Alternatives Development Framework

Public Draft

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California State Coastal Conservancy
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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

The South Bay Salt Pond Restoration Project presents a significant challenge for alternatives formulation and evaluation because alternatives can be formulated at many distinct scales – from the South Bay landscape to sets of individual ponds with nearly infinite possibilities for creating and varying alternatives. This document provides a methodology to systematically identify, evaluate and contrast alternatives, facilitate consideration of a range of reasonable alternatives, and provide a defensible basis for selection of the preferred project alternative.

The methodology was developed and refined with input from the Project Management Team (PMT), the Regulatory and Trustee Agency Group, the Science Team, the Stakeholder Forum, and the Stakeholder Work Groups. The methodology presented is intended to be a flexible tool and, as such, is a work in progress and may be refined as it is applied**.**

The methodology uses the project objectives as key building blocks for alternatives formulation and evaluation. These objectives will form the basis and guide for decision-making at all scales. To make the project objectives implementable, the methodology includes specific detailed objectives under each of the six key objectives. For each detailed objective, the methodology identifies one or more evaluation criteria. Each alternative is measured against the criteria in terms of the degree of success in meeting the objective.

The first step in developing the alternatives is to evaluate and integrate projected landscape scale changes over the 50-year planning horizon. This step will take into account the anticipated effects of sea level rise, changes in sediment budget, and the impacts of tidal restoration itself on the evolution of habitat and bird use throughout the South Bay. The initial task will be to evaluate a range of landscape scale restoration scenarios that range from no action to full tidal restoration. The analysis of the rate and extent of habitat change and bird use response will inform the selection of a preferred landscape scenario that will help define more detailed alternatives. The preferred landscape scenario will address the tradeoff between managed ponds and tidal restoration, net changes in intertidal mudflats, net changes in bird use and preferred locations for tidal restoration within the South Bay to minimize impacts and maximize benefits. Early selection of a preferred landscape scenario will significantly streamline the alternatives development and evaluation process by establishing the target mix of habitats and associated bird use that the project is intended to accomplish at different times within the planning horizon. The preferred landscape scenario can then be compared to the impact of the “No Project” landscape scenario that would also be carried forward and developed into an alternative at the pond cluster scale.

Each alternative will be rated for how well it meets the detailed objectives on a nine-point scale from low to high. It is entirely possible – and highly likely – that the selection process will include varying the relative importance of selected detailed objectives and studying the results. The point scoring will not dictate the final project alternative, but will rather provide insight and understanding for informed decision-making.

Finally, the proposed Phase 1 action will be selected based on a separate set of criteria that will be developed further along in the alternatives development process. Phase 1 will be the first of several phases in a sequential list of restoration actions, and will include a specified set of ponds for tidal restoration and improved managed pond habitat. Other phases will be implemented in the future until restoration is complete.

2. GLOSSARY

This section defines some of the terminology presented in this report.

alternative	An aggregation of a set of options by pond cluster for an entire pond complex; to be used as the basis for the NEPA/ CEQA definition of alternatives.
detailed objective	Specific descriptive objectives that make the project objectives usable for formulating and evaluating alternatives.
evaluation criteria	Measurable criteria that can be used to rate how well an alternative is expected to achieve the detailed objective.
evaluation factor	Additions to the project objectives that function as objectives in the evaluation process.
final alternative	An alternative that has gone through the ranking and rating process and has been selected to be carried forward into the the Draft Environmental Impact Report/Statement.
landscape scale	South San Francisco Bay, south of the San Bruno Shoal, and the South Bay Salt Pond Restoration Project area.
objectives	The six project objectives developed by the Project Management Team (PMT) with input from the Stakeholder Forum, Science Team, and Regulatory and Trustee Agency Group and adopted on February 18, 2004.
option	A comprehensive, integrated strategy for a given pond cluster.
Phase 1 action	The first phase of implementation for the preferred alternative.
pond cluster	Small groups of ponds organized around major slough systems, either separated by major sloughs from other ponds or grouped around major sloughs.
preferred alternative	The alternative selected from among the final alternatives to be carried forward to implementation.
preliminary alternative	An alternative that has passed the initial screening. Preliminary alternatives will be evaluated using the full suite of detailed objectives and evaluation criteria.
scenario	A preliminary landscape scale restoration strategy.

