposed by the enhanced/reconfigured ponds. This assumption will be tested in the adaptive management program and the restoration modified if appropriate.

All or Majority Managed Pond Alternative

This alternative falls outside the range of the bookends (Section 6.4) and was not retained for further analysis because it does not meet project objectives for tidal-marsh-dependent species. Retaining all or most ponds as managed ponds would not meet project objective 1a for promoting the restoration of special-status and native species as this objective requires large areas of tidal restoration. In addition, this alternative would not satisfy project objective 4 because water quality in the South Bay would not be improved. These outcomes would conflict with Federal and State plans for endangered species recovery and would be widely considered unacceptable to agencies and other stakeholders.

75:25 Mix of Tidal:Managed Pond

This alternative was one of the Preliminary Alternatives proposed in January 2005 (PWA and others 2005c). Though it is possible that the ultimate habitat mix will be between the 50:50 and 90:10 bookends, and possibly at 75:25, this alternative does not need to be retained explicitly in the Final Alternatives. All habitat mixes between the bookends are already implicitly included in the range of potential project outcomes.

Large-scale Sediment Import Alternative

Large-scale sediment import to accelerate tidal marsh formation was eliminated from consideration because of limitations in the amount of clean fill that could feasibly and economically be supplied to the South Bay. However, restoration Alternatives B and C include the potential for importing limited amounts of sediment to create upland transition zones, construct levees, and raise the bottom elevations in a small subset of the ponds.

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7. ADAPTIVE MANAGEMENT

Adaptive management will be integral to the phased implementation of the preferred alternative. Management decisions will be updated and adapted to changing conditions as new insight emerges regarding how restoration and management is actually achieving the project objectives. This insight will be informed by periodic monitoring and specific adaptive management experiments, or ‘applied studies’, designed to reduce key uncertainties. Through a continued process of monitoring, experimentation, and feeding new information into the decision-making process, adaptive management will influence the ultimate mix of tidal and managed pond habitat, and the time required to reach this endpoint.

7.1 Overview of Adaptive Management

Implementation of the later phases of the preferred alternative will be subject to adaptive management based on feedback from on-going monitoring efforts of earlier phases. This feedback allows for management plans to be updated as lessons are learned from early phases and new insight emerges regarding the function of the South Bay ecosystem. As a result of management plan updates, the ultimate mix of tidal and managed pond habitats will likely lie between the two bookends defined by Alternatives B and C.

Adaptive management acknowledges that uncertainties exist and provides a framework for adjusting management decisions as key uncertainties are resolved and understanding of the cause-and-effect linkages between management actions and the physical and biological response of the system are more fully understood. As depicted in Figure 6, the adaptive management processes consist of the following steps:

- Establish project goals and objectives based on the most up-to-date understanding and problem definition;
- Develop conceptual models that describe the cause-and-effect linkages between management actions and achievement of the project objectives;
- Identify key uncertainties and develop testable hypotheses that form the basis for experimental designs;
- Plan large-scale restoration, including project phasing and habitat mix, and design adaptive management experiments to test specific hypotheses;
- Implement phased restoration and adaptive management experiments, and monitor physical and biological indicators to track performance; and
- Assess monitoring information, review project goals/objectives, update conceptual models based on improved understanding of ecosystem function, and integrate new understanding into future decision making.

The Adaptive Management Plan currently being developed will provide a more detailed discussion of adaptive management (Trulio and Clark 2005). As described below, key uncertainties identified in the draft Adaptive Management Plan have been integrated into the implementation process, and experimental designs have been identified within the proposed Phase 1 actions to provide early feedback on the success of various management actions.

The draft Adaptive Management Plan includes a description of an institutional structure to carry out adaptive management. Its key element is a feedback loop between information generation (science) and decision making (management) while keeping the public informed and involved in the overall process. This institutional structure will be refined in the coming months to fit the needs of the Project and ensure successful implementation of adaptive management.

7.2 How Adaptive Management Informs the Ultimate Tidal and Managed Pond Habitat Mix (or The Adaptive Management Staircase)

Adaptive management is an integral part of the implementation process and will guide selection of the ultimate mix of habitats within the bookends defined by Alternatives B and C. Since the restoration plan will be implemented over many years, on the order of decades, later phases will be subject to adaptive management based on lessons learned from earlier actions.

Figure 7 provides a schematic for understanding the role of adaptive management in selecting the ultimate mix of tidal and managed pond habitat. On the left axis is the ratio of tidal to managed pond habitat area; on the bottom axis is time. At each phase, the project will assess progress toward the project objectives and decide whether or not to continue along the trajectory, or "staircase," of additional tidal restoration. For example, the project may decide to temporarily halt additional tidal restoration in order to perform additional experiments or studies to increase the level of certainty that the project objectives will be achieved. Based on the results of these analyses, the project may decide to continue up the staircase or to halt additional tidal restoration. The trajectory of Alternative A (No Action) occurs with no planned tidal restoration other than that included in the ISP, but with large areas (approximately 4,800 acres shown in Figure 1) converting to tidal habitat through uncontrolled breaching. Alternative B follows the staircase to a 50:50 mix of tidal and managed pond habitat, and then maintains this habitat mix throughout the 50-year planning horizon. Alternative C follows the trajectory to the top of the staircase, a 90:10 ratio of tidal to managed pond habitat.

The staircase approach, when coupled with adaptive management decisions, allows for a range of outcomes between Alternatives B and C. Note that even if the project results in a 90:10 ratio of tidal to managed pond habitat, adaptive management provides for the possibility that the exact distribution of managed ponds may be different than that shown in Alternative C. Alternatives B and C have been formulated to maintain consistency with respect to tidal restoration and management on a pond-by-pond basis as restoration continues along the staircase. This allows tidal restoration to progress adaptively without costly re-configuration of flood management and public access features that were implemented during early phases. It is possible, however, that some reconfigured ponds may be converted to tidal habitat during later phases if the costs (e.g., continued operations, replacement of hydraulic structures that have served their useful life) outweigh the habitat benefits at that time.

7.3 Key Uncertainties for Project Implementation

Adaptive management will be used to inform a range of planning and design decisions. In addition to informing the tidal habitat and managed pond habitat mix, adaptive management will inform the nature of habitat restoration, flood management, and public access features. The draft Adaptive Management Plan (Trulio and Clark 2005) has identified the following preliminary list of key uncertainties:

- How will bird use be affected by the changing habitat (reduced salt pond) area?
- Will sediment availability limit marsh development without adversely affecting mudflat habitat?
- How can actions be configured to maximize benefits to non-avian species?
- How can the methylation of mercury and mobilization of methylmercury into the food web be managed effectively?
- Can invasive and nuisance species be effectively controlled?
- How will social dynamics affect future restoration actions?
- How will large-scale factors, such as conditions on the Pacific flyway and global sea level rise, affect the ability to meet the project objectives?

In addition, adaptive management is expected to provide key information related to public access. As mentioned above, trail access is considered to be less compatible with tidal habitat restoration than with managed pond restoration because of the sensitive nature of endangered species associated with tidal habitats. Consequently, the proposed trails tend to be adjacent to managed ponds. Compatibility between trail access and different types of adjacent habitats will be the subject of adaptive management studies. Information from these studies may result in changes to public access as the project is implemented.

Figure 8 provides an example of how adaptive management can be used to address uncertainties associated with how bird use may be affected by the changing habitat distribution and whether it is possible to achieve project objectives with the tidal habitat emphasis bookend. As tidal restoration occurs and the area of salt pond habitat is reduced, monitoring and modeling will provide information on the populations of breeding pond-associated birds, for example. If bird monitoring and modeling (*e.g.,* South Bay bird use modeling by PRBO Conservation Science (H. T. Harvey & Associates and PRBO Conservation Science in progress)) suggest that reconfigured ponds are able to sufficiently increase the density of breeding birds as successive ponds are restored to tidal action, then further tidal restoration would continue. However, if monitoring and modeling suggest that reconfigured ponds do not lead to a significant increase in bird densities, further tidal restoration would be delayed until different management tools could be tested to increase the effectiveness of pond reconfiguration. If changes to pond management do not increase bird densities and monitoring indicates that birds are leaving the system instead of relocating to other habitat within the South Bay, then the existing ponds would be maintained and no further breaching would occur.

7.4 Management Actions Affected by Adaptive Management (the "Tool Box")

Each of the key uncertainties identified above will be translated into one or more hypotheses that can be tested by specific adaptive management experiments or targeted research studies. Results of these experiments would trigger different management actions, depending on whether or not a particular hypothesis was confirmed or refuted. In general, there are three types of adaptive management decisions:

- "Irreversible" decisions, not subject to adaptive management once implemented due to physical or economic constraints. Examples of irreversible decisions include where to place the combination of levee alignments, infrastructure, and certain public access facilities. Additionally, marsh/transitional habitats located during earlier project phases are expected to be irreversible.
- "Implemented" decisions subject to adaptive management. These types of decisions include early (previous) restoration or management actions that can be modified and/or adjusted after implementation. Examples of implemented decisions include pond water and salinity management plans, minor modifications to managed pond cell grading and trail alignments, and non-structural public-access/ recreation features. Levee breaches may possibly be subject to adaptive management modifications once implemented if conditions warrant.
- "Future" decisions subject to adaptive management. Restoration and management actions that have not yet been implemented can be modified and/or adjusted prior to implementation. Adaptive management allows these plans to be updated based on new information and lessons learned from earlier phases. Examples of future decision that are subject to adaptive management are: the extent of tidal versus managed pond habitats needed to achieve the objectives; modifications to which ponds may be managed or tidal; and locations and types of public access and recreation features based on how people and wildlife are responding to existing facilities.

Since implemented and future decisions are subject to modifications, a range of pre-planned management actions from a 'tool box' can be applied depending on the results of adaptive management experiments. For example, if restoration of tidal habitats results in unacceptable adverse effects on existing mudflat habitat due to changes in the sediment dynamics of the South Bay, the 'tool box' may include modifications of both implemented and future decisions. In this example, water depths of existing managed ponds may be modified to offset loss of outboard mudflat; or managers may decide to stop maintenance of bayfront levees and allow wind waves from the Bay to convert tidal marsh to unvegetated mudflats. Changes to future decisions could include limiting tidal restoration to areas with surplus sediment supplies, near stream mouths or other areas where intertidal habitats are not shown to suffer deterioration from pond breaches.

7.5 Time Frame for Adaptive Management Learning

In order to inform future phases of the preferred alternative, adaptive management plans need to consider the time required for experiments and targeted research to generate useful information. In some cases, the time required for a measurable response may be on the order of one or two years (e.g., bird densities in reconfigured ponds). In other instances, decades may pass before useful information can be gleaned from experiments or previous restoration actions (e.g., vegetation establishment in subsided ponds). Therefore, it is crucial to prioritize the most critical uncertainties and design experiments that can be accommodated within the Phase 1 actions (see Section 9.3). Additionally, ISP actions and existing restoration projects in the South Bay and elsewhere provide even earlier opportunities to resolve key uncertainties.

8. RESPONSE TO EVALUATION CRITERIA

Technical ratings were developed to assess how well the alternatives respond to the project goals and objectives presented in Section 3. The project objectives provide broad categories of desired project benefits. In order to make these broad objectives usable for evaluating alternatives and developing technical ratings, each objective was further described using a set of evaluation criteria and metrics (PWA and others 2004a). Technical ratings were then developed for each evaluation criteria, using the metrics, technical analyses, and professional judgment as the basis for determining the ratings. The ratings provide a consistent means of comparing alternatives and identifying tradeoffs between project objectives, providing some degree of insight and understanding to inform decision-making. The ratings themselves do not dictate the selected alternative.

8.1 Intent of the Technical Ratings

The intent of the ratings is to provide an early comparison of alternatives, reveal uncertainties for adaptive management, provide insight into impact analysis for the EIS/R, and most importantly, to confirm that the bookends (Alternative B: Managed Pond Emphasis and Alternative C: Tidal Emphasis) are appropriate. Note that because the ratings represent an early comparison, *the ratings are not intended to be definitive representations of project performance.* It is also important to note that the ratings are not intended to be used directly for NEPA/CEQA impact assessment. The impact assessment will be based on consideration of additional detailed information and analyses, and additional factors.

8.2 Rating Methods

The original evaluation criteria and metrics presented in the ADF were developed at an early stage in the planning process; therefore some modification was necessary during the technical rating process. It was originally intended that the evaluation criteria be used as a flexible tool, to be refined as necessary for application at various stages of the Project. A condensed set of evaluation criteria was therefore used in the rating process, based on what is useful relative to what is now known about the alternatives at the programmatic level. Not all evaluation criteria were considered applicable for the current technical rating process and some were recommended for deferment to the NEPA/CEQA impact analysis and/or detailed design phases of the project. For example, two evaluation factors were considered at a general level during alternatives formulation: Cost Effectiveness and Environmental Impact (PWA and others 2004a). Evaluation criteria have been developed for these factors (Appendix E), but detailed assessment has been deferred to the NEPA/CEQA analysis.

Other evaluation criteria were revised through either combining evaluation criteria that tracked similarly, or splitting criteria where one or more identified metrics or species tracked in opposite directions. For example, the original evaluation criteria for 1) maintaining or enhancing the populations of shorebirds currently using intertidal habitat, and 2) enhancing habitat for intertidal invertebrate populations, respectively, are both associated with the area of mudflat habitat available in the South Bay and are closely related. These evaluation criteria were therefore combined (see evaluation criterion 1C-1, Appendix E).

On the other hand, the original evaluation criterion for maintaining or enhancing populations of waterfowl currently using the Bay was split into two separate evaluation criteria, one focused on diving ducks which are associated with the deeper managed ponds, intertidal and shallow subtidal habitats, and one focused on dabbling ducks which are associated with shallower habitats along the tidal marsh edge (see evaluation criteria 1C-3 and 1C-4, Appendix E).

Additionally, some criteria were not applied because they did not distinguish meaningfully between the alternatives. For example, the original evaluation criterion for enhancing moist grassland habitat does not distinguish between alternatives because restoration of grassland habitat was not included in any of the alternatives. The full set of revised evaluation criteria used in the technical rating process is presented in Appendix E, along with the associated technical ratings and rationale.

The following guidelines were used in preparing the technical ratings and rationale:

- The alternatives are rated on a 9-point scale, with a 9 representing a high response (a good outcome), and a 1 representing a low response (a potentially undesirable outcome). The justification for each rating is provided in the rationale column.
- The alternatives are rated at Year 50, relative to initial baseline conditions (see below). Because of this, ratings for the No Action Alternative (at Year 50) may deviate from the baseline rating.
- The baseline is defined as initial conditions with ISP operations in place. The baseline rating for all evaluation criteria is a 5, with the exception of tidal-marsh-dependent endangered and special-status species. The criteria for these species use a baseline of 1.
- Ratings with a high degree of uncertainty are highlighted in gray, and the uncertainties and assumptions are detailed in the rationale column.
- The alternatives are rated at the landscape scale.

The technical ratings and rationale were prepared by the PWA Team technical staff, with input from selected Science Team members, the PMT, the Regulatory Agency Group, and Stakeholders.

8.3 Rating Results

The full set of detailed technical ratings and rationale for each criterion are presented in Appendix F. Table 2 presents an example technical rating for evaluation criteria 1A-1: contribute to the recovery of the South Bay subspecies of the salt marsh harvest mouse. Because the salt marsh harvest mouse is a tidal-marsh-dependant endangered species, the baseline for the technical ratings is a one, meaning baseline conditions are assumed to have a low response to the evaluation criteria. As explained in the Rationale column, an increase in tidal salt marsh is expected under the No Action Alternative at year 50, due in part to restoration of the Island Ponds (Ponds A19, A20 and A21), and due to uncontrolled breaching of levees that restores tidal action to some areas within the Project Area (see Figure 1, No Action Year 50). Therefore, the technical rating for Alternative A increases from a one to a three relative to the baseline.

Under Alternative B, conditions for the salt marsh harvest mouse improve to a five due to the increased extent of available tidal marsh and upland transition habitat for escape cover. Alternative C performs the best (rating an eight) for the salt marsh harvest mouse due to the larger extent of well-connected tidal marsh and upland transition habitat, and a nearly complete tidal marsh corridor.

Table 2. Sample Technical Rating and Rationale

Criteria Number	Evaluation Criteria	Response to Criteria			Rationale
		Alt A (No Action)	Alt B (50:50)	Alt C (90:10)	
1A-1	Contribute to the recovery of the South Bay subspecies of the salt marsh harvest mouse	3	5	8	**No Action:** Increase in tidal salt marsh due to sedimentation of South Bay, restoration of Island Ponds, and some uncontrolled breaching as levees erode. **Alts B-C:** Ranked according to extent of large, connected salt marsh with upland escape cover. Alt B not ranked as high as Alt C due to poor connectivity between restored marshes and less upland transitional habitat

The full set of technical ratings for each alternative is presented graphically in Figures 9 – 11 respectively, with the ratings with the highest degree of uncertainty highlighted in green. The ratings which respond best to the evaluation criteria plot near the outside of the circle on polar diagrams (in the seven to nine range), while the ratings which respond the least to the evaluation criteria plot near the center of the polar diagram (in the one to three range). Therefore, the diagram with the largest area interior of the 'circle' responds the best to the most evaluation criteria. It's important to note that the polar diagrams treat each evaluation criterion as equal to all others – in effect, a form of 1:1 weighting as to their relative importance. For example, reducing the need for predator control is weighted equally with maintaining coastal and fluvial flood control. In actuality, people will place a higher value on meeting some criteria or project objectives relative to others. For example, some may place a higher value on meeting criteria or objectives associated with endangered species recovery efforts, or in meeting criteria associated with improving water quality. The intent of the polar diagrams is therefore not to measure the area within the circle – or in essence to sum the total technical ratings – but to evaluate, compare and contrast how well the alternatives respond to the evaluation criteria in general.

An evaluation of Figures 9 – 11 leads to several key findings with respect to how well the alternatives rate. Both restoration alternatives (Alternatives B and C) perform substantially better than the No Action Alternative (Alternative A) overall. The habitat tradeoffs between tidal marsh and managed ponds is reflected in the ratings for Alternatives B and C, with Alternative B performing better for managed pond species, and Alternative C performing better for tidal-marsh dependent species. Both restorations perform well for flood management, due to the inboard levee which provides coastal flood protection, and the tidal corridors along the majority of the major tributaries and sloughs which enhance fluvial flood conveyance. Both restoration alternatives also perform well with respect to public access and restoration, due to the completion of the Bay Trail and the inclusion of a variety of high quality land-based and water-based public access and recreation opportunities. Both restoration alternatives also perform better than the No Action Alternative with respect to water quality.

9. PHASE 1 ACTIONS

The restoration plan will be implemented in a series of phases over many years, on the order of several decades. It is anticipated that each pond will be managed in a manner similar to the ISP until its implementation phase. The initial phases, including Phase 1, will include a range of habitat types – tidal habitat, enhanced managed ponds, and reconfigured managed ponds – as early experiments for adaptive management (see Section 7). Each phase will have its own project-level NEPA/CEQA impact analysis. Phase 1 actions will be evaluated in the joint programmatic- and project-level EIS/R estimated for release in draft form in the fall of 2006. Subsequent phases will tier off the programmatic-level assessment in the fall 2006 EIS/R document.

The phasing of tidal- and managed-pond restoration will begin with areas that are the most feasible and/or have the highest certainty of achieving the project objectives. A more complete set of Phase 1 selection criteria is presented below, along with the proposed set of Phase 1 actions. The ultimate progression of future restoration phases, including the total number of phases for implementation, will need to consider many factors, such as maintaining consistency with anticipated future phases, and mitigating for impacts as early as possible (preferably before they occur), for example creating a tidal marsh corridor before existing marsh is lost through tidal scour. Currently, Phase 2 is anticipated to be associated with the first interim feasibility study to be completed as part of the Shoreline Study. This first area for the Shoreline Study is referred to as the Alviso Ponds and Santa Clara County area. It includes the entire Alviso pond complex plus the area between this complex and San Francisquito Creek, including the Palo Alto Flood Basin. Future phases are also likely to be associated with additional interim feasibility studies associated with the Shoreline Study, as well as restoration and adaptive management actions associated with the restoration plan. The SBSP Restoration Project and Shoreline Study planning efforts are being closely coordinated.

