TO: Members of the South Bay Salt Pond Restoration Project Management Team

FROM: Philip Williams & Associates, Ltd. and the PWA Team

DATE: September 14, 2004 *(revised October 21, 2004)*

RE: **Initial Restoration Options Memorandum**

1. INTRODUCTION

This document presents the preliminary pond complex options, integrating habitat restoration, flood management, and public access. The options were developed by applying a set of criteria, referred to as 'considerations', to the project area. The considerations take into account the project objectives, evaluation criteria, and guiding principles, as well as opportunities and constraints (Philip Williams & Associates Ltd. and others 2004b) and conceptual models of habitat restoration (*in progress*). The Alternatives Development Framework (ADF) lists the project objectives and evaluation criteria and describes how the options fit within the overall alternatives development process (Philip Williams & Associates Ltd. and others 2004a).

2. OVERVIEW OF PRELIMINARY OPTIONS

The four options that have been developed consist of:

Option 0. No Action / Initial Stewardship Plan (ISP)
Option 1. Managed Pond Emphasis
Option 2. Mix of Tidal and Managed Ponds
Option 3. Tidal Emphasis

The preliminary options were developed with input from the Project Management Team and the consultant team, and were refined based on input from the public and the Science Team. The preliminary options are intended to explore a range of possibilities and should be considered very flexible. Since the No Action / ISP option has already been described in the ADF, this document focuses on the "with project" options.

The options vary in the relative extents of tidal and managed pond habitat, with the exception of the No Action option, in order to accommodate key uncertainties such as sediment availability and the importance of managed pond habitat in relationship to tidal flats, marshes, and bird use in the South Bay. Uncertainties about sediment availability affect our ability to know where and to what extent tidal marsh can be restored, as well as how much existing and created mudflats there will be following project

implementation. Uncertainties about bird use affect our ability to know the extent of managed pond, mudflat, tidal marsh, and bay habitat required to maintain current migratory bird species that use the South Bay.

All of the options are expected to satisfy the project objectives for flood management, and public access and recreation. The options also attempt to satisfy the project objectives for biological habitat, but each option places more emphasis on one objective relative to another. Option 1 provides more managed pond habitat, reducing the extent of tidal restoration, and placing more emphasis on project objective 1B ("Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees"). Species that nest on islands and levees associated with managed ponds, such as the Snowy Plover, American Avocet, Black-necked Stilt, terns, and birds such as the Eared Grebe and phalaropes, will benefit most from this option. Other shorebirds, waterfowl, and piscivorous birds that utilize managed ponds, particularly as high-tide roosting and foraging habitat, will also benefit from this option. However, Option 1 may impede the creation of large expanses of tidal marsh with high-order channels, and thus could potentially reduce the habitat diversity associated with large restored tidal habitats. The tradeoff between the benefits of large managed pond areas versus extensive restored tidal habitat for species that use both habitat types makes it difficult to predict the extent to which such species will actually require larger managed pond areas.

Option 3 places more emphasis on tidal restoration while providing more limited managed pond habitat, therefore it favors tidal-associated species over species that depend more on managed ponds. Option 3 highlights the habitat value for species dependent on tidal marsh, marsh ecotone, and subtidal habitats, thus emphasizing project objectives 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") and 1C ("Support increased abundance and diversity of native species in various South San Francisco Bay aquatic and terrestrial ecosystem components"). This option would provide the most benefit for marsh-dependent species such as the salt marsh harvest mouse and California Clapper Rail, and special-status plants occurring in upland transitional zones and moist grassland habitats, estuarine fish (including special-status anadromous fish), harbor seals, and intertidal invertebrates. The tidal emphasis option would also benefit a number of waterbird species (including many that also use managed ponds) by providing important nesting and foraging habitat for waterfowl, foraging habitat (and enhanced prey populations) for piscivorous birds, and crucial intertidal foraging habitat (and enhanced invertebrate prey populations) for shorebirds.