3. INTRODUCTION

This document provides the Alternatives Development Framework (ADF) for the South Bay Salt Pond Restoration Project. The purpose of the ADF is to provide a methodology to systematically identify, evaluate and contrast alternatives, facilitate consideration of a range of reasonable alternatives, and provide a defensible basis for selection of both the range of alternatives as well as the final project alternative. The ADF builds upon the project objectives (adopted by the Stakeholder Forum on February 18, 2004).

The ADF contains the following sections:

- **Section 4. Project Objectives and Evaluation Factors.** The project objectives and evaluation factors are the building blocks of the alternatives formulation and evaluation framework.
- **Section 5. Detailed Objectives and Evaluation Criteria.** The detailed objectives and evaluation criteria outline in detail the desired project benefits and evaluation metrics for the alternatives.
- **Section 6. Alternatives Formulation and Evaluation Process.** This section describes the overall manner in which alternatives will be identified, assessed, and refined, so that ultimately one final project alternative can be selected. The alternatives formulation and evaluation process is presented graphically in Figure 1. This process considers two project scales: the landscape scale (the South Bay) and the pond cluster scale (groups of ponds).
- **Section 7. Landscape-Scale Restoration Strategies.** This section elaborates on the five landscape scale restoration strategies. Evaluation and selection of a preferred landscape strategy will help define an achievable vision of the project's overall habitat mix.
- **Section 8. Evaluation, Ranking, and Weighting Procedures.** The final step in the ADF process is the evaluation, ranking, and weighting to compare and contrast alternatives.

The ADF was developed with early input and review from the Project Management Team (PMT), the Stakeholder Forum, the Stakeholder Work Groups, the Science Team, and the Regulatory and Trustee Agency Group in meetings in March and April. The ADF will be further refined after public review.

The methodology presented in the ADF is intended to be a flexible tool and, as such, is a work in progress. The detailed objectives, evaluation criteria, and methods may be refined as they are applied.

4. PROJECT OBJECTIVES AND EVALUATION FACTORS

The Alternatives Development Framework uses the project objectives as key building blocks for alternatives formulation and evaluation. These objectives will form the basis for decision-making during alternatives development.

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

1. Create, restore, or enhance habitats of sufficient size, function, and appropriate structure to:
    a. Promote restoration of native special-status plans 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).

Since the set of objectives needs to provide a complete basis for alternatives formulation and evaluation, the methodology includes two additional evaluation factors that function as objectives in the evaluation process and comparative analysis:

7. Cost Effectiveness: Consider costs of implementation, management, and monitoring so that planned activities can be effectively executed with available funding.
8. Environmental Impact: Promote environmental benefit and reduce impact in topics other than biology.

It is important that these evaluation factors are considered throughout the alternatives screening process, not after the fact. Although formal environmental impact analysis will be not be conducted until the final project alternatives are identified, including these factors during the screening process will ensure that environmental impacts and restoration costs across alternatives are considered, so that the final project alternatives can be implemented at a reasonable cost and level of environmental benefit/impact.

5. DETAILED OBJECTIVES AND EVALUATION CRITERIA

The project objectives (Section 4) provide broad categories of desired project benefits. To make these broad objectives usable for formulating and evaluating alternatives, each objective is further described in a set of detailed objectives.[1] For each detailed objective, metrics are identified for use in rating how well an alternative achieves the detailed objective. These metrics are called evaluation criteria and provide the basis for selection of the final project alternative.

The detailed objectives and evaluation criteria were developed with input from the PMT, the Regulatory & Trustee Agency Group, the Science Team, the Stakeholder Forum, and several public work group meetings including the Public Access and Recreation Work Group, the Habitat Work Group, and the Flood Management Work Group. The detailed objectives and evaluation criteria have been refined and expanded upon based on comments and insights provided by the various groups, and they may be further refined as they are applied. They are intended to be a flexible tool and, as such, they are a work in progress**.**

Section 5.1 provides an overview of the detailed objectives and evaluation criteria, and presents the detailed objectives and evaluation criteria themselves in Table 1. Section 5.2 provides more detailed discussion of the detailed objectives and evaluation criteria by objective, for example Biological Habitat, Flood Management, etc. The discussion sections also reflect some of the technical and public comments that aided in their development.