9.1 Phase 1 Selection Criteria

The proposed Phase 1 actions have been selected based on the following criteria:

- Available funding
- Likelihood of success
- Ease of implementation
- Visibility and accessibility
- Opportunities for adaptive management and applied studies
- Value in building support for the project
- Certainty of investment

9.2 Phase 1 Actions

Each restoration alternative includes a common set of proposed Phase 1 actions (Figure 4). The Phase 1 actions consist of tidal-habitat restoration and pond management in each of the three pond complexes, plus improvements in public access. The habitat actions collectively cover approximately 2800 acres. The following set of Phase 1 actions have been proposed, and are consistent with implementation of both Alternatives B and C:

- **Pond A6** (Knapp Tract): Tidal-habitat restoration.
- **Pond A8**: Reversible tidal-habitat restoration. Pond A8 will be restored to muted-tidal or tidal action in a reversible manner as an adaptive management experiment in order to a) assess scour in Alviso slough and b) assess potential impacts associated with mercury methylization in the pond and/or mercury mobilization in Alviso Slough. Restoration of Pond A8 will be done in close cooperation with the Santa Clara Valley Water District.
- **Pond A16**: Reconfigured managed pond. The pond will be reconfigured to include shallowly flooded cells with isolated islands and furrowed areas in order to target specific bird species such as Snowy Plovers, American Avocets, Black-necked Stilts, terns, and foraging shorebirds (Figure 12 shows an example of pond reconfiguration for Pond A16).
- **Ponds E12 and E13**: Reconfigured managed pond. The pond will be reconfigured to provide a gradient of salinities and water depths for specific bird species. While some islands will be created to provide nesting habitat for Snowy Plovers, American Avocets, and Black-necked Stilts, management will focus on maintaining suitable depths for foraging migratory shorebirds and other birds, such as Eared Grebes and Bonaparte's Gulls, that are associated with higher-salinity ponds. The inclusion of Ponds E12 and E13 as a Phase 1 action is pending further analysis regarding the feasibility of water circulation though hydraulic manipulations with minimal pumping requirements. If Ponds E12 and E13 are determined to be unsuitable as a Phase 1 action, Pond E6A will be evaluated as a Phase 1 action.
- **Ponds E10 and E11**: Enhanced managed pond. Once the bayside water control structure in Pond E10 is replaced, water levels will be managed for specific bird species such as diving ducks, nesting and foraging terns, and foraging American White Pelicans and Double-crested Cormorants. Water levels will be managed and monitored as applied studies to inform adaptive management decisions.
- **Ponds E9 and E8A**: Tidal-habitat restoration. Tidal restoration at Ponds E9 and E8A will be done in close cooperation with Alameda County Flood Control and Water Conservation District.
- **Pond SF2**: Tidal-habitat restoration along the bayward edge to provide a tidal-marsh corridor connection under the Dumbarton Bridge, coupled with a reconfigured pond.
- **Viewing Opportunity and Interpretive display** at Bayfront Park in partnership with the City of Menlo Park adjacent to and overlooking the Ravenswood Complex.
- **Bay Trail spine** from Sunnyvale to Stevens Creek in the Alviso Complex.
- **Viewing Opportunity and Interpretive display** in partnership with the City of San Jose adjacent to and overlooking Pond A8.
- **Seasonal trails** around managed ponds in the Eden Landing Complex. Trails associated with Ponds E12 and E13 will be constructed for seasonal access during non-breeding seasons.

9.3 Phase 1 Adaptive Management Experiments

The Phase 1 actions will incorporate adaptive management experiments to test key uncertainties and inform future management decisions. Table 3 lists experiments that could be incorporated within the proposed Phase 1 actions. A more complete list of adaptive management experiments will be identified and incorporated in the Phase 1 design as the Adaptive Management Plan is developed.

Table 3 Example Phase 1 Adaptive Management Experiments*

Project Objective	Key Uncertainty	Phase 1 Experiment
Biological Habitat	Can management of water levels and salinity significantly increase the use of ponds by target bird species?	Reconfigure Ponds E12 & E13 to provide a gradient of salinities and water depths. Monitor densities of target species. Compare with baseline data collected at reference managed ponds.
	Will reconfigured ponds significantly increase the densities of nesting shorebirds while simultaneously providing foraging habitat for migratory shorebirds?	Reconfigure Pond A16 to include shallowly flooded cells with isolated islands and furrowed areas. Monitor densities of target bird species and compare with baseline data collected at other managed ponds.
Flood Management	How effective is tidal restoration at increasing conveyance of flood control channels?	Survey a time series of Old Alameda Creek channel cross-sections after tidal restoration at Eden Landing. Update flood models and assess changes to flood hazards.
Water & Sediment Quality (Ecological Risk)	How will tidal restoration affect mercury methylation and the food web?	Open Pond A8 to *reversible* tidal action and monitor to confirm that MeHg levels in ponds and/or sentinel species do not exceed unacceptable levels.

*Preliminary examples only. To be revised and updated as specific adaptive management activities are developed and approved.

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10. NEXT STEPS

The next steps through 2006 include performing NEPA/CEQA impact assessments of the final alternatives and Phase 1 actions, and preparation of the EIS/R. Appendix E lists the analysis methods to be used to analyze project benefits and impacts associated with the project objectives and evaluation criteria. The primary assessments include: the South Bay Geomorphic Assessment, South Bay Bird Use Assessment, hydrodynamic modeling, hydraulic geometry analyses, fluvial flood modeling, coastal flood analysis, nutrient and contaminant analyses, groundwater analysis, and cost estimating. Each of the assessments will be documented as a technical appendix to the EIS/R. It is anticipated that the final alternatives will be further refined as a result of NEPA/CEQA impact assessments.

Additional steps occurring in 2006 include more detailed specifications of the Phase 1 actions, and refinements to the Adaptive Management Plan and Phase 1 adaptive management experiments in coordination with the lead scientist and the Science Team. The Adaptive Management Plan is also anticipated to be a technical appendix to the EIS/R.

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Source files for this report are located at PWA:
P:\Projects\1750_South_Bay_Salt_Ponds\Task01_Alts_Devt\Alternatives\Final_Alts_Report\Final.Report.01.31.06\Final_Alts_Rpt_Fnl.doc

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FIGURES

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APPENDICES

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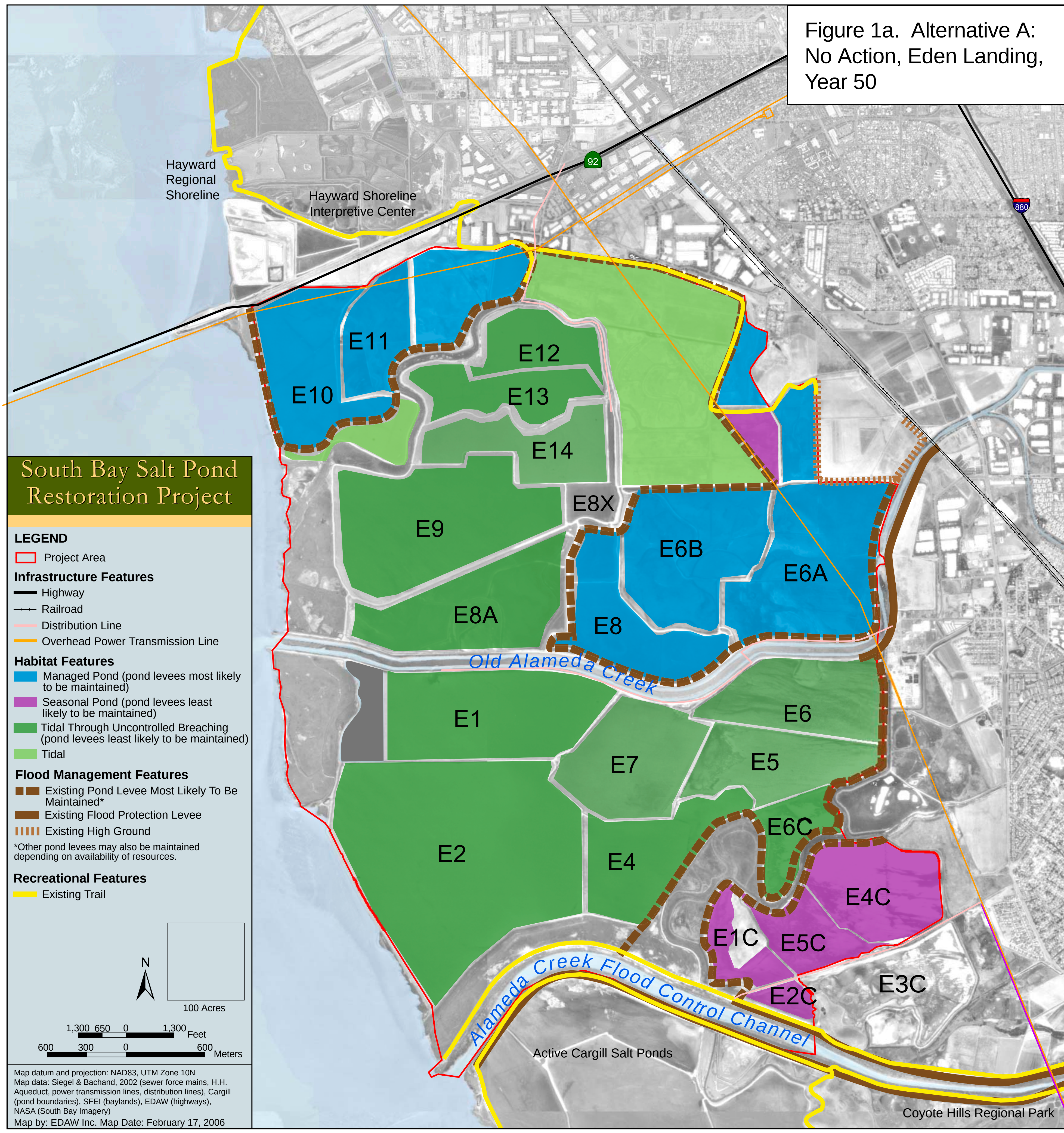
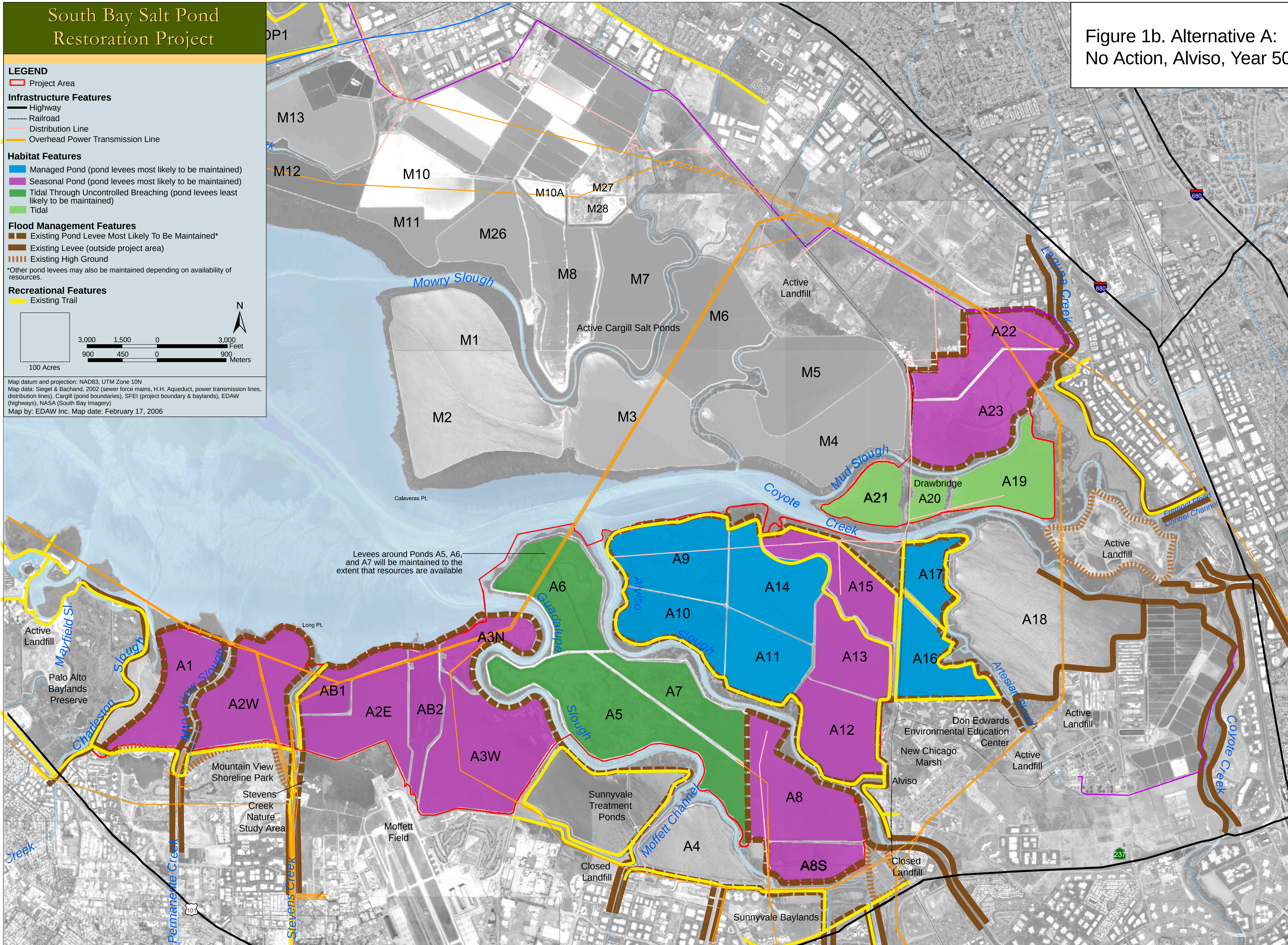
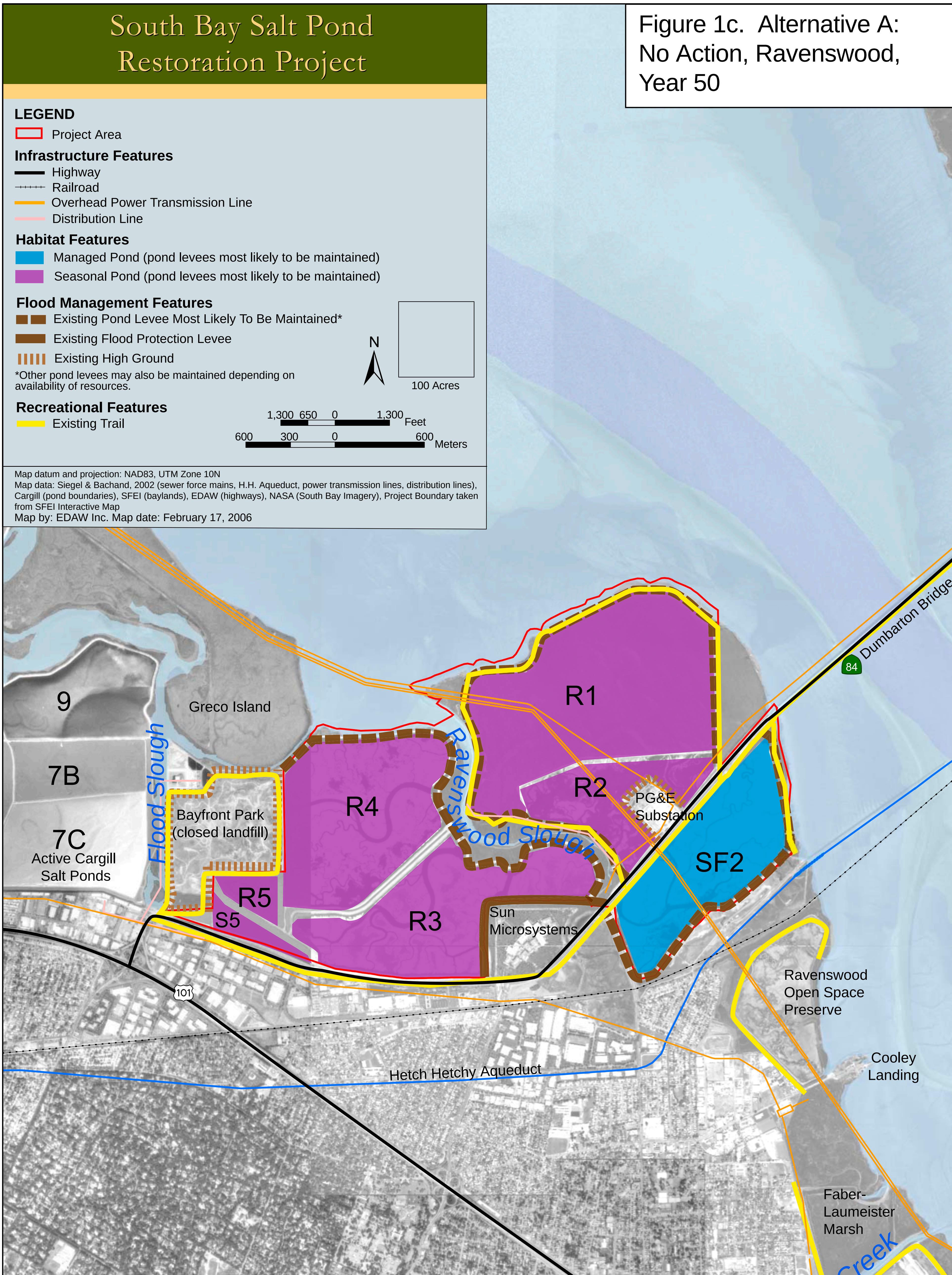


Figure 1a. Alternative A: No Action, Eden Landing, Year 50
Hayward Regional Shoreline
Hayward Shoreline Interpretive Center
92
880
E10
E11
E12
E13
E14
E8X
E9
E6B
E6A
E8A
E8
Old Alameda Creek
E1
E6
E7
E5
E6C
E2
E4
E4C
E1C
E5C
E2C
E3C
Alameda Creek Flood Control Channel
Active Cargill Salt Ponds
Coyote Hills Regional Park
South Bay Salt Pond Restoration Project
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Distribution Line
Overhead Power Transmission Line
Habitat Features
Managed Pond (pond levees most likely to be maintained)
Seasonal Pond (pond levees least likely to be maintained)
Tidal Through Uncontrolled Breaching (pond levees least likely to be maintained)
Tidal
Flood Management Features
Existing Pond Levee Most Likely To Be Maintained*
Existing Flood Protection Levee
Existing High Ground
*Other pond levees may also be maintained depending on availability of resources.
Recreational Features
Existing Trail
N
100 Acres
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery)
Map by: EDAW Inc. Map Date: February 17, 2006


South Bay Salt Pond Restoration Project
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Distribution Line
Overhead Power Transmission Line
Habitat Features
Managed Pond (pond levees most likely to be maintained)
Seasonal Pond (pond levees most likely to be maintained)
Tidal Through Uncontrolled Breaching (pond levees least likely to be maintained)
Tidal
Flood Management Features
Existing Pond Levee Most Likely To Be Maintained*
Existing Levee (outside project area)
Existing High Ground
*Other pond levees may also be maintained depending on availability of resources.
Recreational Features
Existing Trail
N
100 Acres
3,000 1,500 0 3,000 Feet
900 450 0 900 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (project boundary & baylands), EDAW (highways), NASA (South Bay Imagery)
Map by: EDAW Inc. Map date: February 17, 2006
Figure 1b. Alternative A: No Action, Alviso, Year 50
M13
M12
M10
M10A
M27
M28
M11
M26
M8
M7
M6
M1
M5
M2
M3
M4
Active Cargill Salt Ponds
Active Landfill
Mowry Slough
Mud Slough
Coyote Creek
Laguna Creek
A22
A23
A19
A20
A21
Drawbridge
Fremont Flood Control Channel
Active Landfill
A9
A14
A15
A17
A10
A11
A13
A16
A18
A12
A6
A3N
A7
A5
A8
A8S
A4
A1
A2W
AB1
A2E
AB2
A3W
Alviso Slough
Guadalupe Slough
Artesian Slough
Levees around Ponds A5, A6, and A7 will be maintained to the extent that resources are available
Calaveras Pt.
Long Pt.
Active Landfill
Mayfield Sl.
Charleston Slough
Mtn. View Slough
Palo Alto Baylands Preserve
Mountain View Shoreline Park
Stevens Creek Nature Study Area
Moffett Field
Sunnyvale Treatment Ponds
Moffett Channel
Closed Landfill
Sunnyvale Baylands
Closed Landfill
Alviso
New Chicago Marsh
Don Edwards Environmental Education Center
Active Landfill
Active Landfill
Permanente Creek
Stevens Creek
Coyote Creek
Creek
101
237
880
680



South Bay Salt Pond Restoration Project
Figure 1c. Alternative A: No Action, Ravenswood, Year 50
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Overhead Power Transmission Line
Distribution Line
Habitat Features
Managed Pond (pond levees most likely to be maintained)
Seasonal Pond (pond levees most likely to be maintained)
Flood Management Features
Existing Pond Levee Most Likely To Be Maintained*
Existing Flood Protection Levee
Existing High Ground
*Other pond levees may also be maintained depending on availability of resources.
Recreational Features
Existing Trail
N
100 Acres
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery), Project Boundary taken from SFEI Interactive Map
Map by: EDAW Inc. Map date: February 17, 2006
9
7B
7C
Active Cargill Salt Ponds
Greco Island
Flood Slough
Bayfront Park (closed landfill)
R1
R2
R3
R4
R5
S5
SF2
Ravenswood Slough
PG&E Substation
Sun Microsystems
Dumbarton Bridge
84
101
Hetch Hetchy Aqueduct
Ravenswood Open Space Preserve
Cooley Landing
Faber-Laumeister Marsh
Creek