The mix of tidal and managed ponds option (Option 2) attempts to achieve more of a balance between tidal restoration and managed ponds, thus addressing all three of the detailed objectives in project objective 1 in a more balanced manner than Options 1 or 3. Option 2 would provide less habitat value for species that are dependent largely on tidal habitats than Option 3, and less habitat value for species that are dependent largely on managed ponds than Option 1.

All the options assume that managed ponds will be graded and managed to significantly enhance foraging, roosting, and nesting opportunities for shorebirds, waterfowl, and other waterbirds. Pond

management will be at a level sufficient to meet target ponding depths and deter vegetation establishment. This level is comparable to ongoing management levels at other wildlife refuge areas in the state.

Note that tidal and managed pond habitat are referred to in a broad sense; each of the two categories include important sub-habitat types. Tidal habitat includes tidal marsh and tidal mudflat, as well as marsh ecotone, tidal channel, salt pan, and slough habitats. Managed pond habitat includes deep and shallow ponds, moderate salinity ponds (close to bay water) and high salinity brine ponds, and associated levees and islands.

Options 1, 2, and 3 were developed for each pond complex. For example, Eden Landing Options 1, 2, and 3 correspond with the three different habitat mixes. Combining options, or variations thereof, from each pond complex could form the preliminary project alternatives. For example, Alternative 1 could consist of Eden Landing Option 3, Alviso Option 2, and Ravenswood Option 1.

Within a given option, the relative mixes of tidal and managed pond habitat vary between pond complexes. There is more emphasis on tidal habitat at Eden Landing and Ravenswood and more emphasis on managed ponds at Alviso. This is a result of applying the considerations described below. For example, while a limited number of managed ponds may be included under Eden Landing and Ravenswood Option 3, the overall mix of tidal habitat and managed ponds could be more balanced at the landscape level, particularly considering that extensive Refuge and Cargill lands will remain as managed salt ponds in the foreseeable future.

3. CONSIDERATIONS

The preliminary options considerations are a set of criteria that help guide where specific design elements (*e.g.*, tidal habitat, managed pond habitat, flood management, and public access/recreation) should be located within the landscape. This section describes the considerations for flood management, tidal restoration, managed pond restoration, and recreation and public access. The considerations were developed with input from the Project Management Team and the consultant team, and were refined with input from the public and the Science Team.

The considerations provide guidance, but do not dictate the answer. It is not unusual, and in fact expected, that individual considerations will conflict. For example, the consideration for enhancing moist grasslands would have Pond A22 restored as moist grasslands, while the consideration for creating high marsh/upland transitions would have the same pond restored to tidal marsh, and the consideration for recovering snowy plovers may have the site managed for salt pan habitat. The different options represent trade-offs between the application of the considerations, with each option placing a different emphasis on specific considerations. Application of the considerations to the project area and the resulting options are described further in Section 4.

3.1 Flood Management

- **Improve flood management at the mouths of major creeks that currently experience flooding or are otherwise undersized.** These locations are: Alameda Flood Control Channel, Old Alameda Creek, Stevens Creek, Permanente Creek, Sunnyvale West and East Channels, Guadalupe Slough, and Alviso Slough (Guadalupe Creek). It is assumed that Coyote Creek has adequate flood protection. Although Alviso Slough also has adequate flood protection, it is considered advantageous to encourage channel scour and enlargement to increase conveyance.
- **Integrate with existing flood protection**. Planning and placement of the flood protection levees will take into consideration existing lines of flood protection. Where feasible, proposed levees will be integrated into the existing levee alignment.
- **Locate levees for improved coastal flood protection.** At this time, it is assumed that the flood control levee alignments will be decided largely through engineering feasibility assessment rather than through the options development process. Coastal flood control levees may be located along the landward edge of the project site or bayward of managed ponds. Levees may consist of one large levee or two moderately-sized levees in parallel, allowing for controlled overtopping of the bayward levee. At some locations the levee alignment is likely to be outside the SBSP boundary. Options may be developed to account for different levee alignments later in options development.