5.1 Overview of Detailed Objectives and Evaluation Criteria

The detailed objectives are designed to illustrate specific benefits of project actions. The trade-offs between potentially competing detailed objectives will be addressed during the rating process (see Section 8). For example, a detailed objective may “provide recreation for a variety of uses and user types.” It is not necessary to add “while protecting wildlife.” The alternative’s value to wildlife is considered in other detailed objectives.

Each detailed objective is to assist in distinguishing between alternatives. Therefore, the detailed objectives do not include design details that will be incorporated in all of the alternatives. Examples of design details to be included in all alternatives are: including transition zones between restored tidal marsh and levees, lowering levees where feasible, and conducting operations and maintenance for invasive species.

[1] Since the two additional Evaluation Factors function as Objectives for purposes of alternatives development, the term “Objectives” is used broadly to include the Evaluation Factors.

Evaluation criteria are generally "relative" indicators of performance. Some evaluation criteria, called exclusion criteria, are "absolute" or "fatal flaw" criteria. Exclusion criteria must be met for the alternative to be carried forward for further consideration. Exclusion criteria are noted in Table 1.

The evaluation criteria are to be measurable, or as measurable as possible. For example: area of tidal marsh, habitat area for breeding birds, dollars. Some evaluation criteria identify habitat that has broad benefits beyond those specified in the detailed objective. For example, mudflat habitat benefits shorebirds, but also benefits a variety of fish, invertebrates and waterfowl that use and depend on the mudflats.

The evaluation criteria are not to be confused with project performance criteria. The evaluation criteria are for use in alternatives development only, during the early planning process. Project performance criteria are for post-implementation assessment during monitoring and adaptive management.

Table 1 – Detailed Objectives and Evaluation Criteria

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.	
Detailed Objectives	**Evaluation Criteria**
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
2. Contribute to the recovery of the California Clapper Rail	• Area of broad tidal marshes with suitable channel densities and appropriate vegetation structure. Connectivity of such existing and restored marshes, both within and adjacent to the project area
3. Re-establish populations of special-status plants, amphibians and reptiles	• Area of high marsh/upland transitional zones
4. Contribute to the recovery of the Western Snowy Plovers and California Least Terns	• Area of suitable breeding habitat (salt pan, islands, undisturbed levees) , in combination with appropriate foraging habitat.
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

Table 1 – Detailed Objectives and Evaluation Criteria (cont.)

Objective 1B. Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees.	
Detailed Objectives	**Evaluation Criteria**
1. Maintain 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
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
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

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.	
Detailed Objectives	**Evaluation Criteria**
1. Maintain or enhance the populations of shorebirds currently using intertidal mudflat habitat	• Area of mudflat habitat available in the South Bay through the life of the project
2. Enhance South Bay fish populations	• Area of tidal marsh and tidal channel habitat within marshes, in combination with bay and mudflat habitat
3. Enhance habitat for intertidal invertebrate populations by contributing to the grazing and detrital food webs	• Area of intertidal habitat, including tidal marshes and mudflats
4. Maintain or enhance the populations of near-shore birds including waterfowl, currently using the Bay	• Length of edge habitat (water or mudflat bordering on salt marsh) • Area of mudflat and shallow waters inundated at high tide, and area of shallow water 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
6. Enhance moist grassland habitats	• Areas where moist grasslands could grade into transitional habitats • Length of edge where transitional habitats could grade into moist grasslands

Table 1 – Detailed Objectives and Evaluation Criteria (cont.)