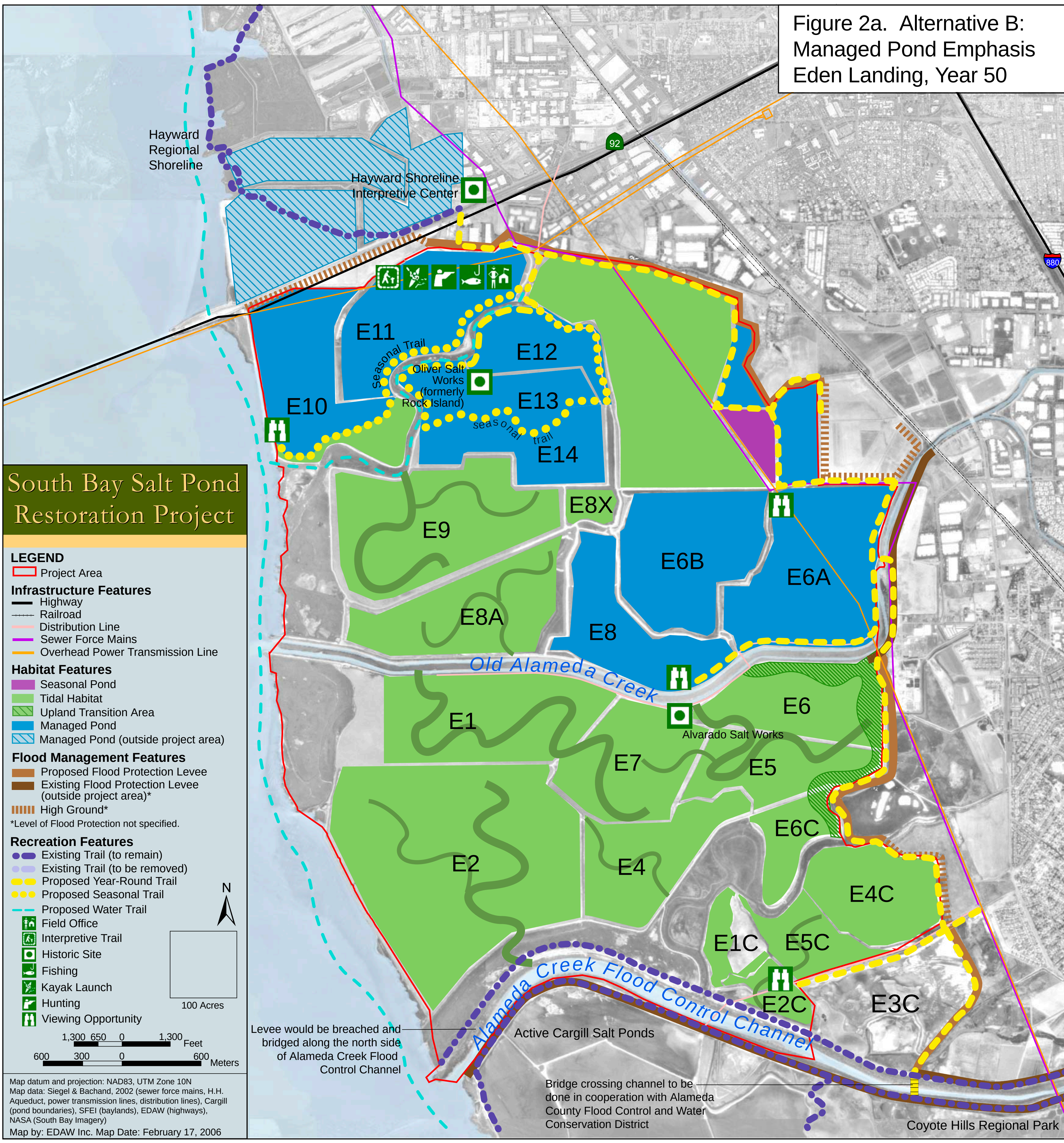


Figure 2a. Alternative B: Managed Pond Emphasis Eden Landing, Year 50

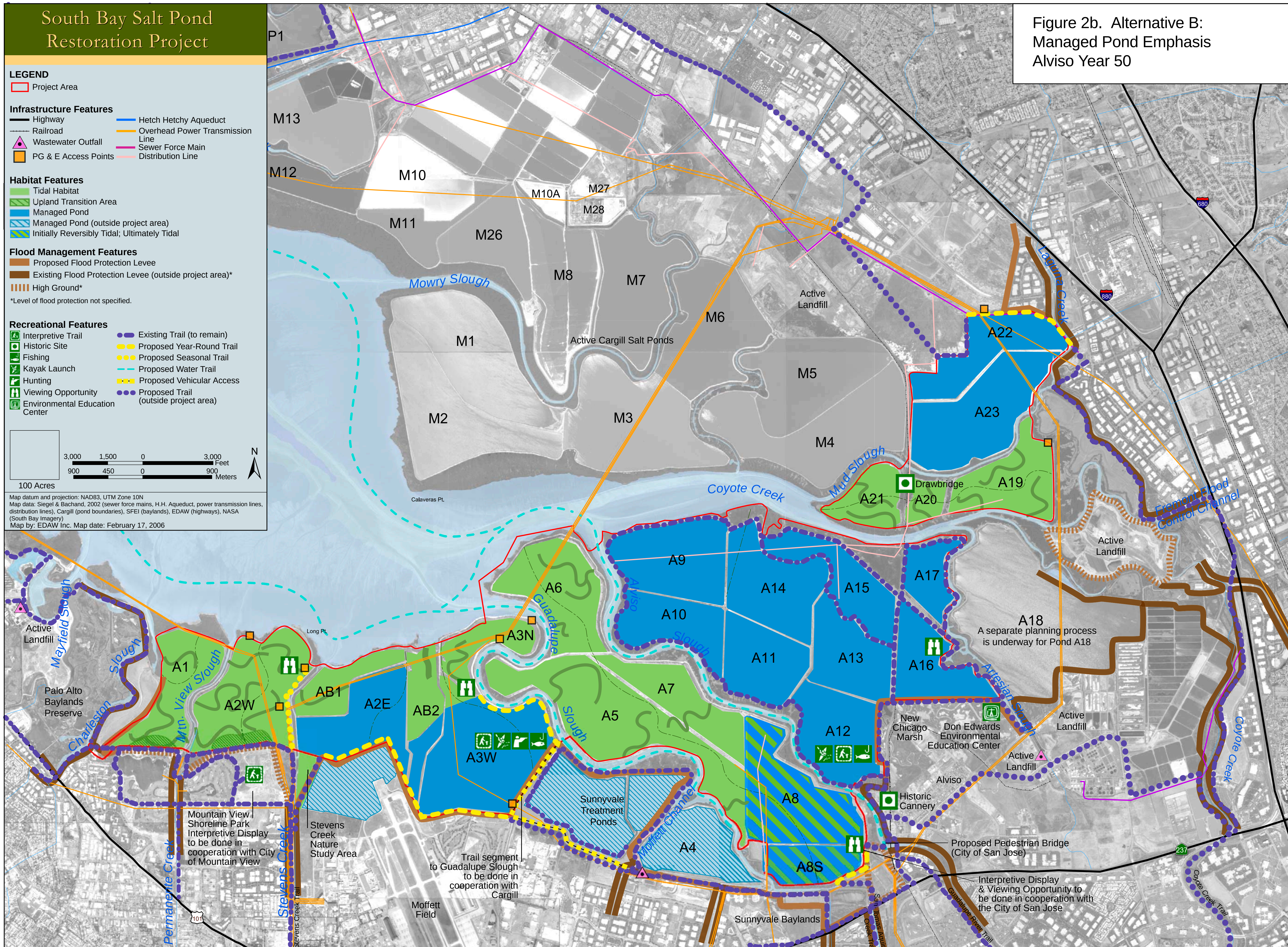
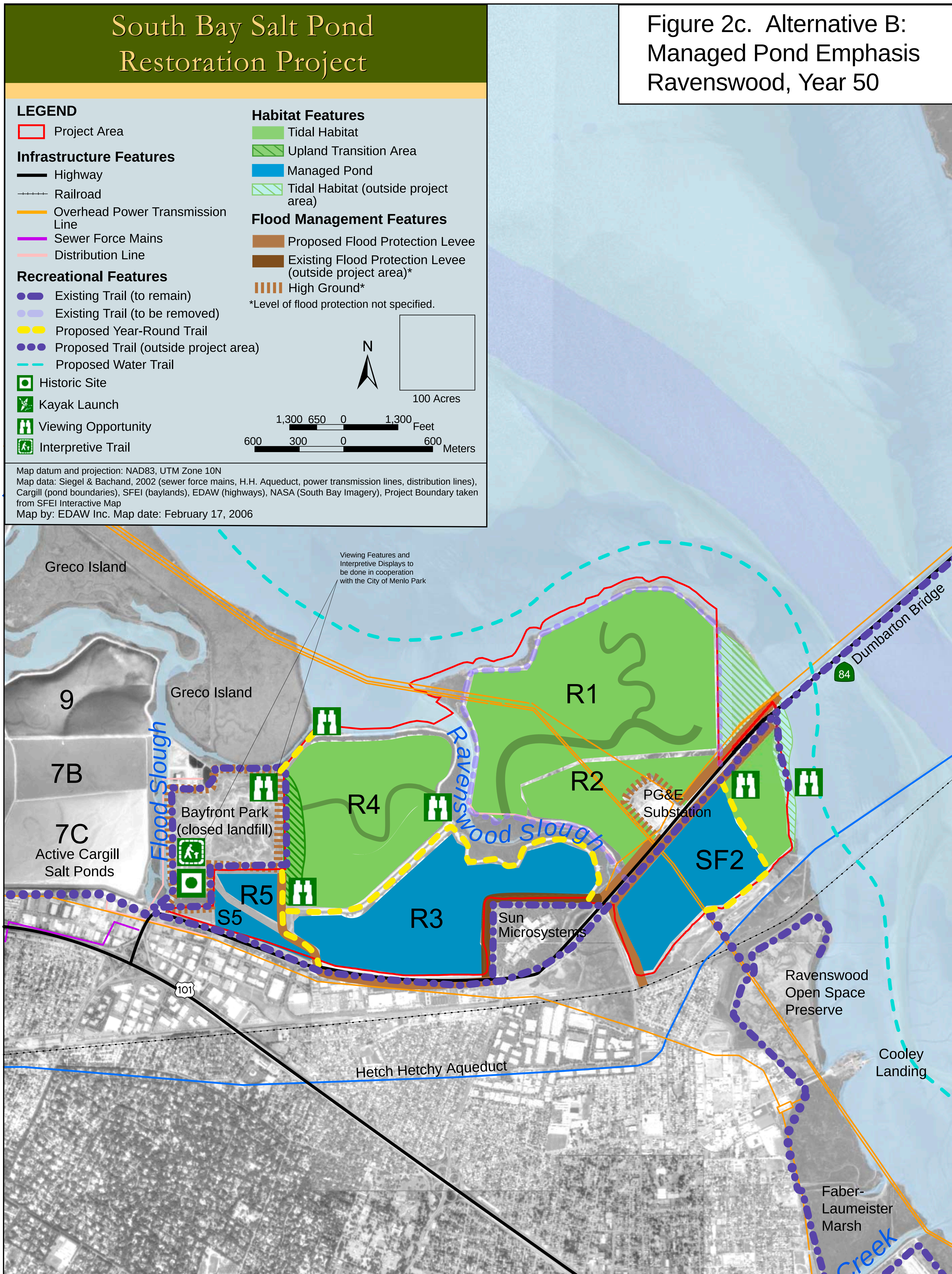


Figure 2b. Alternative B: Managed Pond Emphasis Alviso Year 50



South Bay Salt Pond Restoration Project
Figure 2c. Alternative B: Managed Pond Emphasis Ravenswood, Year 50
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Overhead Power Transmission Line
Sewer Force Mains
Distribution Line
Recreational Features
Existing Trail (to remain)
Existing Trail (to be removed)
Proposed Year-Round Trail
Proposed Trail (outside project area)
Proposed Water Trail
Historic Site
Kayak Launch
Viewing Opportunity
Interpretive Trail
Habitat Features
Tidal Habitat
Upland Transition Area
Managed Pond
Tidal Habitat (outside project area)
Flood Management Features
Proposed Flood Protection Levee
Existing Flood Protection Levee (outside project area)*
High Ground*
*Level of flood protection not specified.
N
100 Acres
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery), Project Boundary taken from SFEI Interactive Map
Map by: EDAW Inc. Map date: February 17, 2006
Greco Island
Viewing Features and Interpretive Displays to be done in cooperation with the City of Menlo Park
Greco Island
9
7B
7C
Active Cargill Salt Ponds
Flood Slough
Bayfront Park (closed landfill)
R1
R2
R3
R4
R5
S5
SF2
Ravenswood Slough
PG&E Substation
Sun Microsystems
Dumbarton Bridge
84
101
Hetch Hetchy Aqueduct
Ravenswood Open Space Preserve
Cooley Landing
Faber-Laumeister Marsh
Creek

Figure 3a. Alternative C: Tidal Habitat Emphasis Eden Landing, Year 50

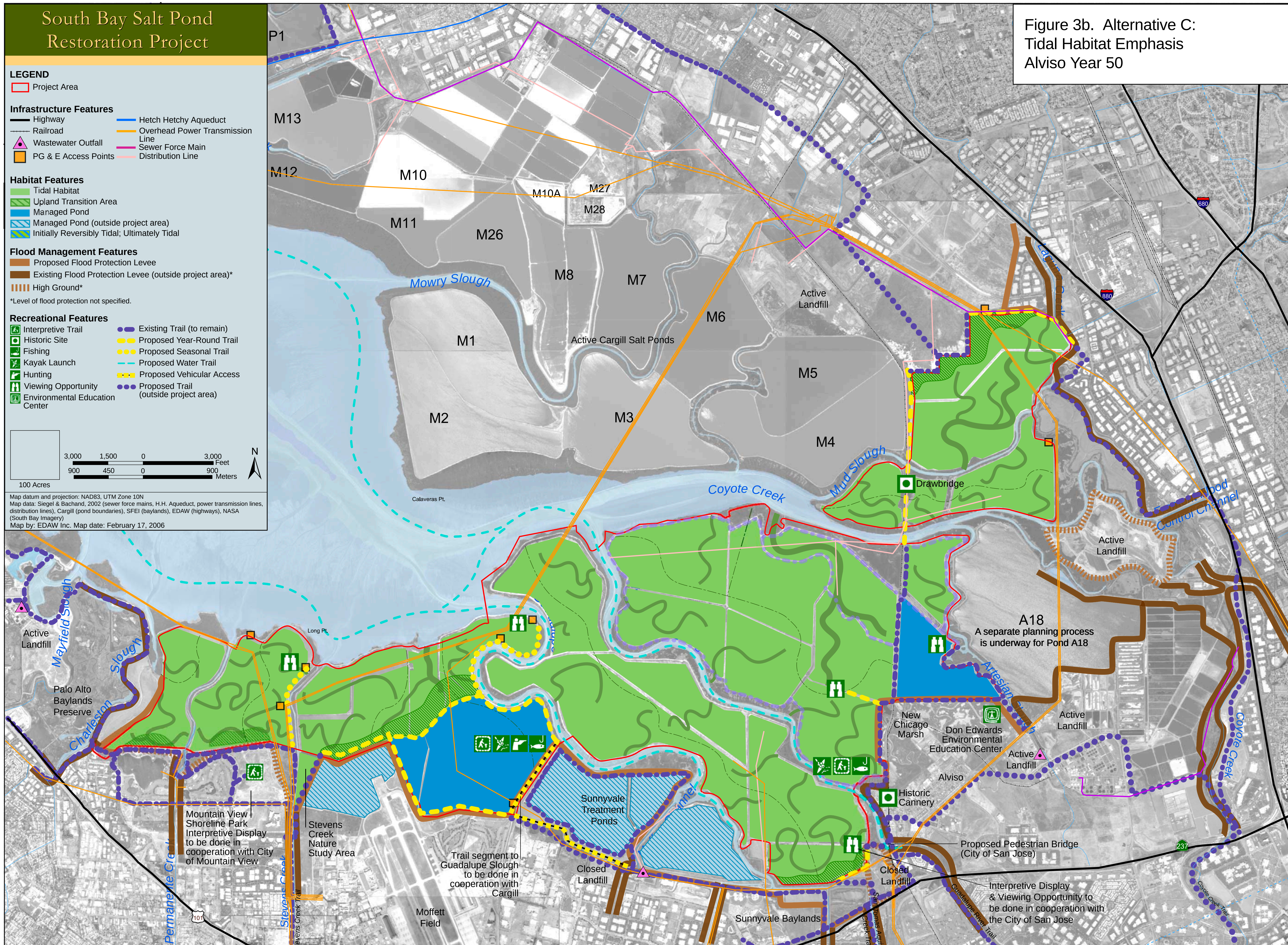
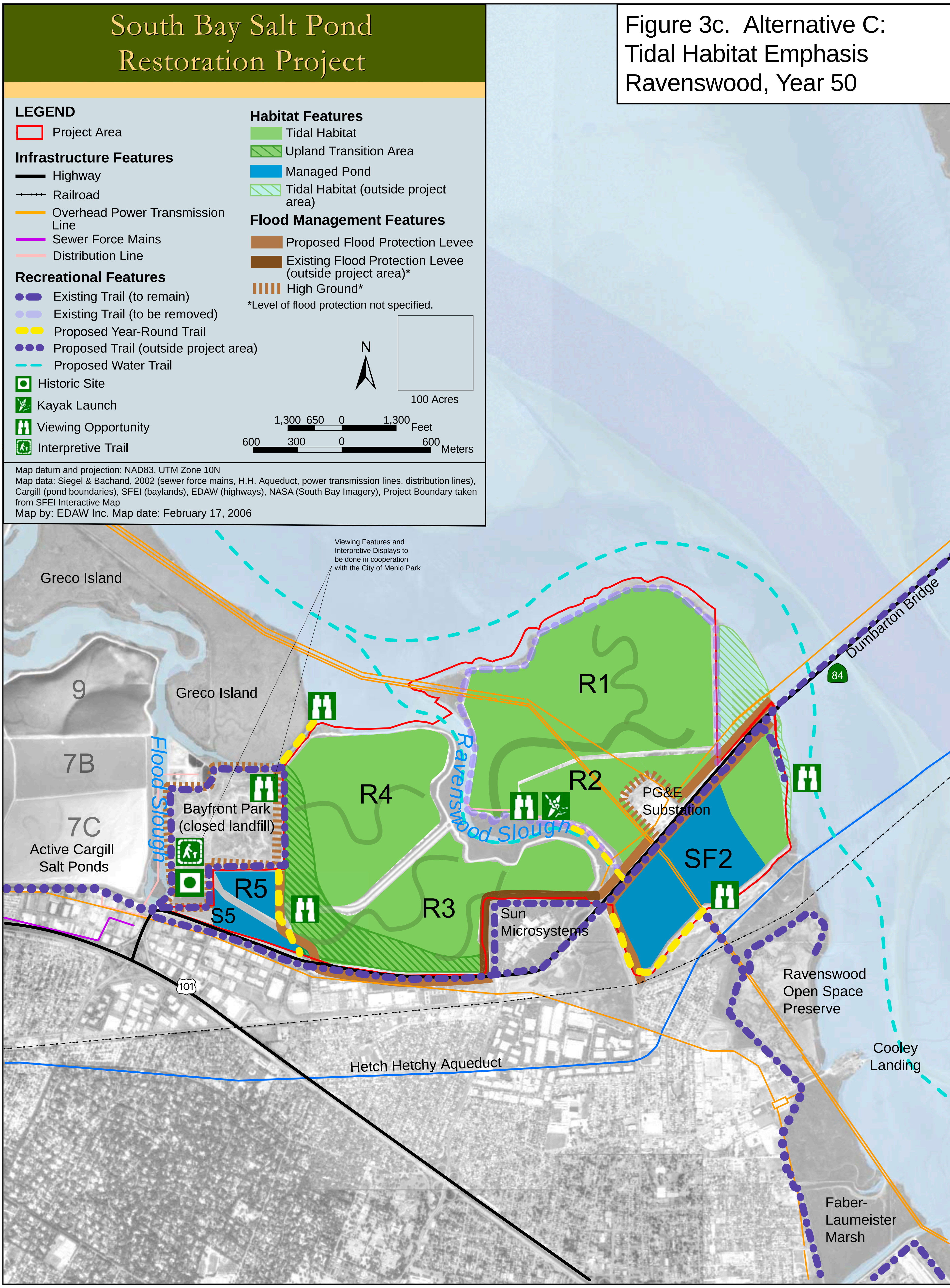
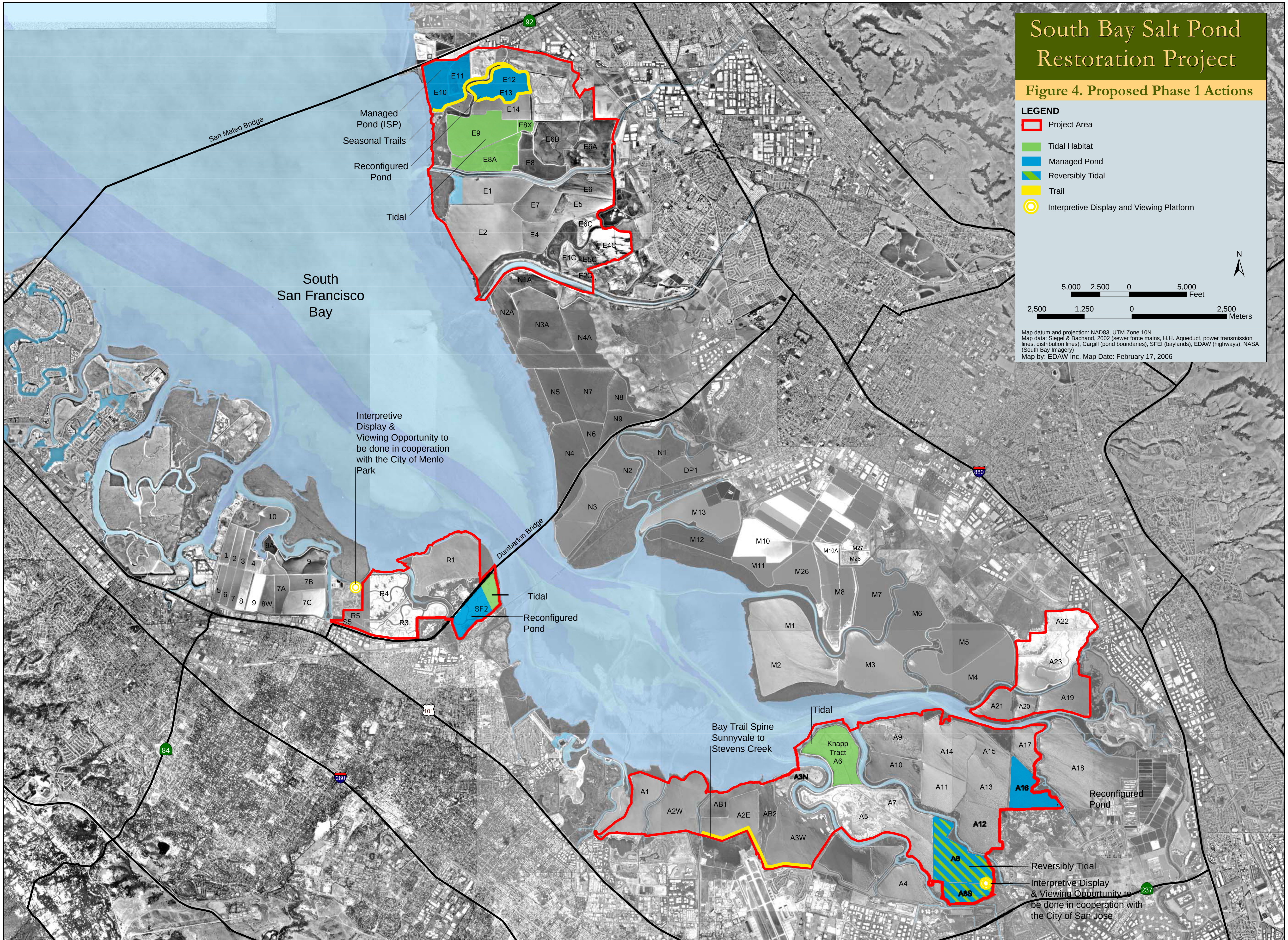