3.2 Tidal Habitat

- **Create a tidal marsh corridor.** Creation of a continuous band of tidal marsh along the Bay will provide connectivity of habitat for salt marsh dependent species, particularly the salt marsh harvest mouse (high marsh habitat).
- **Create broad upland transitional areas.** It is a high priority to conduct tidal restoration in areas where there are opportunities to create a natural transition from marsh to upland habitat. Upland transition will also be created along levees by constructing broad, gently sloping outboard levee sides.
- **Restore tidal action to high elevation ponds.** Ponds that are only slightly subsided – with pond bottoms above approximately mean tide level – can be more quickly and easily restored to tidal marsh than more subsided ponds, providing habitat rapidly for marsh dependent species. This does not mean that only slightly subsided ponds 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.
- **Restore tidal marshes adjacent to anadromous fish migration corridors.** In addition to helping create habitat for anadromous fish (evaluation criterion 1A5), this consideration also benefits harbor seals (1C5) by enlarging and deepening the major sloughs and complements the flood management design considerations above.
- **Reconnect historic tidal channels with extensive intact drainage systems** to rapidly establish multi-order channel systems. Figure 1 depicts an example of the historic tidal channels in the Alviso pond complex.
- **Create large marsh systems where possible** to sustain complex/high-order drainages, isolate broad areas from human disturbance and predator access, and support larger populations of salt marsh

harvest mice in case connectivity is interrupted by future marsh loss due to a sediment deficit or sea level rise.

- **Incorporate unmanaged ponds and salt pans** within the upper portions of restored tidal marsh in some areas to benefit waterbirds and mimic historical marsh conditions.

3.3 Managed Pond Habitat

- **Preserve and enhance managed ponds near interpretive opportunities** for the historic salt works.
- **Consider moderately subsided ponds with bottoms near mean tide elevations as candidates for managed ponds.** These ponds are the least expensive to manage because flow in and out of the pond can be accomplished by gravity drainage. No/minimal pumping is required.
- **Create managed pond habitat in accessible areas.** Locating managed ponds landward of the restored tidal habitat and grouping managed ponds together generally provides the easiest operations and maintenance access.
- **Widely disperse ponds that are to be managed for breeding habitat**, in order to reduce predation and competition between colonies.
- **Restore managed ponds in areas with relatively less adjacent managed pond habitat** to provide a more even distribution of pond habitat (see Figure 3 for adjacent habitats).

It is assumed that the location of managed ponds is flexible, as management actions will attract birds rapidly to new locations. The response of birds to ISP implementation shows evidence of this phenomenon. It is also assumed that islands for bird nesting and roosting, and levees to divide ponds into units that can be managed for different habitat conditions, will be created, and that ponds, islands, and levees will be managed actively to provide the desired habitat conditions.

Note that "Crop rotation" is recommended to reduce predation. The ability to control/alter depth in managed ponds from year to year would enable movement of habitat from one area to another for various types of birds. For example, one year the area could be managed for snowy plovers, the next for shorebirds, or waterfowl. This could greatly help to address the avian predation issue, given that predators can be very destructive once they "lock in" on bird species in certain areas. This is an operation and maintenance consideration rather than a design consideration as it does not guide where managed ponds are located.

3.4 RECREATION AND Public Access

Alignments for public access and recreation can be interchanged between the options, except for a few locations that are based on the specific restoration option (e.g., maintaining an existing trail where ponds exist now may not be possible if the area becomes tidal, and trails that coincide with a proposed levee location). Public access and recreation within each option provide a mixture of possibilities for different and high quality visitor experiences.

Definitions (Corresponding with map legend)

- Existing Trail: Bay trail and other trails that exist within and adjacent to the project area.
- Levee Trail: A trail that will be designed to be part of the managed pond levees or flood protection levees.
- Tidal Trail: A trail that will need to be designed to tolerate or withstand tidal flow or will be located on high ground adjacent to tidal areas.
- Feature or Point of Interest: These include historic and cultural features as well as other locations that provide good views.