FLOOD MANAGEMENT	
Objective 2. Maintain or improve existing levels of flood protection in the South Bay area.	
Detailed Objectives	**Evaluation Criteria**
1. Maintain existing levels of flood protection in the South Bay area	• No increase in the frequency of occurrence of flood inducing water levels[1, 2, *]
2. Improve levels of flood protection in the South Bay area	• Decrease in frequency of occurrence of flood inducing water levels[1, 2]
3. Remove FEMA identified areas of flood risk from the floodplain	• Area removed from the FEMA floodplain[1]
4. Provide flood protection to Corps standards	• Area afforded flood protection to Corps standards.
5. Manage sediment processes to maintain beneficial uses while minimizing adverse effects including increased dredging requirements.	• Volume of sediment available to the restored marshes and mudflats • Reduction in dredging requirements for maintenance of flood control.

[1] in areas where flooding is not desirable based on land use

[2] include consideration of sediment deposition and erosion effects on water levels

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

Table 1 – Detailed Objectives and Evaluation Criteria (cont.)

PUBLIC ACCESS & RECREATION	
Objective 3. Provide public access and recreational opportunities compatible with wildlife and habitat goals.	
Detailed Objectives	**Alternatives Evaluation Criteria**
1. Improve public access and recreation in the project area	• 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
2. Provide access and recreation that promotes wildlife-oriented public use and stewardship.	• Number of opportunities for USFWS "priority uses" (wildlife observation, wildlife photography, environmental interpretation, environmental education, hunting, and fishing) • Number of user experiences provided (e.g. access to the water, educational and interpretive opportunities, ability to experience a diversity of habitats)
3. Provide recreation for a variety of uses and user types	• Number of user groups and individuals that can be accommodated • Number of access points and staging areas with amenities required for a variety of different uses • Range and diversity of uses provided
4. Enhance opportunities for linking the project areas to existing public open spaces, trails and adjacent communities	• Number of links provided • Number of Bay Trail spine gaps closed and spur and connector trails provided • Number of links to public transit • Number of opportunities for non-motorized, multi-modal access to and from the project area
5. Enhance opportunity for aesthetic experiences	• 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

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.	
Detailed Objectives	**Evaluation Criteria**
1. Maintain existing levels of water quality (surface and ground water)	• Within the range of background concentrations of key indicator constituents (e.g., mercury, metals, nutrients, algae)*
2. Improve levels of water quality (surface and ground water)	• Below the range of background concentrations of key indicator constituents (e.g., mercury, metals, nutrients, algae)
3. Limit ecological risk associated with mercury methylation and bioaccumulation	• No net increase in mercury or methylmercury loads to the bay • Minimization of methylmercury production and biological uptake
4. Limit mobilization of existing contaminants present in sediments	• Higher concentration sediments stabilized and protected from erosion or transport

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

Table 1 – Detailed Objectives and Evaluation Criteria (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.	
Detailed Objectives	**Evaluation Criteria**
1. Minimize colonization of mudflats and marshplain by non-native *Spartina* and its hybrids	• Area of potentially colonizable mudflat (assuming that no control measures are found to be feasible)
2. Maintain or improve the current levels of vector management	• Increased human disease transmission, due to increased mosquito populations* • Increased area of potential mosquito habitat
3. Improve protection from predators and reduce need for Predator Management	• Area of predator-accessible tidal marshes
4. Minimize colonization by non-native *Lepidium*	• Area of potentially colonizable brackish marsh and transitional areas

***** EXCLUSION CRITERION, i.e. must 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).	
Detailed Objectives	**Evaluation Criteria**
1. Maintain the services provided by existing infrastructure	• Must not increase risk of failure or service degradation due to physical changes*****
2. Maintain maintenance access for existing infrastructure	• Does not eliminate maintenance access due to physical changes or limitations resulting from habitat improvements.

• EXCLUSION CRITERION, i.e. must be met by alternative to carry forward and receive further consideration

Table 1 – Detailed Objectives and Evaluation Criteria (cont.)