Figure 3b. Alternative C: Tidal Habitat Emphasis Alviso Year 50



South Bay Salt Pond Restoration Project
Figure 3c. Alternative C: Tidal Habitat Emphasis Ravenswood, Year 50
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Overhead Power Transmission Line
Sewer Force Mains
Distribution Line
Recreational Features
Existing Trail (to remain)
Existing Trail (to be removed)
Proposed Year-Round Trail
Proposed Trail (outside project area)
Proposed Water Trail
Historic Site
Kayak Launch
Viewing Opportunity
Interpretive Trail
Habitat Features
Tidal Habitat
Upland Transition Area
Managed Pond
Tidal Habitat (outside project area)
Flood Management Features
Proposed Flood Protection Levee
Existing Flood Protection Levee (outside project area)*
High Ground*
*Level of flood protection not specified.
N
100 Acres
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery), Project Boundary taken from SFEI Interactive Map
Map by: EDAW Inc. Map date: February 17, 2006
Viewing Features and Interpretive Displays to be done in cooperation with the City of Menlo Park
Greco Island
9
Greco Island
7B
7C
Active Cargill Salt Ponds
Flood Slough
Bayfront Park (closed landfill)
R5
S5
R4
Ravenswood Slough
R3
R1
R2
PG&E Substation
SF2
Sun Microsystems
Dumbarton Bridge
84
101
Ravenswood Open Space Preserve
Cooley Landing
Hetch Hetchy Aqueduct
Faber-Laumeister Marsh



South Bay Salt Pond Restoration Project
Figure 4. Proposed Phase 1 Actions
LEGEND
Project Area
Tidal Habitat
Managed Pond
Reversibly Tidal
Trail
Interpretive Display and Viewing Platform
N
5,000 2,500 0 5,000 Feet
2,500 1,250 0 2,500 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery)
Map by: EDAW Inc. Map Date: February 17, 2006
South San Francisco Bay
San Mateo Bridge
Dumbarton Bridge
Managed Pond (ISP)
Seasonal Trails
Reconfigured Pond
Tidal
Interpretive Display & Viewing Opportunity to be done in cooperation with the City of Menlo Park
Tidal
Reconfigured Pond
Bay Trail Spine Sunnyvale to Stevens Creek
Tidal
Reconfigured Pond
Reversibly Tidal
Interpretive Display & Viewing Opportunity to be done in cooperation with the City of San Jose
Knapp Tract A6
E11
E10
E12
E13
E14
E9
E8X
E8A
E8
E6B
E6A
E1
E7
E6
E5
E2
E4
E6C
E4C
E1C
E5C
E2C
N1A
N2A
N3A
N4A
N5
N7
N8
N9
N6
N4
N1
N2
DP1
N3
M13
M12
M10
M10A
M27
M28
M11
M26
M8
M7
M6
M1
M5
M2
M3
M4
A22
A23
A21
A20
A19
A9
A14
A15
A17
A10
A18
A3N
A11
A13
A16
A1
A2W
AB1
A2E
AB2
A7
A5
A12
A3W
A8
A4
A8S
R1
R4
R5
S5
R3
SF2
10
1
2
3
4
9A
9
7A
7B
5
6
7
8
8W
7C
92
680
101
84
280
237

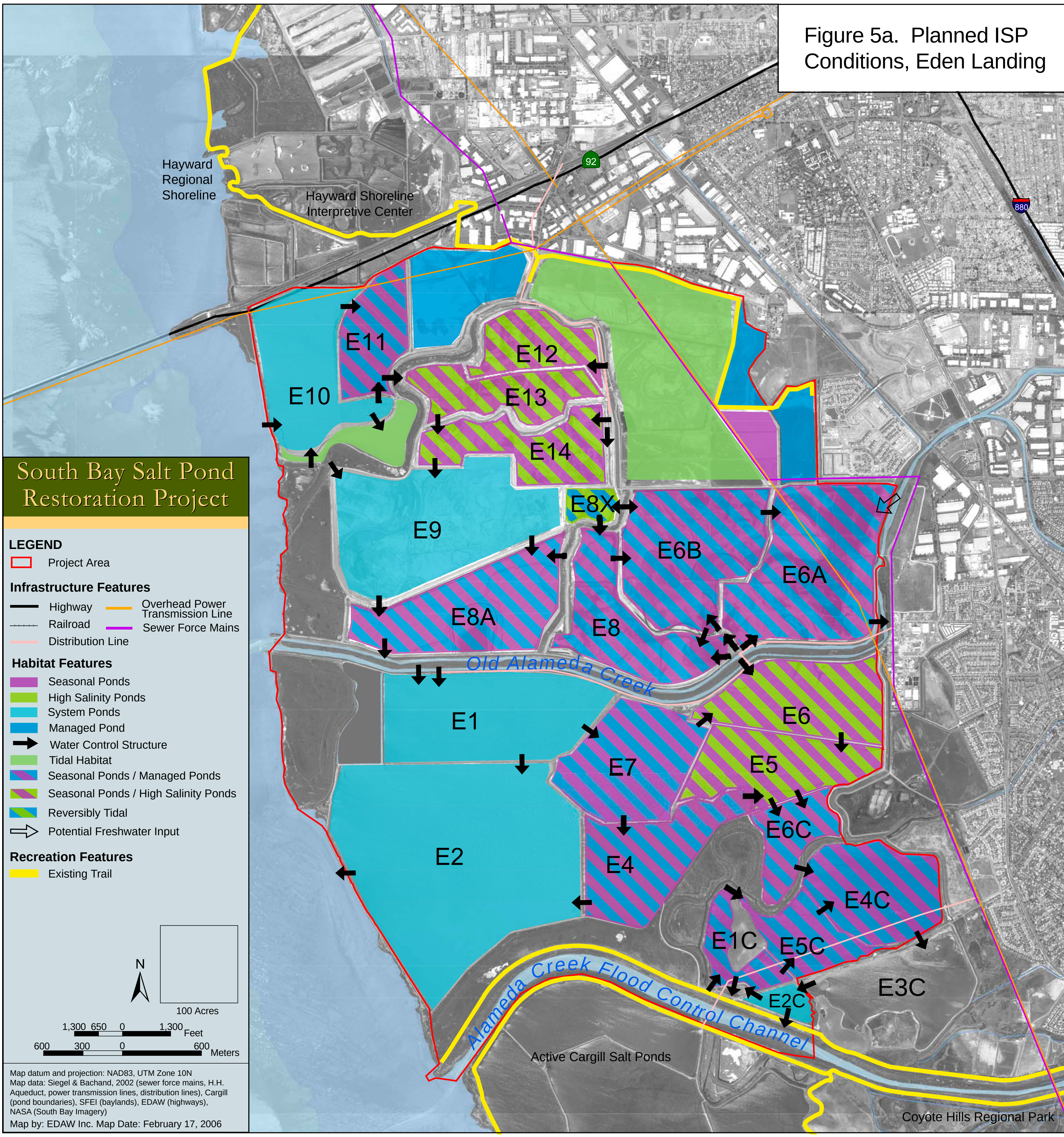


Figure 5a. Planned ISP Conditions, Eden Landing
South Bay Salt Pond Restoration Project
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Distribution Line
Overhead Power Transmission Line
Sewer Force Mains
Habitat Features
Seasonal Ponds
High Salinity Ponds
System Ponds
Managed Pond
Water Control Structure
Tidal Habitat
Seasonal Ponds / Managed Ponds
Seasonal Ponds / High Salinity Ponds
Reversibly Tidal
Potential Freshwater Input
Recreation Features
Existing Trail
100 Acres
N
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery)
Map by: EDAW Inc. Map Date: February 17, 2006
Hayward Regional Shoreline
Hayward Shoreline Interpretive Center
92
880
E10
E11
E12
E13
E14
E9
E8X
E6B
E6A
E8A
E8
Old Alameda Creek
E1
E6
E5
E7
E2
E4
E6C
E4C
E1C
E5C
E2C
E3C
Alameda Creek Flood Control Channel
Active Cargill Salt Ponds
Coyote Hills Regional Park

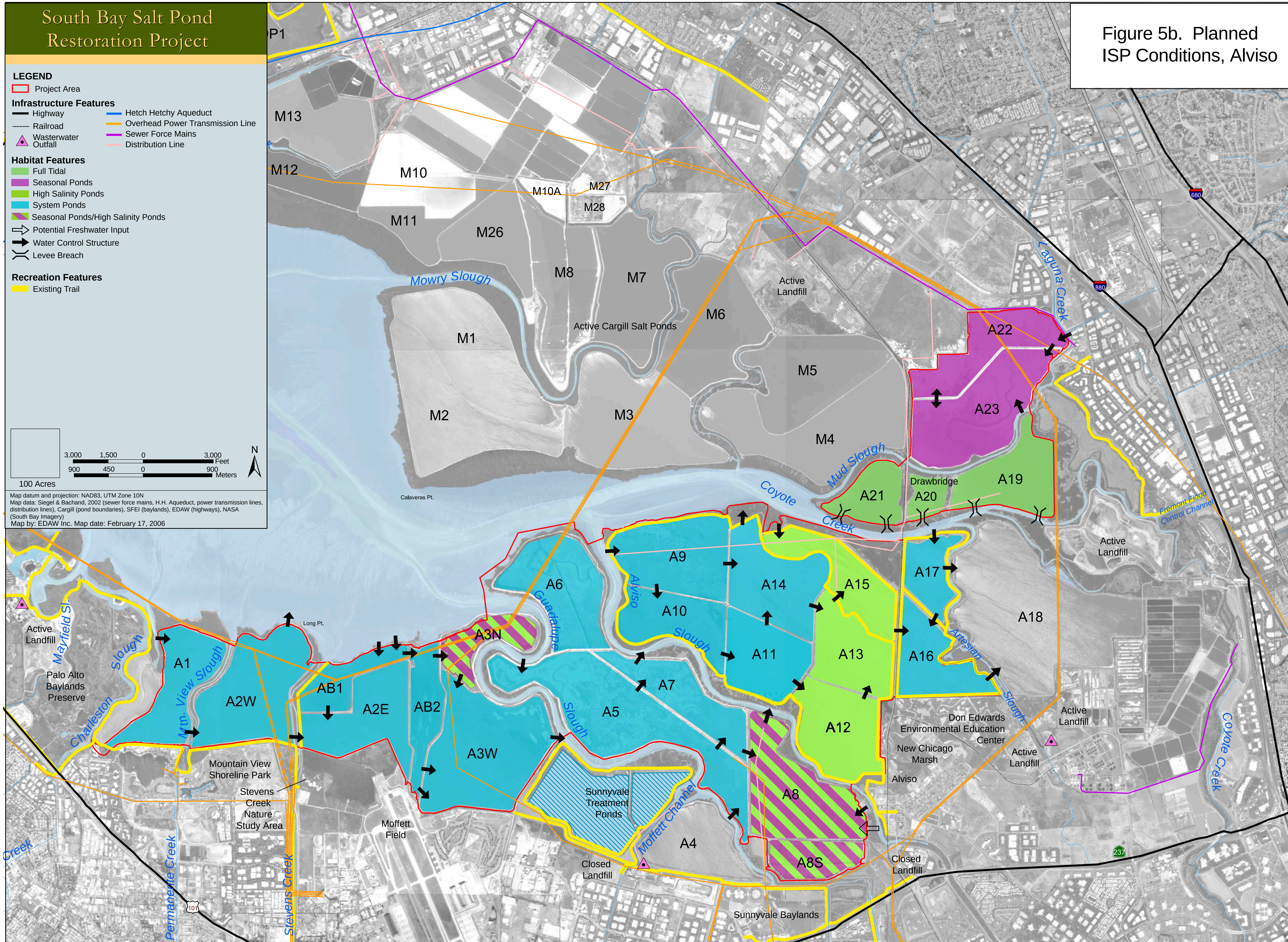
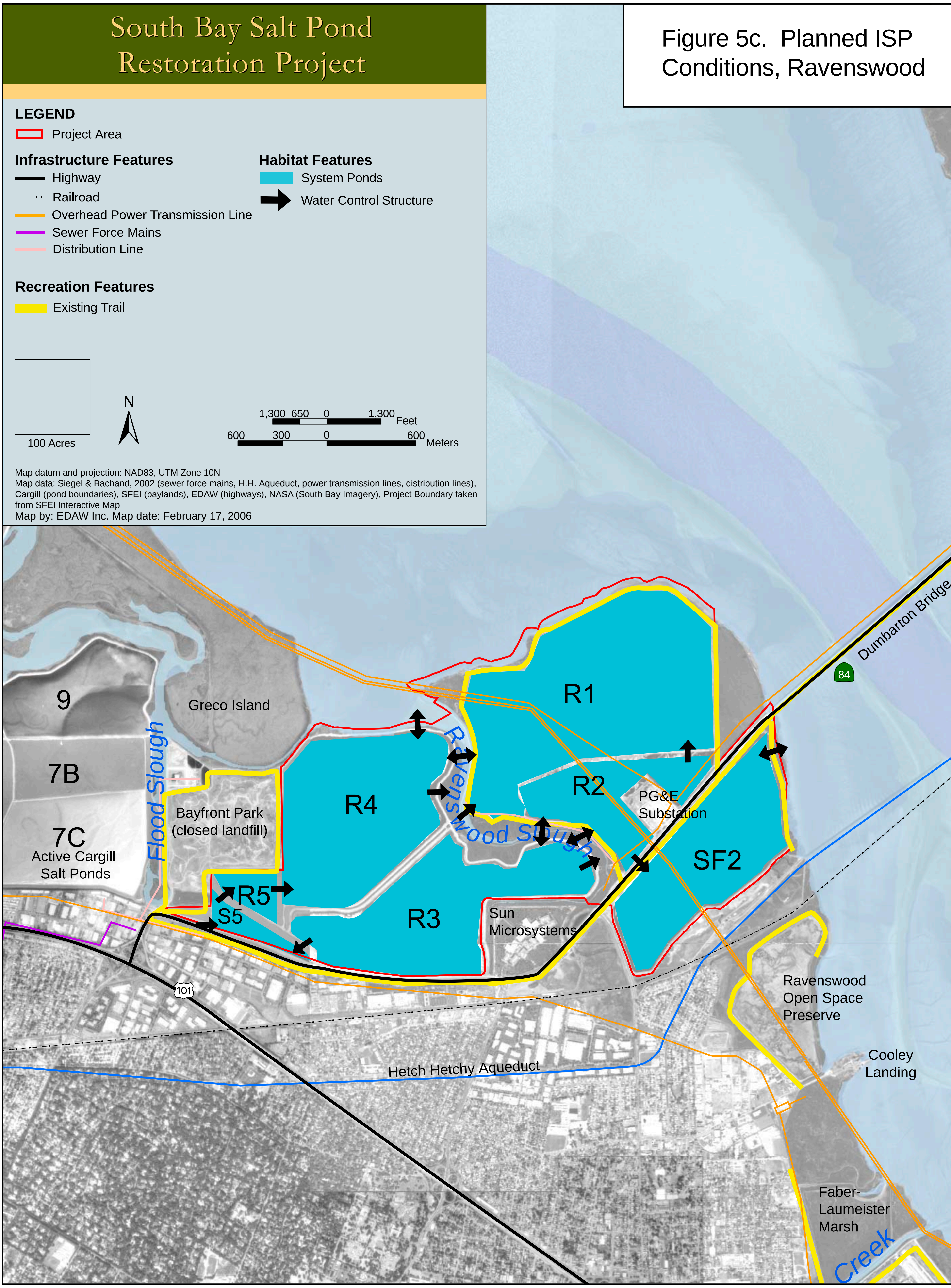


Figure 5b. Planned ISP Conditions, Alviso



South Bay Salt Pond Restoration Project
Figure 5c. Planned ISP Conditions, Ravenswood
LEGEND
Project Area
Infrastructure Features
Highway
Railroad
Overhead Power Transmission Line
Sewer Force Mains
Distribution Line
Habitat Features
System Ponds
Water Control Structure
Recreation Features
Existing Trail
100 Acres
N
1,300 650 0 1,300 Feet
600 300 0 600 Meters
Map datum and projection: NAD83, UTM Zone 10N
Map data: Siegel & Bachand, 2002 (sewer force mains, H.H. Aqueduct, power transmission lines, distribution lines), Cargill (pond boundaries), SFEI (baylands), EDAW (highways), NASA (South Bay Imagery), Project Boundary taken from SFEI Interactive Map
Map by: EDAW Inc. Map date: February 17, 2006
Dumbarton Bridge
84
R1
R2
R4
R3
R5
S5
SF2
PG&E Substation
Ravenswood Slough
Flood Slough
Greco Island
9
7B
7C
Active Cargill Salt Ponds
Bayfront Park (closed landfill)
Sun Microsystems
101
Hetch Hetchy Aqueduct
Ravenswood Open Space Preserve
Cooley Landing
Faber-Laumeister Marsh
Creek