- **Provide options to cluster access and associated facilities to reduce habitat encroachment.**
- **Allow for a range of options to complete the Bay Trail** (e.g., inboard levee trail, rail corridor right of way).
- **Provide public access such as trails and staging areas that can be integrated with historic and cultural features** or other points of interest to allow for interpretive and educational components.
- **Integrate public access (trails) with flood control structures (levees) where appropriate**, to reduce the creation of separate trail corridors.

3.5 Other/Notes

The following considerations are split into common design features and assumptions. Common design features that will be in all options are:

- **Levee lowering to create high marsh habitat**, where possible.
- **Split ponds.** The design does not need to be limited by the existing pond locations. Old levees can be removed or new levees constructed.
- **Retain certain levees as wave breaks to promote sedimentation.**

Major assumptions associated with the options are:

- **Assume flexibility for adjusting managed pond vs. tidal habitat as needed for flood management** once detailed studies are complete.
- **Assume no relocation of major infrastructure such as the railroad and PG&E substation.** Assumes that PG&E towers can be raised or improved as needed and that maintenance access to the power towers and lines can be accomplished via appropriate permit conditions, and will not dictate the type of habitat that can be restored.
- **Assume outboard levees will be maintained until tidal marsh corridor develops.**

4. DISCUSSION OF PRELIMINARY OPTIONS

When applying the considerations to the pond complexes, the considerations for improving fluvial flood protection were applied first, while simultaneously seeking opportunities to meet habitat-related considerations as well. Next, the considerations for tidal and managed pond restoration were applied, followed by the considerations for public access and recreation. Alternate levee alignments for coastal flood protection are still in initial development and do not currently vary significantly between options.

Note that the opportunities for simultaneously improving fluvial flooding and meeting habitat-related considerations strongly favored tidal restoration at the mouths of each of the major creeks.

4.1 Landscape Scale

At the landscape scale, the options emphasize tidal habitat at Eden Landing and Ravenswood and emphasize a higher proportion of managed ponds at Alviso. This is largely a result of relative pond bottom elevations. The Eden Landing and Ravenswood ponds are only slightly subsided and are most favorable for tidal restoration. In addition, the Eden Landing ponds are seen as a unique opportunity for restoration of chenier ridge (tidal) habitat, which provides pocket sand beaches good for native plants and naturally sustaining tidal pans for shorebirds. The Alviso ponds are the most subsided. Some Alviso ponds are at favorable elevations for management while others are more deeply subsided, making them difficult to restore to either tidal or managed pond habitat. For the most subsided ponds, the habitat choices were guided by considerations other than pond elevations.

Adjacent land use plays into the landscape distribution of habitats. Eden Landing is adjacent to large areas of existing managed pond habitat and salt production ponds (the remaining Cargill ponds), which are balanced by emphasizing tidal restoration in this area. The Alviso complex is also next to large areas of salt production ponds, but is targeted for a relatively high proportion of managed ponds because of greater freshwater inflows (from the treatment plant and local creeks) in this area. The greater influence of freshwater flows in the eastern part of the Alviso complex means that tidal restoration would result in fresh and brackish marshes, which satisfy fewer of the project objectives than does salt marsh.

4.2 Pond Complex options

Figures 3 through 14 show the preliminary options for each pond complex. Each figure is annotated with notes identifying which considerations have been applied to each area. The notes in bold face denote considerations that are unique to the given option, while the remaining notes denote features that are common among the three pond complex options. The options provide recommendations for habitat restoration within the SBSP property boundary as well as at Moffett Field and Pond A4, consistent with the request of the property owners.

5. LIST OF FIGURES

6. REFERENCES

Philip Williams & Associates Ltd., H.T. Harvey & Associates, EDAW, Brown and Caldwell. 2004a. Alternatives Development Framework, Public Draft, South Bay Salt Pond Restoration Project. San Francisco, CA.: Prepared for: California State Coastal Conservancy, U.S. Fish and Wildlife Service, California Department of Fish and Game.

Philip Williams & Associates Ltd., H.T. Harvey & Associates, EDAW, Brown and Caldwell. 2004b. Initial Opportunities and Constraints Summary Report, South Bay Salt Pond Restoration Project. 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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