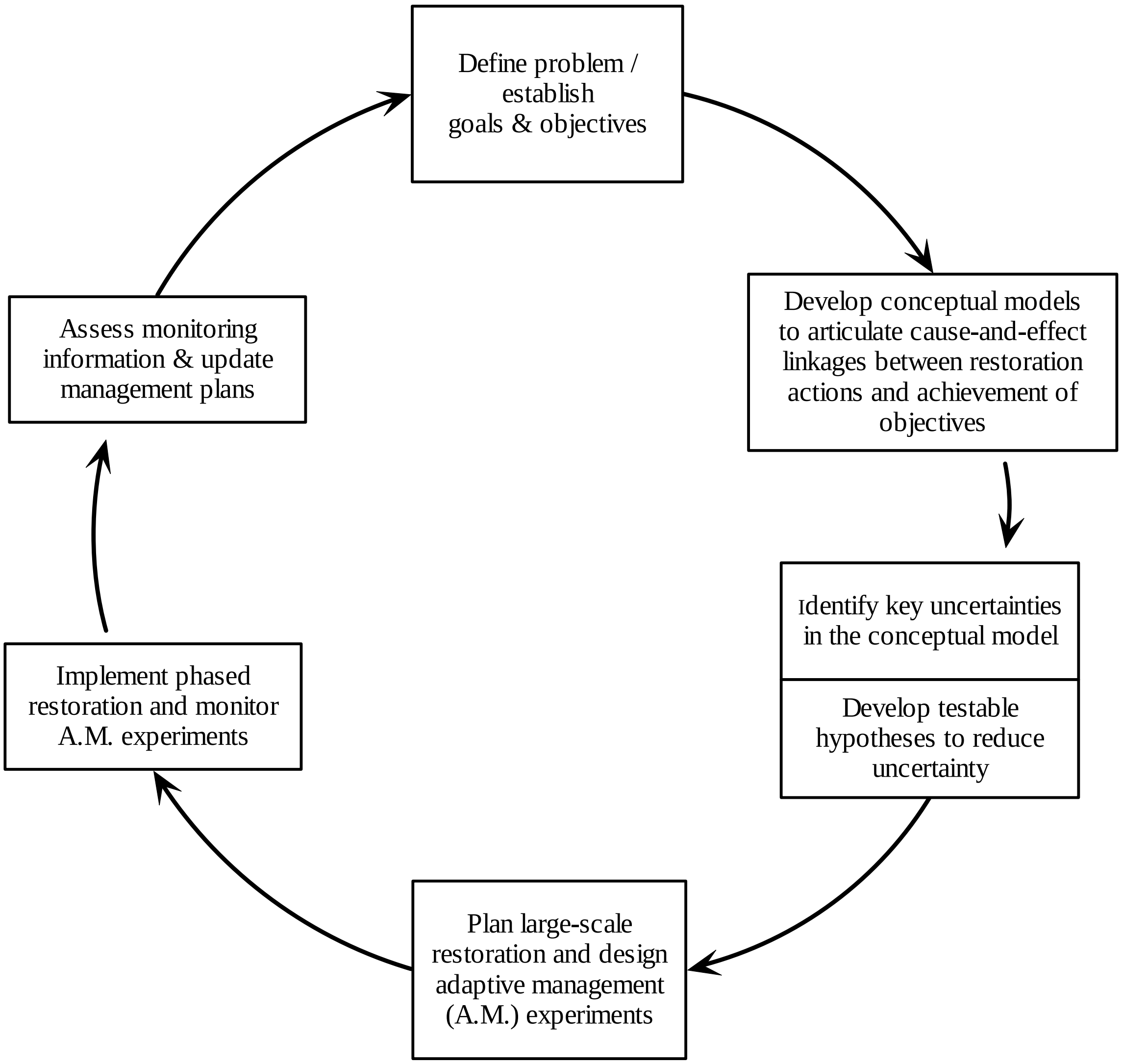
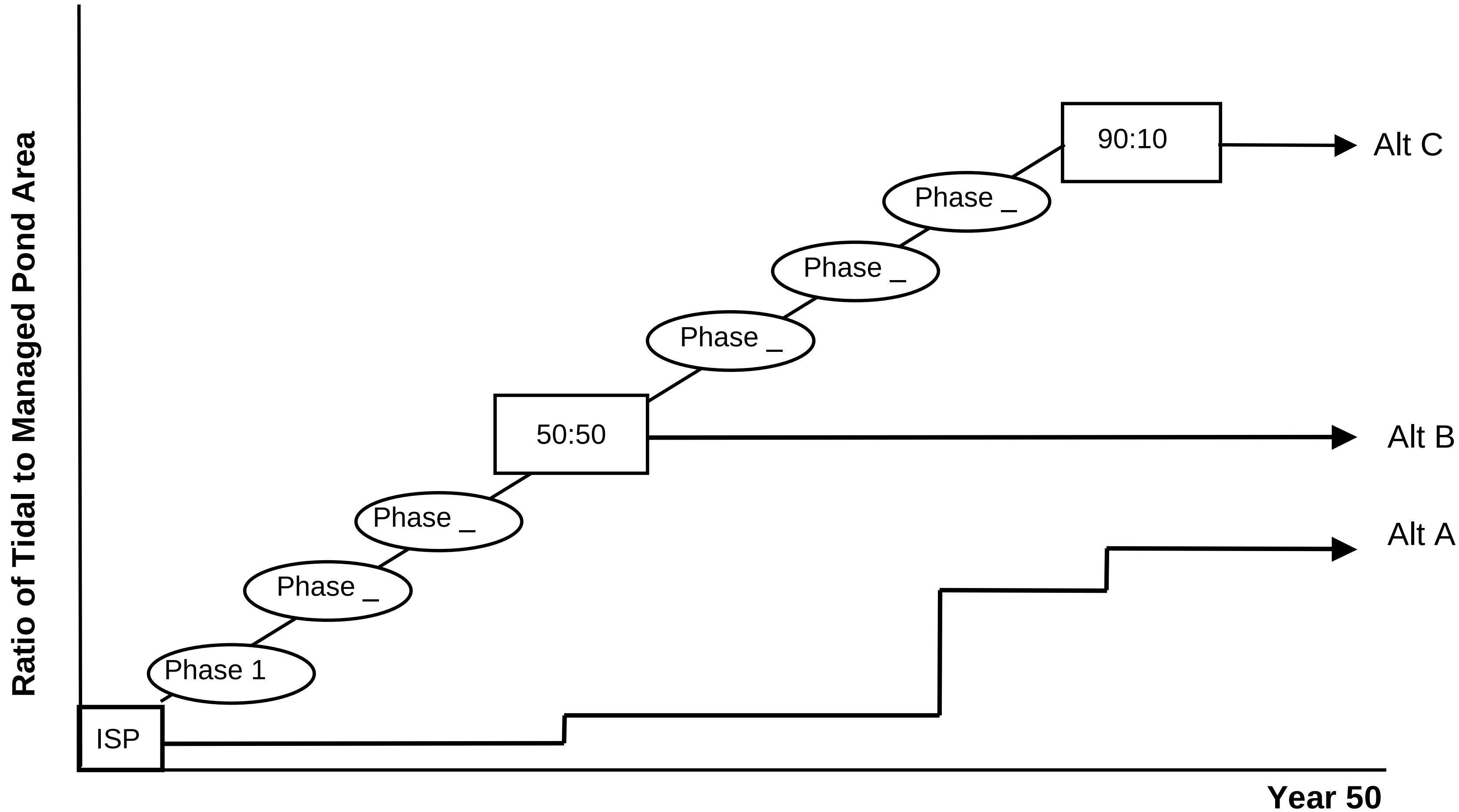


figure 6

South Bay Salt Pond Restoration Project

Adaptive Management Process

PWA



ISP = Initial Stewardship Plan

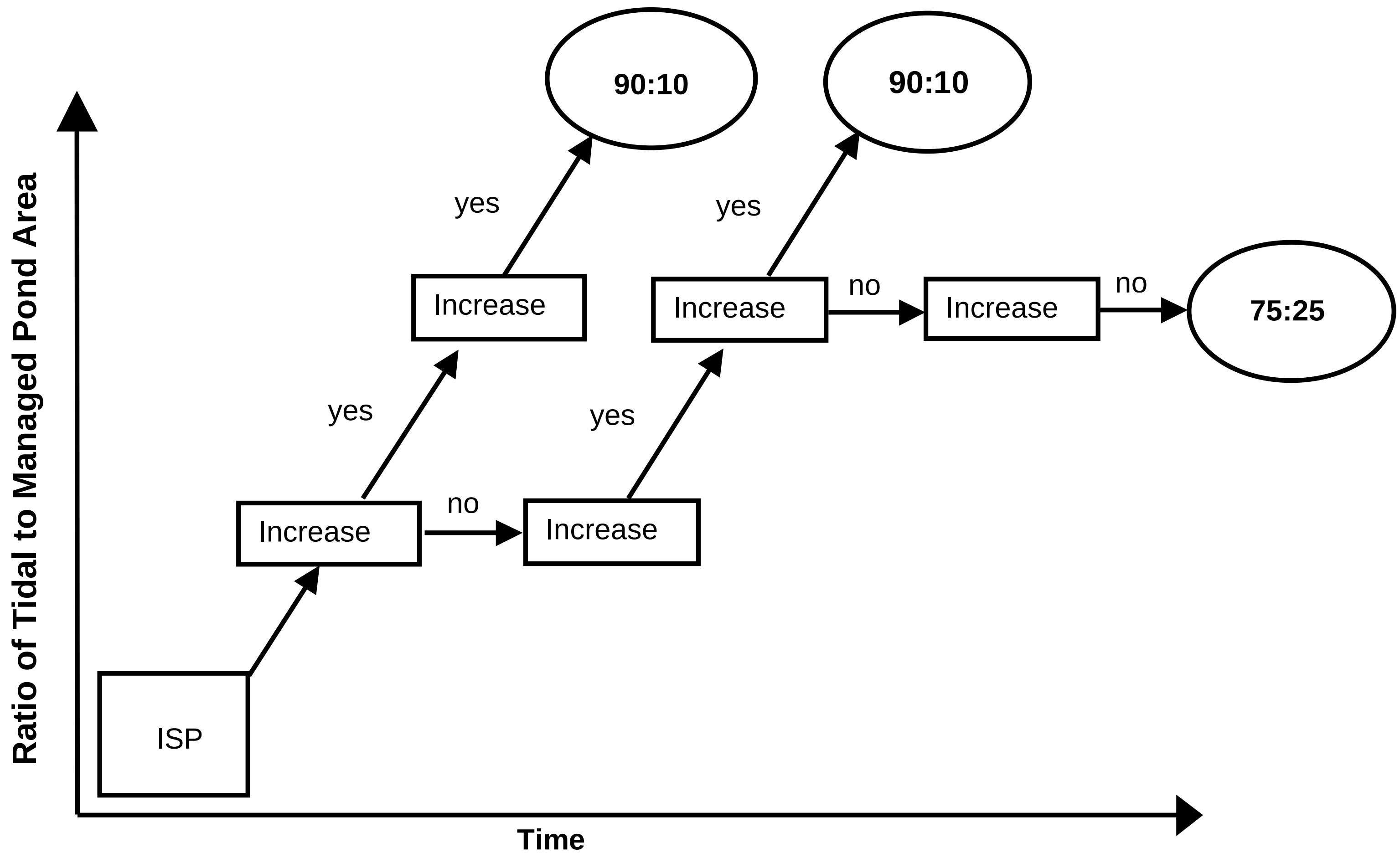
Note: The number and timing of phases after Phase 1 are not defined at this time. The "stairstep" evolution of Alternative A reflects periodic unplanned pond breaches; no specific timing or magnitude of these breaches is implied.

f igure **7**

South Bay Salt Pond Restoration Project

How Adaptive Management Informs the Ultimate Tidal & Managed Pond Habitat Mix

PWA

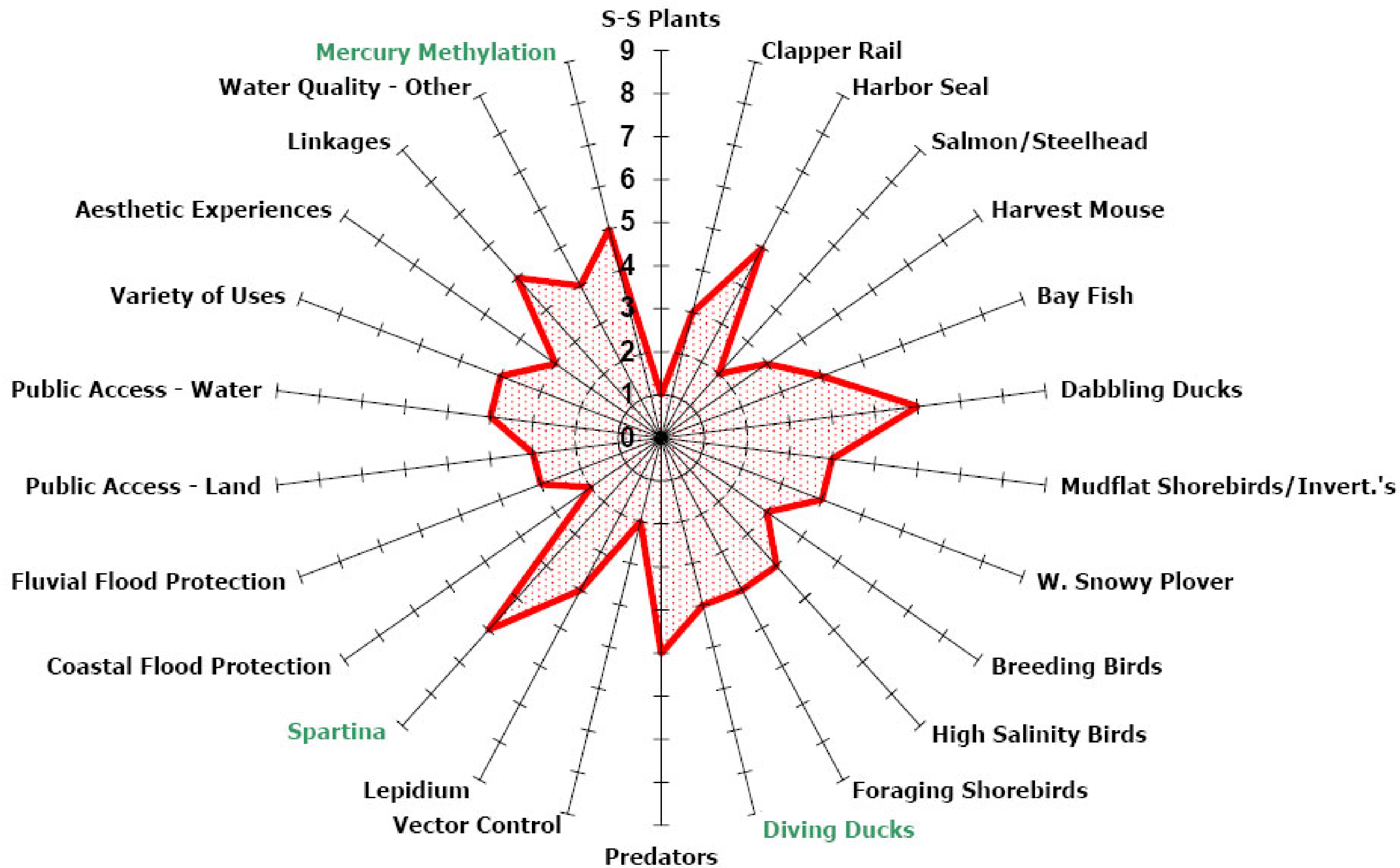


f igure **8**

South Bay Salt Pond Restoration Project

Example of How Adaptive Management Decisions Affect Phasing and Endpoint of Habitat Mix

PWA



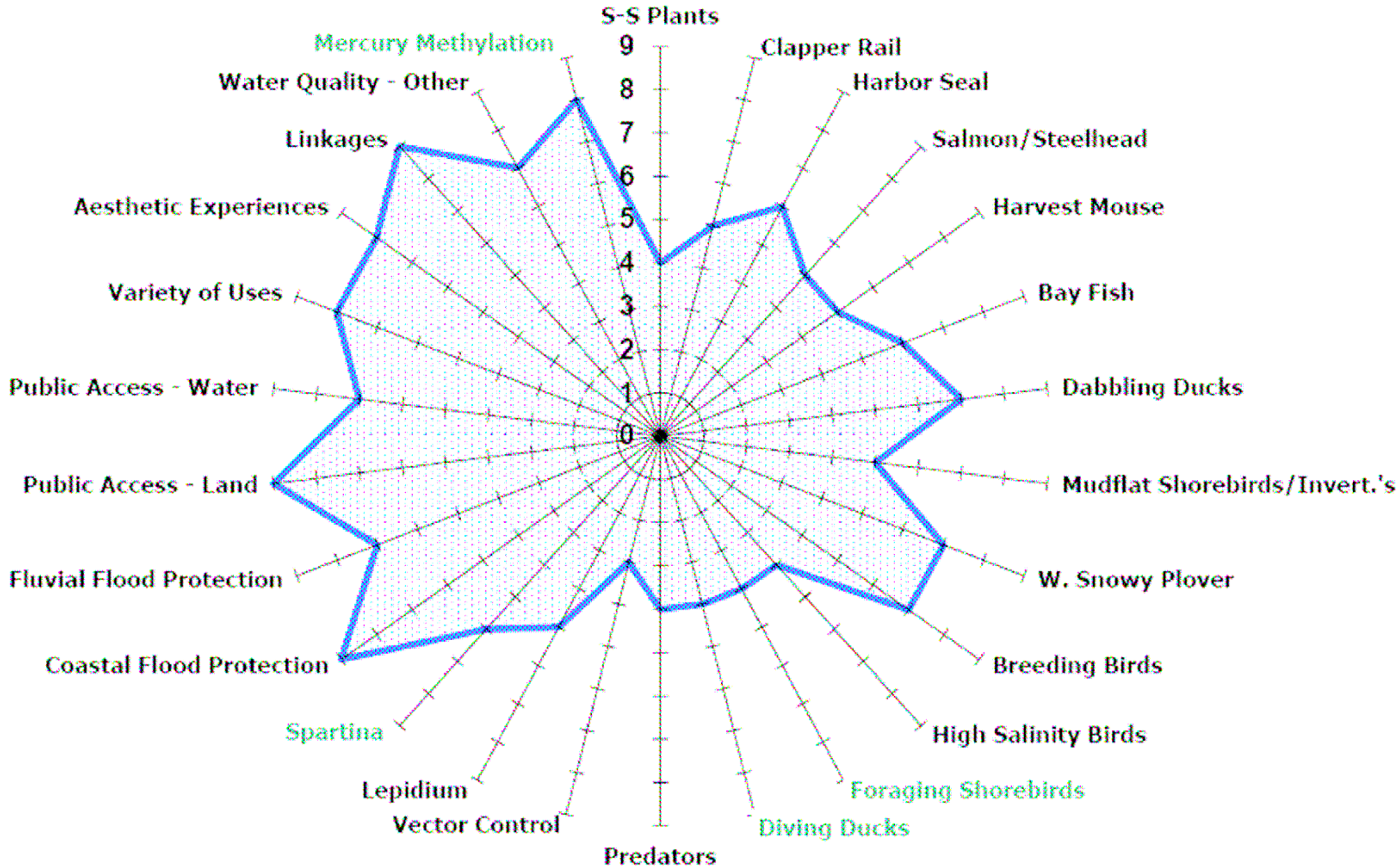
Note: Evaluation criteria highlighted in green are associated with a high degree of uncertainty

f igure **9**

South Bay Salt Pond Restoration Project

Overall Valuation for Alternative A (No Action)

PWA



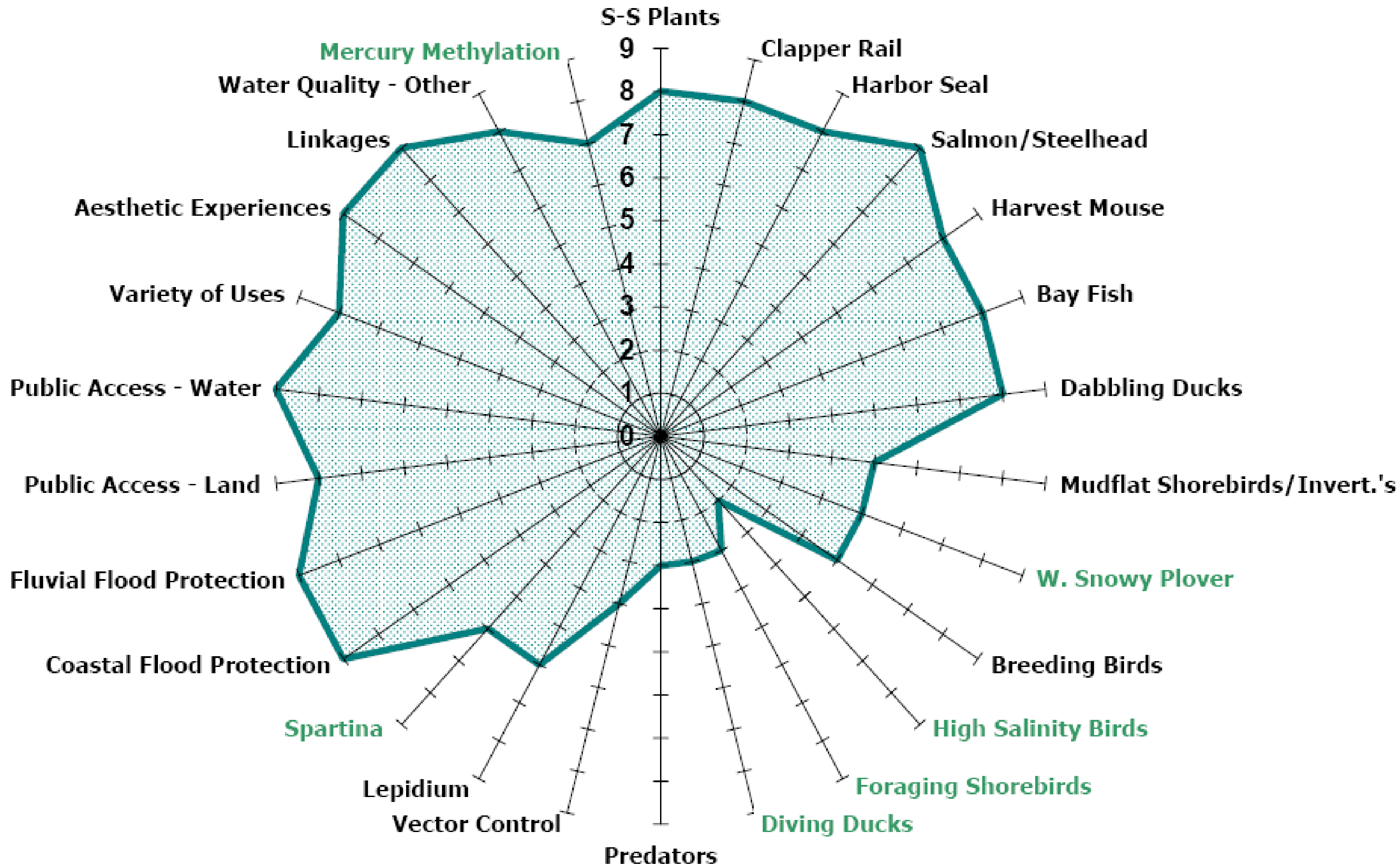
Note: Evaluation criteria highlighted in green are associated with a high degree of uncertainty

f igure **10**

South Bay Salt Pond Restoration Project

Overall Valuation for Alternative B (Managed Pond Emphasis)

PWA



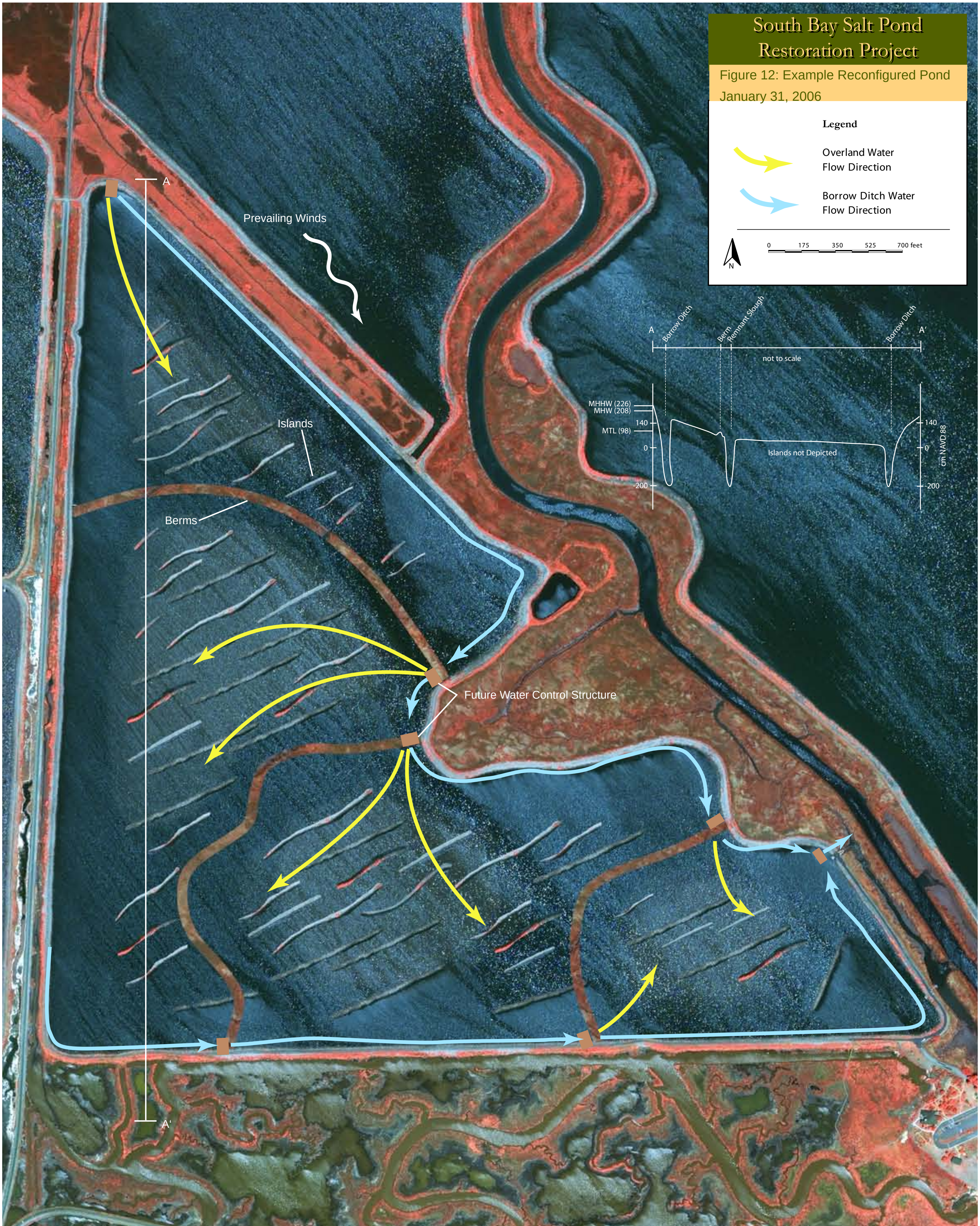
Note: Evaluation criteria highlighted in green are associated with a high degree of uncertainty

f igure **11**

South Bay Salt Pond Restoration Project

Overall Valuation for Alternative C (Tidal Habitat Emphasis)

PWA



Note: Preliminary Design will be revised as specific adaptive management studies are developed.

APPENDICES

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APPENDIX A – PLANNING CONSIDERATIONS

The Planning Considerations (considerations) summarized below were developed to help guide the location of specific habitat restoration, flood management, and public access / recreation elements within the landscape and within each pond complex. Note that there can be linkages or, in some cases, conflicts between considerations. Because trade-offs must often be made between desirable land uses, the considerations guide, but don't dictate, a particular layout of the design features.

Managed Pond Habitat		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Preserve and enhance managed ponds near interpretive opportunities	Protect cultural resources and provide public access routes on maintained pond levees	For example, locate managed ponds near historic salt works (*e.g.*, ponds E12 and E13)
Consider moderately subsided ponds with bottoms near mean tide elevations as the best candidates for managed ponds	Moderately subsided ponds are the least expensive to manage because flow in and out of the ponds can be accomplished by gravity drainage. No/minimal pumping is required.	Locate ponds with bottoms near mean tide elevations
Create managed pond habitat in accessible areas	Provides the easiest operations and maintenance access.	Locate managed ponds landward of the restored tidal habitat and within a complex, generally group managed ponds together
Avoid grouping managed pond habitat in only one part of the project area	Reduces the travel distance by waterbirds that use both pond and tidal habitats.	Locate managed ponds throughout the project area (*i.e.*, in all three complexes), considering the distance between managed ponds
Widely disperse ponds that are to be managed for breeding habitat	Reduces predation and competition between colonies.	Locate ponds designated for breeding habitat throughout the project area (*i.e.*, in all three complexes), considering the distance between similarly managed ponds
Restore managed ponds in areas with relatively less adjacent managed pond habitat	Provides a more even distribution of pond habitat	Locate managed ponds in areas with less adjacent (outside the project area) managed pond habitat

Tidal Habitat		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Create a tidal marsh corridor	Provides connectivity of habitat for salt marsh dependent species, particularly the salt marsh harvest mouse (high marsh habitat).	Create a continuous band of tidal marsh along the Bay.
Create broad upland transitional areas	Provides high tide refuge for the salt marsh harvest mouse, and provides necessary habitat for the growth and survival of special-status plants.	Conduct tidal restoration in areas where there are opportunities to create a natural transition from marsh to upland habitat. Upland transition can also be created along levees by constructing broad, gently sloping outboard levee sides.
Restore tidal action to high elevation ponds	Provides habitat quickly for marsh dependent species. This does not mean that only high elevation are appropriate for tidal restoration, but that relatively quick restoration of tidal marsh in some areas may be important on the landscape-scale, and for protection of existing populations.	Conduct tidal restoration in ponds that are only slightly subsided – with pond bottoms above approximately mean tide level
Restore tidal marshes adjacent to anadromous fish migration corridors	Provides habitat for anadromous fish; provides benefits for harbor seals by enlarging and deepening the major sloughs; complements the flood management planning considerations	Conduct tidal restoration in ponds adjacent to major sloughs that serve as fish migration corridors
Reconnect historic tidal channels with extensive intact drainage systems	Rapidly establishes multi-order channel systems.	Conduct tidal restoration in areas with intact relic drainage systems.
Create large marsh systems where possible	Provides opportunity for establishment of complex/high-order drainages; isolates broad areas from human disturbance and predator access; and provides habitat to support larger populations of salt marsh harvest mice in case connectivity is interrupted by future marsh loss due to sediment deficits or sea level rise.	Conduct tidal restoration in large contiguous areas

Tidal Habitat		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Incorporate unmanaged ponds and salt pans into salt marsh areas	Provides benefits to waterbirds, mimics historical marsh conditions, and is naturally self-sustaining. Mosquito control may be necessary in these areas.	Although the majority of these features will evolve gradually through natural processes, their development may be expedited by excavation of shallow basins in the upper marsh and/or along drainage divides.

Flood Management		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Improve flood management at the mouths of major creeks that currently experience flooding or are otherwise undersized	Improves flood management and lessen flooding risks upstream	Conduct tidal restoration adjacent to the following major sloughs and channels in order to encourage channel scour and enlargement to increase conveyance: Alameda Flood Control Channel, Old Alameda Creek, Stevens Creek, Permanente Creek, Sunnyvale West and East Channels, Guadalupe Slough, and Alviso Slough (Guadalupe River). Coyote Creek currently has adequate flood protection in the lower reaches. Flood management projects currently planned for upstream reaches may increase downstream flows in the future, requiring subsequent improvement in the lower sections. Although Alviso Slough also currently has adequate flood protection with the Pond A8 overflow in place, it is considered advantageous to encourage channel scour and enlargement to increase conveyance.
Integrate with existing and currently planned flood protection projects.	Planning and placement of the flood protection levees will take into consideration existing and proposed flood management systems.	Where feasible, proposed levees will be integrated into the existing levee alignment.
Locate levees for improved coastal flood protection	Final flood control levee alignments will be selected based on engineering feasibility, land ownership, construction and maintenance costs and compatibility with the restoration and public access plan. The detailed alignment will occur in subsequent project design phases, rather than through the alternatives development process.	In most cases, coastal flood control levees will be located along the landward edge of the project site. In isolated locations, the preferred location may be closer to the bay to protect a particular facility. At some locations the levee alignment is likely to be outside the SBSP boundary. At the program level, alternatives include the potential for variations in levee alignments to protect a given reach of shoreline.

Public Access and Recreation		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Provide options to cluster access and associated facilities	Reduce habitat encroachment and associated human disturbance to wildlife	Locate opportunities to cluster access
Allow for a range of options to complete the Bay Trail	Completion of the Bay Trail Spine	For example, use inboard levees and/or rail corridor right of way
Provide public access such as trails and staging areas that can be integrated with historic and cultural features	Allows for interpretive and educational components associated with points of interest.	Locate historic and cultural features
Integrate public access (trails) with flood control structures (levees) and other infrastructure such as PG&E access points where appropriate	Simultaneously satisfies multiple objectives, reduces the creation of separate trail corridors and reduces infrastructure costs.	Locate flood control levees relative to desirable access points and trail locations
Allow for a variety of different and high quality user experiences	Provides a mixture of access possibilities.	For example, access at different locations, trails with varying lengths, and access to the Bay.
Integrate public access and recreation with existing access opportunities	Expand and enhance existing public access and recreation opportunities	For example, integrate with existing trail segments and other recreational facilities on adjacent parks and open space parcels.
Consider the location and amount of public access features to provide the highest quality visitor experience	Provide visitor with a high quality, memorable experience of the landscape	All areas
Attempt to provide shorter distance opportunities and longer distance access	Provides opportunities for visitors with varying abilities	Short spur tails off of Bay Trail spine and longer trails to the Bay.
Consider operations and maintenance requirements, costs and opportunities for partnerships to implement and operate public access features	Consider and minimize ongoing costs.	All areas

Public Access and Recreation		
Consideration	**Purpose / Rationale**	**How and Where to Achieve within the Project Area**
Consider location and siting of features to reduce conflicts and impacts of visitors to the adjacent habitats (provide buffers, seasonal access, visitor restrictions, etc)	Reduce habitat disturbance	All areas
Ensure that Phase 1 projects can dovetail well with long term alternatives implementation	Eliminate the need to remove facilities as new restoration phases are implemented	All areas

APPENDIX B – CHANGES BETWEEN THE PRELIMINARY AND FINAL ALTERNATIVES

The preliminary alternatives presented in the Preliminary Program Alternatives Memorandum (PWA and others 2005) have changed in response to changes in the overall alternatives approach, the availability of new information, results of preliminary assessments, and comments received on the preliminary alternatives from the landowners and the USFWS Endangered Species Program, Project workshops. These changes are reflected in the final alternatives presented in this report, and are summarized below.

1. Alternatives Approach

The final alternatives represent a range that responds to the project objectives, with each alternative representing a potential "end-state" at year 50. These end-states are evaluated as "bookends," representing a range of outcomes from a 50:50 ratio of tidal to managed-pond habitat (Alternative B), to a 90:10 ratio (Alternative C). The preliminary results from the Landscape-Scale Assessment support the bookends as viable options in terms of relying on natural sedimentation to create tidal marsh in the subsided pond, including the deeply subsided Alviso ponds. However, adaptive management will be an integral part of the planning and implementation process to guide selection of the ultimate endpoint, and the optimum configuration may very well be a solution between these two bookends.

Previously, an alternative was presented that represented a 75:25 ratio of tidal to managed-pond habitat (formerly Alternative 2 in the Preliminary Program Alternatives Memorandum, PWA and others, 2005). This alternative was eliminated in favor of the bookend approach with more explicit reliance on adaptive management. The impacts associated with a 75:25 alternative would fall between the two bookends, therefore analysis of this intermediate point would not provide additional information for NEPA/CEQA impact analysis.

The revised alternatives approach also considers the phased implementation of the two restoration alternatives. For example, using the adaptive management approach, Alternative B could represent an early phase of Alternative C. In order to achieve phased implementation, the alternatives required some refinement, particularly with respect to the flood control levee alignment. In the preliminary alternatives, the levee alignments varied in order to show alignment "options". In the initial project assessment, several different levee alignments were considered: The flood control levees could be located on the inboard (landward) side of managed ponds or on the outboard (bayward) side.. The outboard location has the benefit of requiring only a single levee for both pond creation and flood management, while an inboard flood levee still requires a bayward levee to form the pond. However, construction of a levee on the outboard side of a managed pond precludes that pond being restored to tidal habitat a later date. In addition, levee construction and maintenance are typically more expensive and difficult. Therefore, to maintain the maximum flexibility in the habitat mix and for optimal flood management, the levee alignments were consolidated and the inboard location was chosen for both Alternatives B and C.

The consolidation in levee alignments also resulted in changes to tidal habitat and managed pond locations, most notably in the Ravenswood pond complex between ponds R3 and R4, and in the A3W/B2 pond cluster in the Alviso Pond Complex. The previous alignments in these locations called for the creation of a new levee on the pond bed. In order to make Alternative B an early phase of Alternative C, the flood control levee was moved to the inboard side, and the managed ponds area was re-defined so that new managed pond levees would not be constructed in Alternative B, only to be later removed in Alternative C. For example, in the Ravenswood pond complex, the new levee that bisected pond R4 in the preliminary alternative was moved to the existing managed-pond levee between ponds R3 and R4. Similar changes were made to the public access alignments in order to minimize the creation of new trails in Alternative B that would later be removed in Alternative C.

2. Alternative A: No Action

The No Action Alternative has been updated, both with respect to the planned ISP operations and with respect to year 50 conditions (Appendix C). The planned ISP operations have been updated based on current ISP implementation and planned implementation efforts. The year 50 conditions have been described based on the most likely No Action scenario in the absence of the long-term restoration project. Both updates were based on conversations with CDFG and USFWS, and additional revisions will likely occur based on continuing discussions.

3. Alternative B: Managed Pond Emphasis

Alternative B (formerly Alternative 1 in the Preliminary Program Alternatives Memorandum, PWA and others, 2005) was revised based on comments from the USFWSF Endangered Species Program and the landowners. One change in particular related to the trails into the tidal habitats. These trails were shortened based on concerns about interactions between humans and endangered species. This reduction in trail does not affect the Bay Trail spine. There was additional concern regarding the number of trails bordering upland transition habitat; however, the trails will be separated from sensitive upland transition habitat through the use of appropriate buffers. This was considered a design issue and will be considered during the design of future phases of the project.

Additional public access changes occurred in response to two field tours in September 2005 and a public access workshop in October 2005. In general, public access options were refined and consolidated, focusing on the public access options that offer the highest quality public access, including the addition of the water trail and additional public access details specified on the alternative maps. This approach is beneficial for use with the adaptive management / phased implementation approach.

Habitat changes also occurred at Pond A8. Pond A8 was made reversibly tidal in order to test concerns related to mercury methylization and mobilization. In order to maintain a 50:50 tidal to managed-pond habitat ratio, ponds A12 and A17 were switched from tidal habitat to managed ponds. These changes also correlated well with a phased implementation approach.

As mentioned previously, the flood control levees were also revised, and the flood control levees now follow the inboard perimeter levees. This primarily affected the levee alignment in the Ravenswood pond complex between ponds R3 and R4, and the alignment in the Alviso pond complex between Stevens

Creek and the Sunnyvale Treatment Ponds. The flood control levee alignment at Eden Landing south of Old Alameda Creek was also revised based on input from Alameda County Flood Control and Water Conservation District.

4. Alternative C: Tidal Habitat Emphasis

In general, Alternative C (formerly Alternative 3 in the Preliminary Program Alternatives Memorandum, PWA and others, 2005) was refined in a similar manner as Alternative B with respect to changes in public access and recreation. The primary public access addition for this alternative is a the new loop train at pond A3W to create a loop trail experience and offset for the loss of the A9 loop trail when ponds A9 through A15 become tidal habitat.

In Eden Landing, pond E10 was switched to managed-pond habitat at the request of DFG, and pond E14 became tidal habitat in order to maintain a 90:10 habitat ratio. No significant changes were made to the flood control levees in this alternative, other than the revision of the flood control levee alignment at Eden Landing consistent with Alternative B.

References

PWA, H. T. Harvey & Associates, EDAW, Brown and Caldwell. 2005. Preliminary Program Alternatives Memorandum. San Francisco, CA.: Prepared for: California State Coastal Conservancy, U.S. Fish and Wildlife Service, California Department of Fish and Game.

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APPENDIX C – NO ACTION ALTERNATIVE DETAIL

The No Action Alternative is the most likely outcome in the absence of a long-term restoration plan. The No Action Alternative is based on the professional judgment of the landowners and project planners with respect to future levels of funding for land-management, the expected lifetime of existing levees and hydraulic structures, and other factors that are inherently difficult to estimate. The No Action Alternative may change somewhat in the future as specific assumptions are refined. The landowners will coordinate with the local flood management agencies to focus their maintenance funds on pond levees with high priority to be maintained.

The main text of the Final Alternatives Report provides an overview and map of the most likely No Action Alternative at Year 50 (Figures 1a – 1c). The following sections detail specific No Action scenarios for each pond complex.

1. Eden Landing

California Department of Fish and Game (CFDG) currently has an operations and maintenance budget for Eden Landing under an endowment of approximately $10k/year plus some limited supplemental funds. Additionally, CDFG has an annualized levee maintenance budget of approximately $80k/year. However, levee upgrades can consume multiple years' annual allocation. For example, $500k was recently spent upgrading pond levees between Old Alameda Creek and the Alameda Creek Flood Control Channel (ACFCC). Pumping costs are not currently covered under the endowment or levee maintenance budget and would be considered an additional operations cost.

The planned ISP management of Eden Landing as of 2006 (Figure 5a in the main text of the Final Alternatives Report) has changed from the original ISP plan (John Krause and Carl Wilcox CDFG, pers. comm.). The ISP maps were updated based on current operations; however, additional management changes could further revise operations. The culvert connection to the bay at E2 has been implemented; the old E10 culvert connection recently failed and will be replaced in 2006. Levees with the highest risk of failure or overtopping are: levees around ponds E8A, E9, E12, E13, and E14; the bayward levees along E1 and E2; and levees along the south side of ponds E2, E4, and E5.

Under the most likely No Action scenario, none of the pumps would be operated due to lack of funding for electricity, with the exception of the pump at Pond E1; however, the pumps will be maintained as funding allows. Without the pumps, the 'C' sub-system (Ponds E1C, E4C, and E5C) would be the first ponds to become seasonal wetlands because no summer inflow exists in the absence of pumping. Pond E2C could operate as muted tidal using the existing ISP control structure.

In the short- to medium-term, Ponds E1, E2, E4 and E7 could operate as managed ponds, and E5, E6, and E6C could operate as high salinity ponds in the winter and seasonal ponds in the summer. However, all internal structures will likely fail within 5 to 20 years and the ponds would become seasonal. Successive dry years would cause all the ponds with the exception of Ponds E1 and E2 to become seasonal earlier due to the limited ability to circulate adequate amounts of bay water through the system to meet salinity discharge requirements. If the levees outboard of Ponds E1 and E2 fail, all ponds between Old Alameda Creek and the ACFCC would eventually become tidal with the exception of the ponds E1C, E2C, E4C, and E5C. These ponds would be maintained as seasonal wetlands in order to provide some level of flood protection.

Ponds E10, E11, E8, E6A, and E6B are expected to remain as managed ponds for the 50-year planning horizon. The pond levees for Ponds E8A, E9, E12, E13, and E14 will not be maintained. These ponds will initially operate as seasonal wetlands, and will eventually become tidal as the levees erode and breach. CDFG is expected to focus their limited levee maintenance and improvement funds on the levees along the east side of Ponds E4, E5, E6, and E6C to reduce the potential for periodic overtopping into areas that currently provide flood detention for low-lying areas of Alameda County.

2. Alviso

The USFWS currently has an operational budget of $200k/year for management and maintenance of the Alviso pond complex; however, this sum is likely insufficient to cover even ongoing levee maintenance. Figure 5b presents the planned ISP operations as of 2006, with the exception of ponds A22 and A23. Cargill continues to manage ponds A22 and A23 in order to reduce salinities. Once salinities are reduced, these ponds are expected to be turned over to USFWS.

In general, the Alviso complex is in better condition than the other two complexes. Most of the internal hydraulic structures have been recently upgraded or replaced, with the exception of the siphons which are old, hidden, and unreliable. The A9 levee system (A9, A10, A11, A12, A13, A14, and A15) has been recently maintained per typical salt pond maintenance (placement of excavated bay sediment on the levees). While these are not designed as flood protection structures, the maintained salt pond levees have provided historical flood protection benefits. However, the levee system from A1 through A8 has not been maintained within the past 6 years and is in poorer condition. The outboard levees along A1 through A6 are subject to high erosive forces.

Under the most likely No Action scenario (Figure 1b), ponds A9, A10, A11, A14, A16 and A17 would remain as managed ponds, and ponds A12, A13, and A15 would become seasonal wetlands if funding is not available to operate the pumps. Levees along ponds A5, A6, and A7 are the least likely to be maintained. The levees would be allowed to erode, creating additional tidal habitat in A5, A6, and A7 through uncontrolled breaching. The levee along the east side of Pond A8 would be raised to prevent frequent tidal overtopping into A8/8S. Pond A8/A8S would operate as a seasonal wetland with direct rainfall and evaporation only. Existing flood detention storage would be maintained in Pond A8, but not in Ponds A5, A6, and A7. This loss of flood detention storage has the potential to raise water surface elevations at the mouth of Guadalupe Creek/Alviso Slough and reduce flood protection. It would require hydraulic assessment to determine the most effective method for compensating for the loss of flood storage, and restoring flood hazard management to the current level.

Levees around the ponds east of Guadalupe Slough (A1 through A3W) are high priority levees to be maintained. Levees for the ponds between Stevens Creek and Guadalupe Slough currently provide some level of flood protection for Moffett Field. For the 50-year scenario, it is assumed these outboard levees are maintained (or repaired upon failure) and the associated ponds are not actively managed. Ponds A19, A20, and A21 will be restored to tidal habitat under the ISP. Ponds A22 and A23 would become seasonal wetlands.

3. Ravenswood

Cargill is currently maintaining the Ravenswood pond complex until salinities are reduced, and then the ponds will be turned over to the USFWS for ongoing management. Figure 5c depicts the planned ISP operations, although it is unlikely that any of the ISP structures will be installed due to lack of funding, with the exception of the bay connection in pond SF2. Therefore, under the most likely No Action scenario (Figure 1c), the remaining ponds (R1, R2, R3, R4, R5 and S5) would function as seasonal wetlands unless levees failed. The outboard levees along pond R1 and R2 are in poor condition. It is assumed that these levees would be maintained or repaired upon failure to provide flood protection for the PG&E substation. SF2 could continue operating as a managed pond for the 50-year planning horizon.

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Table D1. Eden Landing Pond Complex Public Access and Recreation

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
Trails	Seasonal Levee Trail	Along perimeter of Ponds E12 and E13	X	X
	Year-Round Levee Trail	Eastern edge of Pond E12- provides year-round access to Oliver Salt Works Historical Site	X	X
	Year-Round Levee Loop Trail	Northern and western edges on Pond E6C south through E1C to connect with existing trail along northern edge of Alameda Creek Flood Control Channel to levee trail along east side of E3C. This forms a loop trail that could be accessed from the Alameda Creek Stables staging area.		X
	Seasonal Levee Trail	Southern edges of Ponds E11 and E10	X	X
	Year-Round Levee Trail	Southern edges of Ponds E4C and E5C	X	
	Year-Round Levee Trail	North side of Old Alameda Creek, along the southern edge of Ponds E8 and E6A	X	
	Year-Round Levee Trail	South side of Old Alameda Creek, along the northern edge of Pond E6		X
	Year-Round Levee Trail (Bay Trail Spine)	On flood control levees along northern and eastern edges of pond complex	X	X
Access Points and Staging Areas	Staging Area	Provided at entry to Eden Landing Road near Mt. Eden Creek bridge and northern edge of Pond E12	X	X
	Staging Area	Existing staging area at Alameda Creek Stables to provide access to E3C and E1C* trails.	X	X
	Bridge Crossing	Bridge Crossing at Alameda Creek Flood Control Channel *	X	X
Boating (non-motorized)	In Bay and sloughs, launching site at southeastern corner of Pond E11	Accessible slough and marsh channels (>4 meter wide)	X	X

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
Historic Features	Oliver Salt Works	West end of Pond E12 north of Pond E13	X	X
	Alvarado Salt Works	West end of Pond E6	X	X
Hunting	Controlled access on specific hunt dates (from blinds and levees as specified by CDFG)	Marsh areas and all ponds with sufficient water except Pond E6A and the 835-acre restoration site (recreation access may be limited during hunting dates)	X	X
Fishing	Controlled access by season and area	From boat or from shore, as designated by DFG	X	X
Interpretive/Education Stations		Provided at Oliver Salt Works, Alvarado Salt Works and at key locations along trails	X	X
Viewing Platforms	Raised accessible structures or placed at a key highpoint for best vantage of surrounding landscape; interpretive signage and information integrated into design.	Terminus of Seasonal Trail south of Ponds E11 and E10	X	X
		Terminus of year-round trail in southern part of Pond E8	X	
		Terminus of year-round trail in northern part of Pond E7 at northwestern corner of Pond E6A		X
		Terminus of trail north of Pond E2C	X	
		Western edge of E6C along levee trail		X

* Bridge crossing in cooperation with Alameda County Flood Control and Water Conservation District.

Table D2. Alviso Pond Complex Public Access and Recreation

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
Trails	Seasonal Levee Trail	Eastern edge of Pond A2W – coincides with PG&E access	X	X
	Year-Round Levee Trail (Bay Trail spine)	Southern edge of Ponds A2E, A3W linking existing segments of the Bay Trail Spine	X	X
	Year-Round Trail Adjacent to Existing Rail Corridor (Bay Trail spine)	Northwestern corner of A23 south to northeastern corner of Pond A17 to pass over Drawbridge		X
	Proposed Year-Round Levee Trail (outside of project area (Bay Trail spine)	Extends south from year-round flood-control levee trail (south of Pond A2E) along western edge of Stevens Creek Open Space Preserve	X	X
	Year-Round Levee Trail	Northern edge of Pond A3W to creating a loop trail from Bay Trail spine in C only	X	X
	Year-Round Levee Trail	Extends north from Pond A17 across Coyote Creek to connect to Bay Trail Spine at northwestern corner of Pond A23, provides viewing access to historic Town of Drawbridge		X
	Year-Round Levee Trail (Bay Trail spine)	Northern edge of Pond A22 to connect existing Bay Trail Spine to points south	X	X
	Vehicular Access	Southerly side of the Sunnyvale Treatment Ponds and along the southeast edge of Pond A3W*	X	X
	Proposed Trail (outside project area)	City of San Jose Bay Trail spine segment surrounding the "Legacy" property, located at the southeast corner of Pond A8S. The City of San Jose has proposed a pedestrian bridge crossing Alviso Slough to access this proposed Bay Trail segment	X	X
	Proposed Trail (outside project area) Bay Trail spine	Connects Guadalupe River Trail with Coyote Creek Trail (alternate Bay Trail spine segment)	X	X
	Proposed Trail (outside project area)	Extends from northeastern edge of Pond A22 connecting to existing segments of Bay Trail Spine	X	X
Access Points and Staging Areas		Don Edwards EEC	X	X
		Kayak launch, fishing and trail access provided on southwest corner of Pond A12, at Alviso Marina County Park (immediately adjacent to pond complex)	X	X

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
		Access to Pond A8 (hunting and service only)	X	X
		Kayak, hunting, and fishing access provided on eastern side of Pond A3W	X	X
Boating (non-motorized recommended)	Bay, Alviso Slough Channel, Guadalupe Slough Channel	Accessible slough and marsh channels (>4 meter wide) (Check for seasonal closures)	X	X
Historic Features	Drawbridge remnants	Between ponds A20 and A21	X	X
	Historic Cannery Building	In Alviso, outside of the SBSP Project Area but owned by USFWS	X	X
Hunting	Controlled access on specific hunt dates and areas (from blinds and levees as specified by USFWS)	Currently to match the ISP Hunt Plan Amendment, Ponds A2E, AB1, AB2, A3W, A3N, A5, A7 and the northern portion of A8 within the Alviso complex would be open to hunting on Saturdays, Sundays, and Wednesdays; a Refuge Special Use Permit would be required. Pond A19 is open to hunting under the current Hunt Plan.	X	X
Fishing	By boat in Bay and sloughs only	Mallard Slough closed to boating March 1 – August 31	X	X
Interpretive/Education Stations and Programs	Don Edwards Environmental Education Center	Located south of Pond A16, outside of project area	X	X
	Docent-led tours Interpretive displays** Environmental education field trips, hands-on activities, classroom presentations and other outreach	Along hiking trails, at wildlife observation areas, and throughout the Refuge	X	X
Viewing Platforms		At terminus of seasonal trail along Pond A2W	X	X
		At terminus of Year-round trail at northeastern edge of Pond A3N		X
		At terminus of year-round trail at northeastern edge of Pond AB2	X	

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
		Northeastern corner of Pond A8S (to be coordinated with City of San Jose)	X	X
		Eastern edge of Pond A16	X	X
		Viewing platform between Ponds A12 and A13		X
Access agreement must be obtained from the City of Sunnyvale and Cargill. *Trail segment at A3W to Guadalupe Slough in cooperation with Cargill. ** Interpretive display at Shoreline Park in cooperation with the City of Mountain View.				

Table D3. Ravenswood Pond Complex Public Access and Recreation

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
Trails	Year-Round Trail	Extends from existing Bay Trail Spine north between Ponds R5/S5 and R4/R3	X	X
	Year-Round Trail	Northwestern edge of Pond R4	X	X
	Year-Round Trail	Eastern and southern edges of Pond SF2	X	
		West and southwestern edge of Pond SF2		X
	Year-Round Loop Trail	Northern and eastern edges of Pond R3 creating a loop trail from existing Bay Trail spine along Hwy. 84	X	
	Proposed Trail (outside project area)	Extends West from existing Bay Trail Spine, south of Pond 7C	X	X
	Proposed Trail (outside project area)	Connects existing Bay Trail Spine north of Ravenswood Open Space Preserve to Year-Round Trail in Pond SF2	X	X
	Proposed Trail (outside project area) (Bay Trail spine)	Connects Existing Bay Trail spine segments west of Faber-Laumeister Marsh	X	X
Access Points and Staging Areas	Kayak Launch	Eastern region of complex, at base of Ravenswood Slough		X
Boating (non-motorized recommended)	Bay and its tributaries	Accessible slough and marsh channels (>4 meter wide) (Check for seasonal closures)	X	X
Historic Features	Historic red barn	South of Bayfront Park by Pond S5	X	X
Hunting	Controlled access on specific hunt dates and areas (from blinds and levees as specified by USFWS)	Ponds R1 and R2 (except the southeastern portion of R2 next to the highway); from boats, shore, or levees.	X	X
Fishing		Not allowed from ponds; Available from the Bay	X	X

Recreational Features	Description	Locations	Included in Alternative B	Included in Alternative C
Interpretive/Education Stations and Programs	Docent-led tours Environmental education field trips, hands-on activities, classroom presentations and other outreach	Various locations	X	X
Viewing Platforms		Along proposed year round trail, east of Pond R5	X	X
		Northeast corner of Bayfront Park	X	X
		At terminus of proposed year-round trail northwest of Pond R4	X	X
		Eastern region of Complex, at southern terminus of existing spur at Pond SF2 at water's edge	X	X
		At junction of proposed year-round trail and Bay Trail Spine, northeast of Pond SF2	X	
		At junction of proposed year-round trail and proposed trail south of Pond SF2		X
		At northeastern corner of Pond R3 accessed by proposed year-round trail at Pond R3	X	
		Base of Ravenswood Slough, at northern terminus of proposed year-round trail		X

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Table E1. Evaluation Criteria and Metrics

BIOLOGICAL HABITAT

Objective 1. Create, restore, or enhance habitats of sufficient size, function, and appropriate structure to:

Objective 1A. Promote restoration of native special-status plants and animals that depend on South San Francisco Bay habitat for all or part of their life cycles.

Evaluation Criteria	Metrics	Analysis Method
1. Contribute to the recovery of the south bay subspecies of the salt marsh harvest mouse	• Area of complete salt marshes, with broad marshplain (i.e., pickleweed) habitat and broad upland/peripheral halophyte transitional zones • Connectivity of such existing and restored marshes both within and adjacent to the project area • Proximity of restored marshes to existing marshes providing suitable salt marsh harvest mouse habitat	• South Bay Geomorphic Assessment (estimates of salt marsh establishment) • Hydrodynamic Modeling (water levels inform vegetation colonization predictions, salinity modeling informs vegetation types) • Alternative Design (salt marsh habitat locations and upland transition zone placement)
2. Contribute to the recovery of the California Clapper Rail	• Area of broad tidal marshes with suitable channel densities and appropriate vegetation structure	• South Bay Geomorphic Assessment (estimates of salt marsh establishment, empirical analyses of channel formation based on previous restoration efforts and historical information) • South Bay Bird Use Assessment • Hydrodynamic Modeling (water levels inform vegetation colonization predictions, salinity modeling informs vegetation types)
3. Re-establish populations of special-status plants	• Area of high marsh/upland transitional zones • Connectivity of existing and restored high marsh/upland transitional zones, both within and adjacent to the project area • Proximity of restored high marsh/upland transitional zones to existing populations of special-status species	• South Bay Geomorphic Assessment (estimates of salt marsh establishment) • Alternative Design (salt marsh habitat locations and upland transition zone placement)
4. Contribute to the recovery of the Western Snowy Plover	• Area of suitable breeding habitat (salt pan, islands, undisturbed levees) in combination with appropriate foraging habitat.	• South Bay Geomorphic Assessment • South Bay Bird Use Assessment • Alternatives Design (managed ponds with islands and undisturbed levees)
5. Enhance habitat for anadromous special-status fish (Salmon and steelhead)	• Length of tidal channel habitat within marshes connected to creek and river systems that support or could support these species	• South Bay Geomorphic Assessment (empirical analyses of channel formation based on previous restoration efforts and historical information)

Table E1. Evaluation Criteria and Metrics **(cont.)**

BIOLOGICAL HABITAT		
Objective 1B. Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Maintain or increase current populations of some or all bird species breeding at the salt ponds	• Area of managed ponds with associated breeding islands, undisturbed levees, and associated breeding structures	• South Bay Bird Use Assessment (bird-use modeling and empirical analyses) • Alternatives Design (managed ponds with islands, undisturbed levees, and breeding structures)
2. Maintain habitat for salt pond specialized birds (*e.g.*, Wilson's Phalaropes)	• Area of managed pond habitat with somewhat elevated salinities (100-140 ppt), and appropriate depths	• South Bay Bird Use Assessment (bird-use modeling and empirical analyses) • Alternatives Design (high salinity managed pond)
3. Maintain current population levels for foraging shorebirds	• Estimate of foraging habitat area, including mudflat exterior to salt ponds, ponds and pans in tidal marshes and suitable foraging areas in managed ponds	• South Bay Bird Use Assessment (bird-use modeling and empirical analyses) • South Bay Geomorphic Assessment (historical information and empirical analyses regarding pond and pan formation) • Hydrodynamic Modeling (mudflats exterior to ponds) • Alternatives Design (managed pond water level management)

Table E1. Evaluation Criteria and Metrics **(cont.)**

BIOLOGICAL HABITAT		
Objective 1C. Support increased abundance and diversity of native species in various South San Francisco Bay aquatic and terrestrial ecosystem components, including plants, invertebrates, fish, mammals, birds, reptiles and amphibians.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1, 3. Maintain or enhance the populations of intertidal invertebrates and larger shorebirds that forage almost exclusively on intertidal mudflats	• Area of mudflat habitat available in the South Bay through the life of the project	• South Bay Bird Use Assessment (bird-use modeling and empirical analyses) • South Bay Geomorphic Assessment (estimates of intertidal habitat) • Hydrodynamic Modeling (mudflats exterior to ponds)
2. Enhance South Bay fish populations	• Area of tidal marsh and tidal channel habitat within marshes, in combination with bay and mudflat habitat	• South Bay Geomorphic Assessment (estimates of salt marsh establishment, empirical analyses of channel formation based on previous restoration efforts and historical information) • Hydrodynamic Modeling (Bay and mudflat habitat exterior to ponds)
4a Maintain or enhance the populations of diving ducks currently using the Bay	• Area of deeper-water managed ponds, bay mudflats, and shallow subtidal areas	• South Bay Bird Use Assessment (bird-use modeling and empirical analyses • South Bay Geomorphic Assessment (estimates of intertidal and subtidal habitat) • Alternatives Design (managed pond water level management) • Hydrodynamic Modeling (Bay and mudflat habitat exterior to ponds)
4b. Maintain or enhance the populations of dabbling ducks currently using the Bay	• Length of edge habitat between vegetated marsh and open water or mudflat, including bay/mudflat edge, channels, and marsh ponds	• South Bay Geomorphic Assessment (estimates of salt marsh establishment, empirical analyses of channel, pond, and pan formation based on previous restoration efforts and historical information) • Hydrodynamic Modeling (Bay and mudflat habitat exterior to ponds)
5. Enhance harbor seal habitat for foraging and isolated haul-out areas	• Area of new isolated, large/deep tidal channels adjacent to marsh plain	• South Bay Geomorphic Assessment (empirical analyses of large channel formation based on previous restoration efforts and historical information)

Table E1. Evaluation Criteria and Metrics **(cont.)**

FLOOD MANAGEMENT		
Objective 2. Maintain or improve existing levels of flood protection in the South Bay area.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Maintain***** or improve levels of coastal flood protection in the project area [1]	• Area removed from the coastal floodplain	• Coastal Flood Analyses • Hydrodynamic Modeling (water levels)
2. Maintain***** or improve levels of fluvial flood protection in the project area [1,2]	• Volume of channel enlargement • Length of levee lowered and/or removed	• Fluvial Flood Modeling • Hydraulic Geometry Analyses • Hydrodynamic Modeling (water levels relevant to local drainage)

[1] in areas where flooding is not desirable based on land use
[2] include consideration of sediment deposition and erosion effects on water levels and flood protection facilities (such as levees)
***** EXCLUSION CRITERION, i.e. <u>must</u> be met by alternative during all project phases to carry forward and receive further consideration

Table E1. Evaluation Criteria and Metrics **(cont.)**

PUBLIC ACCESS & RECREATION		
Objective 3. Provide public access and recreational opportunities compatible with wildlife and habitat goals.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Improve public access and recreation in the project area	• Miles of levee trails located within project area • Miles of tidal trails located within project area • Miles of marsh and slough channels • Number of compatible public access and recreation opportunities consistent with DFG and USFWS missions and other relevant agency plans, policies and regulatory requirements. • Number of opportunities for multi-agency/stakeholder partnering to plan, implement and manage public access and recreation	• Alternatives Design
2. Provide for a variety of uses and user types	• Number of user groups and individuals that can be accommodated. • Number of multi-use access points (trails that meet edge of water) and staging areas with amenities required for a variety of different uses. • Range and diversity of uses provided	• Alternatives Design
3. Enhance opportunity for aesthetic experiences	• Number and quality of user experiences provided (e.g. miles of seaward levee trails, bridge and ROW connections and access to historic features). • Number of opportunities for multi-sensory experiences. (e.g. open water and marsh views, smells of the bay, audibility of wildlife and others) • Number of viewing areas/viewpoints/ scenic overlooks • Number of access points and trails that are close to the open bay	• Alternatives Design
4. Provide regional linkages	• Number of links provided • Number of Bay Trail spine gaps closed and spur and connector trails provided • Gaps closed in the Bay Trail spine and alignments adjacent to restoration area. • Number of links to public transit • Number of opportunities for non-motorized, multi-modal access to and from the project area	• Alternatives Design

Table E1. Evaluation Criteria and Metrics **(cont.)**

WATER & SEDIMENT QUALITY		
Objective 4. Protect or improve existing levels of water and sediment quality in the South Bay, and take into account ecological risks caused by restoration.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Improve levels of water quality for total dissolved solids, metals, dissolved oxygen (surface and ground water)	• Acres of tidal wetlands • Residence time	• South Bay Geomorphic Assessment (estimates of salt marsh establishment) • Hydrodynamic Modeling (residence time and salinity modeling comparing no action and alternatives for some constituents) • Nutrient and Contaminant Analyses • Groundwater Analysis
2. Limit ecological risk associated with mercury methylation and bioaccumulation and mobilization of mercury present in sediments	• Acres of tidal wetlands • Water levels and inundation frequencies in restored areas and managed ponds • Volume of channel enlargement and scour	• South Bay Geomorphic Assessment (estimates of salt marsh establishment) • Hydrodynamic Modeling (water levels, salinity) • Nutrient and Contaminant Analyses • Hydrodynamic Modeling (potential for particle tracking modeling for high concentrations areas, for project-level (e.g., Phase 1) modeling • Hydraulic Geometry Analyses • Fluvial Flood Modeling

Table E1. Evaluation Criteria and Metrics **(cont.)**

NUISANCE SPECIES MANAGEMENT		
Objective 5. Implement design and management measures to maintain or improve current levels of vector management, control predation on special status species, and manage the spread of non-native invasive species.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Minimize colonization of mudflats and marshplain by non-native Spartina and its hybrids	• Area of mudflat and marshplain potentially colonizable by non-native Spartina and its hybrids (assuming that no control measures are found to be feasible)	• South Bay Geomorphic Assessment (estimates of colonizable mudflats and marshplain) • Hydrodynamic Modeling (water levels, salinity) • Invasive *Spartina* Technical Memorandum
2. Maintain or improve the current levels of vector management	• Area of potential mosquito habitat	• Alternatives Design
3. Improve protection from non-native and nuisance predators and reduce need for predator management	• Area of tidal marshes and levees easily accessible by non-native mammalian predators (e.g., cats, dogs, and red foxes)	• South Bay Geomorphic Assessment (estimates of salt marsh establishment) • Alternatives Design
4. Minimize colonization by non-native *Lepidium*	• Area of potentially colonizable brackish marsh and transitional areas	• Hydrodynamic Modeling (salinity modeling) • Alternatives Design (upland transition zone locations)

***** EXCLUSION CRITERION, i.e. <u>must</u> be met by alternative to carry forward and receive further consideration

INFRASTRUCTURE		
Objective 6. Protect the services provided by existing infrastructure (e.g. power lines, railroads, wastewater treatment plants).		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Maintain the services provided by existing infrastructure	• Must not increase risk of failure or service degradation due to physical changes*****	• Hydrodynamic modeling (comparing hydrodynamic changes which affect PG&E towers, outfalls, etc.)
2. Maintain maintenance access for existing infrastructure	• Does not eliminate maintenance access due to physical changes or limitations resulting from habitat improvements.	• Alternatives Design

- EXCLUSION CRITERION, i.e. <u>must</u> be met by alternative to carry forward and receive further consideration

Table E1. Evaluation Criteria and Metrics **(cont.)**

COST EFFECTIVENESS [1]		
Objective 7. Consider costs of implementation, management, and monitoring so that planned activities can be effectively executed with available funding. Form partnerships and alliances to develop and institute a long-term viable funding strategy.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Restoration construction costs	• Dollars	• Cost estimates
2. Long-term restoration operations and maintenance costs	• Dollars, 50-year time frame	• Cost estimates

[1] Not used until suitable information becomes available

ENVIRONMENTAL IMPACT		
Objective 8. Promote environmental benefit and reduce impact in topics other than biology.		
Evaluation Criteria	**Metrics**	**Analysis Method**
1. Preserve cultural resources, including important archaeological and historical sites	• Number of cultural resource sites impacted • Number of opportunities for interpretation and education	• NEPA/CEQA Impact assessment
2. Provide public services to accommodate projected demand	• Number of law enforcement patrols needed • Response times for fire, police and ambulance services	• NEPA/CEQA Impact assessment
3. Promote compatibility with surrounding land plans and uses	• Level of land use compatibility	• NEPA/CEQA Impact assessment
4. Provide safe, convenient access to the project area while managing congestion on nearby streets	• Number of vehicle trips • Number of parking spaces • Number of bicycle lanes • Level of service on nearby roads	• NEPA/CEQA Impact assessment
5. Enhance air quality for proposed and surrounding uses	• Air pollutant levels • Potential for creation of objectionable odors	• NEPA/CEQA Impact assessment
6. Manage noise levels for proposed and surrounding uses	• Decibel levels • Number of noise-generating activities • Distance between noise-generating activities and nearby sensitive receptors	• NEPA/CEQA Impact assessment

APPENDIX F – TECHNICAL RATINGS AND RATIONALE

Insert tables of revised evaluation criteria w/ technical ratings and rationale – these are in the excel spreadsheet Appendix_E_Tech_Ratings.xls – just PDF this file and insert into the final PDF.

Appendix F – Technical Ratings and Rationale

BIOLOGICAL HABITAT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
1A-1	Contribute to the recovery of the South Bay subspecies of the salt marsh harvest mouse*	3	5	8	**No Action:** Increase in tidal salt marsh due to sedimentation of South Bay, restoration of Island Ponds, and some uncontrolled breaching as levees erode. **Alts B-C:** Ranked according to extent of large, connected salt marsh with upland escape cover. Alt B. not ranked as high as for Clapper Rail due to poor connectivity between restored marshes and less upland transitional habitat (which affects the mouse more than the rail) in Alt B.
1A-2	Contribute to the recovery of the California Clapper Rail*	3	5	8	**No Action:** Increase in tidal salt marsh due to sedimentation of South Bay, restoration of Island Ponds, and some uncontrolled breaching as levees erode. **Alts B-C:** Ranked according to extent of large, contiguous salt marsh with dendritic channels.
1A-3	Re-establish populations of specia status plants*	1	4	8	**No Action:** Limited existing habitat, with no expected habitat enhancement. **Alts B-C:** Ranked according to extent of upland ecotone, and possibly beach habitat. **Assumptions:** Active revegetation of special-status plant species and import of fill material to provide an upland transitional zone will occur.

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BIOLOGICAL HABITAT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
1A-4	Contribute to the recovery of the Western Snowy Plover**	4	7	**5**	**No Action:** Uncontrolled breaching and establishment of vegetation in seasonal wetlands expected to reduce habitat (though degree of reduction uncertain). **Alt B:** Enhanced breeding habitat (e.g., islands, furrowed ponds) in reconfigured/enhanced ponds augments salt pan/seasonal wetland habitat. **Alt C:** Reconfigured ponds managed to support high nesting densities (e.g., islands, furrowe ponds), but lacks extent of seasonal pond habitat of Alt. B. **Assumptions/Uncertainties:** Much more active avian predator management will occur under Alts B-C than for No Action. Assumes that creation of numerous islands in reconfigured ponds, and possibly the use of furrowed ponds, in Alts B and C will support hi densities of nesting plovers; an uncertain assumption that will be tested through adaptive management experiments.
1A-5	Enhance habitat for anadromous special-status fish (salmon and steelhead)*	2	5	9	**No Action:** Increase in tidal salt marsh from sedimentation of South Bay, restoration of Island Ponds, and some uncontrolled breaching as levees erode. **Alts B-C:** Ranked according to extent of tidal restoration along major sloughs with existing or potential spawning. Alt C ranks "9" (rather than "8") because the incremental increase in benefits to anadromous fish that would be gained by restoring the final 10% of managed ponds in Alt C would be fairly low since these ponds are not located along major sloughs. Thus, the 90:10 alternative comes very close to maximizing benefits of restoration to anadromous fish.

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BIOLOGICAL HABITAT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
1B-1	Maintain or increase current populations of some or all bird species breeding at the salt ponds**	3	7	5	**No Action:** Erosion of nesting islands, uncontrolled breaches, and invasion of seasonal wetlands by vegetation will reduce nesting habitat. **Alt B:** Enhanced breeding habitat (e.g., islands, furrowed ponds) in reconfigured/enhanced ponds augments salt pan/seasonal wetland habitat in ponds. **Alt C:** Reconfigured ponds managed to support high nesting densities (e.g., islands, furrowe ponds), but lacks extent of seasonal/managed pond habitat of Alt. B. **Assumptions:** Because Snowy Plover and California Gull are addressed elsewhere, this criterion focuses on terns, stilts, and avocets. Assumes much more active avian predator management under Alts B-C than for No Action.
1B-2	Maintain habitat for salt pond specialized birds (e.g., Wilson's Phalaropes)**	4	4	**2**	**No Action:** Reduction in habitat due to breaching and vegetation establishment in unmanaged seasonal wetlands. **Alts B-C:** Ranked according to extent of high-salinity managed ponds, with concurrent slig increase in salt pan habitat in restored marshes. **Uncertainties:** Although a decline in species such as phalaropes and Bonaparte's gulls is predicted as high-salinity pond habitat declines, the extent of these species' use of less saline managed ponds is unknown, and will be determined by monitoring.

Appendix F – Technical Ratings and Rationale

BIOLOGICAL HABITAT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
1B-3	Maintain current population levels for foraging shorebirds**	4	**4**	**3**	**No Action:** Decrease in suitable foraging habitat (mudflats, pans and ponds within marshes, and managed pond areas) due to reduction in bay mudflats and increased vegetation in seasonal wetlands. **Alts B-C:** Because the long-term extent of intertidal mudflat will differ little between alternatives, ranked according to extent of shallow-water foraging habitat in managed ponds and marsh ponds. **Assumptions/Uncertainties:** Assumes that high-tide roosting habitat is not limiting. Uncertainties are: (1) the extent to which various shorebird species require ponds for foraging; (2) the degree to which marsh restoration will increase productivity of, and shorebird foraging conditions on, mudflats, reducing the need for foraging in ponds; (3) the magnitude of the increase in shorebird densities that can be achieved through pond management; and (4) the extent of shallow-water habitat that can be maintained at any given time within managed ponds.
1C-1, 1C-3	Maintain or enhance populations of intertidal invertebrates and larger shorebirds that forage almost exclusively on intertidal mudflats**	4	5	5	**No Action:** Slight decrease in intertidal mudflats; uncontrolled breaching likely to provide little in the way of new mudflat along larger sloughs, as breaches will not necessarily occur at optimal locations. **Alts B-C:** Slight decrease in intertidal mudflats offset somewhat by new mudflats within restored tidal marshes and along larger restored channels. **Assumptions/Issues:** Assumes that high-tide roosting habitat is not limiting. Marsh restoration is expected to increase productivity of, and thus possibly shorebird foraging conditions on, mudflats, but the degree to which shorebirds will benefit is unknown.

Appendix F – Technical Ratings and Rationale

BIOLOGICAL HABITAT					
Criteria Number	Evaluation Criteria	Response to Criteria			Rationale
		Alternative A (No Action)	Alternative B (50:50)	Alternative C (90:10)	
1C-2	Enhance South Bay fish populations**	4	6	8	**No Action:** Slight decrease in intertidal mudflats; uncontrolled breaching likely to provide little in the way of complex channel networks, as breaches will not necessarily occur at optimal locations. **Alts B-C:** Increasing extent of tidal channel nursery/foraging habitat and increasing productivity of intertidal mudflats.
1C-4A	Maintain or enhance the populations of diving ducks currently using the Bay**	**4**	**4**	**3**	**No Action:** Increase in subtidal habitat in bay more than offset by uncontrolled breaching and conversion of some managed ponds to seasonal wetlands. **Alts B-C:** Ranked according to extent of open water 1-6 m deep. Reduction in foraging habitat in ponds due to restoration offset somewhat by increase in subtidal habitat in bay and at mouths of larger restored channels **Uncertainties/assumptions:** The increase in subtidal habitat under No Action is uncertain. The degree to which a reduction in habitat in ponds will be offset by increases in habitat in t bay and in restored sloughs is unknown, and the ratings for Alts B and C may be too low.
1C-4B	Maintain or enhance the populations of dabbling ducks currently using the Bay**	6	7	8	**No Action:** Slight increase in tidal salt marsh due to sedimentation of South Bay, restoration of Island Ponds, and uncontrolled breaching, and increase in vegetated seasonal wetlands. **Alts B-C:** Ranked according to extent of suitable foraging habitat (edge habitat between vegetated marsh and mudflat/open water). May be rated somewhat higher for most species.
1C-5	Enhance harbor seal habitat for foraging and isolated haul-out areas**	5	6	8	**No Action:** Slight increase in tidal salt marsh due to sedimentation of South Bay, restoration of Island Ponds, and uncontrolled breaching offset by loss of intertidal mudflats. **Alts B-C:** Ranked according to number, extent, and dispersion of large tidal sloughs in restored marshes for foraging and haul-out locations.

Appendix F – Technical Ratings and Rationale

FLOOD MANAGEMENT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
2-1	Maintain or improve levels of **coastal** flood protection in the project area	2	9	9	**No Action**: Coastal flooding worsens as levees deteriorate and sea level rises. **Alternatives B-C**: New levees provide coastal flood protection. **Assumptions**: For No Action, levee breaches will be repaired for those levees that provide flood protection, but levees will fail with increasing frequency.
2-2	Maintain or improve levels of **fluvial** flood protection in the project area	3	7	9	**No Action**: Fluvial flooding worsens as channel siltation continues and sea level rises. **Alternative B**: Benefits from channel scour at the mouths of creeks and from levee lowering **Alternative C**: Similar to Alternative B, but with greater benefits from increased channel scour and levee lowering. **Assumptions:** For No Action, assume only Pond A8 provides measureable offline flood storage. Assume that channel siltation continues in response to past modifications (diking, dredging, and groundwater pumping). For Alternatives B and C, assume channel scour in response to increased tidal prism. The exact amount of channel scour may vary, though in all cases flood performance be at least as good or better than existing conditions. Assume selected levee lowering for flood benefits.

Appendix F – Technical Ratings and Rationale

PUBLIC ACCESS AND RECREATION					
Criteria Number	Evaluation Criteria	Response to Criteria			Rationale
		Alternative A (No Action)	Alternative B (50:50)	Alternative C (90:10)	
3-1a	Improve land-based public access and recreation	3	9	8	**No Action:** Some possible levee failures could deteriorate existing trails at Ravenswood and Alviso, decreasing land-based access. **Alts B-C:** Ranked according to miles of existing trails utilizing managed pond levees that would remain in Alt B and a reduced amount with tidal restoration. Both alternatives would complete the Bay Trail spine.
3-1b	Improve water-based public access and recreation	4	7	9	**No Action:** Some additional sitlation may occur, further reducing access to sloughs for boating. **Alts B-C:** Ranked according to addtional opportunities for water access with tidal restoration, however even Alternative B would improve water access.
3-2	Provide for a variety of uses and user types	4	5	8	**No Action:** Operations and maintenance budgets may be used to maintain some levees for flood control but unlikely funding for all trail and public access operations, resulting in reduced amount of users accommodated. (Some areas may need to be closed). **Alts B-C:** Ranked according to increased opportunities for a diversity of recreational uses and visitors.
3-3	Enhance opportunity for aesthetic experiences	3	8	9	**No Action:** Some levee deterioration would prevent access to certain exisitng trails that currently provide access to the shoreline, reducing the quality of the visitor experience. Also, deterioration reduces visual appearance in some places. **Alts B-C:** Ranked according to the changing visitor experience as tidal resotration increases. The landscape views and experience will appear less "engineered" within a more naturalistic setting. Large expansive tidal marsh areas with some managed ponds will provide more visual diversity. (A less "homogenized" landscape).

Appendix F – Technical Ratings and Rationale

PUBLIC ACCESS AND RECREATION					
Criteria Number	Evaluation Criteria	Response to Criteria			Rationale
		Alternative A (No Action)	Alternative B (50:50)	Alternative C (90:10)	
3-4	Provide regional linkages	5	9	9	**No Action:** No real change from existing conditions. **Alts B-C:** Ranked accoriding to closing gaps in the Bay Trail spine and augmenting connections and visitor enhancements to existing facilities and access along hte South Bay.

Appendix F – Technical Ratings and Rationale

WATER & SEDIMENT QUALITY					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
4-1	Improve levels of water quality fo total dissolved solids, metals, dissolved oxygen (surface and ground water)	4	7	8	**No Action:** Limited ability to manage flows in ponds. DO levels will continue to be diurnally depressed because of flow management limitations. **Alt B:** Pond design and water management will allow for more flexibility in pond operations and the ability to manage flows to improve water quality. Low DO events reduced relative to No Action. **Alt C:** Wetlands will remove solids. Mature wetland vegetation will take up and store nutrients. Low DO events reduced relative to Alt B. Metals adsorbed to sediments/solids will be deposited in wetlands improving surface water quality.
4-2	Limit ecological risk associated with mercury methylation and bioaccumulation and mobilization of mercury present in sediments	**5**	**8**		**No Action:** Low DO levels will increase methylation potential. Limited ability to manage flows to increase DO levels. Mobilization of sediments initially limited but will increase as operations and maintenance of ponds decrease. **Alt B:** Increased ability to manage flows to reduce methylation. Pond design and flow management will limit exposure and risk. Mobilization of sediments from year 0 to Year 50 higher relative to No Action because of increase in tidal wetlands. **Alt C:** Higher probability of mobilizing mercury present in sediments from Year 0 to Year 50. Draining of pore water in tidal habitats increases potential for mobilization and bioaccumulation of methylmercury. Design may be able to limit pore water effects. **Uncertainties:** Cost of implementing mercury management design features may not be compatible with owner financial constraints. Mercury management design features may conflict with other resource management objectives e.g., tidal habitat flow regime.

Appendix F – Technical Ratings and Rationale

NUISANCE SPECIES MANAGEMENT					
Criteria Number	**Evaluation Criteria**	**Response to Criteria**			**Rationale**
		Alternative A (No Action)	**Alternative B (50:50)**	**Alternative C (90:10)**	
5-1	Minimize colonization of mudflats and marshplain by non-native Spartina and its hybrids	**6**	**6**	**6**	**All Alternatives:** Assume that invasive Spartina will be controlled by the Invasive Spartina Project prior to SBSP restoration. **Uncertainty:** The effectiveness of the Invasive Spartina Project is unknown.
5-2	Maintain or improve the current levels of vector management	2	3	4	**No Action:** Significant increase in need for management due to increase in vegetated seasonal wetlands and potential for poor drainage in tidal areas created by unplanned breaches. **Alts B-C:** Anticipate some increase in need for management with tidal restoration, but more in low-salinity managed (especially seasonal) ponds. **Assumption:** Mosquito control will be a management issue, and thus all alternatives will have the same level of control (though the cost of control will vary somewhat among alternatives depending on the need for management).
5-3	Improve protection from non-native and nuisance predators and reduce need for predator management	5	5	3	**No Action:** Some management of mammalian and avian predators expected. Management assumed to be funded at a lower level, but also less necessary, than for Alts B and C. **Alts B-C:** Assume more funding for predator management than for No Action alt. Need for mammalian predator management will decrease (due to a reduction in predator access to restored marshes after levees are breached), but need for avian predator management will increase (due to concentration of nesting shorebirds and terns into fewer ponds), as the ratio restored marsh to managed pond increases. Avian predator management may be more labor-intensive than mammalian, resulting in decreasing ratings as tidal restoration increases. **Assumption:** The reduced need for mammalian predator management as tidal restoration increases will likely be more than exceeded by the increase in the need for avian predator management. However, the level of management is expected to increase as the need increases, so that predators will be effectively managed under Alts. B and C even though the rating (which is based on the **need** for management) declines.

Appendix F – Technical Ratings and Rationale

NUISANCE SPECIES MANAGEMENT					
Criteria Number	Evaluation Criteria	Response to Criteria			Rationale
		Alternative A (No Action)	Alternative B (50:50)	Alternative C (90:10)	
5-4	Minimize colonization by non-native Lepidium	4	5	6	**No Action:** Ranked 4 (not 5) because Island Ponds may be invaded by Lepidium, and brackish marsh may expand as tidal prism decreases due to sedimentation of South Bay. **Alts B-C:** Ranked primarily according to (1) the percent of tidal marsh that is brackish (vs. salt marsh), which will decrease as tidal restoration increases (due both to restoration of mar in currently saline areas and increased tidal prism); and (2) the extent of upland transitional habitat, which will increase with tidal restoration.

*   Baseline ISP Conditions = 1   (tidal marsh dependant endangered or special-status species)
** Baseline ISP Conditions = 5
All Alternatives Rated at Year 50
Numbers highlighted in gray are particularly uncertain