COST EFFECTIVENESS	
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.	
Detailed Objectives	**Evaluation Criteria**
1. Manage construction costs to achieve project goals and objectives with available funding	• Dollars
2. Manage long-term operations and maintenance costs	• Dollars, 50-year time frame
3. Manage monitoring costs to support project goals and objectives	• Dollars, 10-year time frame
4. Institute a long-term viable funding strategy	• Assessment of institutional complexity and achievability
5. Increase partnerships and alliances to institute a long-term funding strategy	• Participation by multiple entities (e.g., Corps, SCVWD, and others) in long-term funding
6. Achieve a favorable benefit/cost ratio.	• Calculation of benefit to cost (b/c) ratio, using Corps procedures
7. Limit costs of delay	• Assessment of institutional and legal complexity/controversy

ENVIRONMENTAL IMPACT	
Objective 8. Promote environmental benefit and reduce impact in topics other than biology.	
Detailed Objectives	**Evaluation Criteria**
1. Preserve cultural resources, including important archaeological and historical sites	• Number of cultural resource sites impacted • Number of opportunities for interpretation and education
2. Provide public services to accommodate projected demand	• Number of law enforcement patrols needed • Response times for fire, police and ambulance services
3. Promote compatibility with surrounding land plans and uses	• Level of land use compatibility
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
5. Enhance air quality for proposed and surrounding uses	• Air pollutant levels • Potential for creation of objectionable odors
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

5.2 Discussion of Detailed Objectives and Evaluation Criteria

5.2.1 Biological Habitat

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

The first objective is to create, restore, or enhance habitats of sufficient size, function, and appropriate structure to accomplish three sub-objectives. Therefore, most of the evaluation criteria for the detailed objectives focus on predicting the amounts of habitats that will be created, restored, or enhanced. The approach for each sub-objective is described below.

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.

The five detailed objectives apply to native special-status species that will benefit from tidal restoration or from enhancement of existing managed ponds. The habitats predicted for each alternative will include tidal marshes appropriate for California Clapper Rails, salt marsh harvest mice, steelhead and salmon, and managed areas for Snowy Plover. Species were chosen for which the evolution of habitat could be predicted, so that alternatives could be compared. Suggestions from the Science Team and the public have been incorporated, including the discussions at the Habitat Work Group on the use of specific versus representative species in the detailed objectives.

Many other special status species occur in the South Bay, or could occur with restoration. Other species will benefit from either tidal restoration (e.g. song sparrows) or pond management, but benefits to most of these species are already measured in the evaluation criteria described. In a few other cases, it would be very difficult to predict benefits in a manner that would allow a meaningful comparison of alternatives.

Objective 1B: Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees.

Groups of species were chosen to represent the important functions of the salt ponds and levees for birds, specifically—breeding, foraging, and roosting (or rafting). The evaluation criteria are based on the amount of habitat available for each of these functions. For birds breeding at the salt ponds, and for shorebirds foraging within them, the detailed objectives are to maintain the current population levels for these birds. The area of appropriate habitat is the best measure of our ability to maintain populations. Breeding habitat (islands, levees) will also provide roosting 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.

The six detailed objectives under objective 1C represent the tidal components of bay habitats, specifically intertidal habitats (vegetated marsh and unvegetated mudflats) and subtidal habitats, and the species those habitats support. Terrestrial habitats grading into the upper edges of tidal marshes, or adjoining managed ponds are also represented. As described above, species or groups of species were chosen for which the evolution of habitat could be predicted, so that alternatives could be compared.

5.2.2 Flood Management

Objective 2. Maintain or improve existing levels of flood protection in the South Bay area.

For the first two detailed objectives, restoration alternatives will be evaluated against the existing level of flood protection in the South Bay. Flood protection will be considered in areas within, and adjacent to, the restoration zones. The level of flood protection will be measured by the flood inducing water levels with a specific frequency of occurrence. The selection of occurrence frequency will be based on frequencies used by the respective flood management authority (i.e. Alameda County Flood Control District, Santa Clara Valley Water District, San Mateo County Flood Control District). The water surface elevations will be compared at locations where water levels could result in flooding (e.g., the Bay, slough or channel water level).

For the third and fourth detailed objectives, alternatives will be evaluated on the basis of FEMA and U.S. Army Corps of Engineers (Corps) standards, respectively. FEMA standards are used to delineate floodplains for flood insurance purposes. Corps standards are used to delineate floodplains for projects with Corps partnering. FEMA and the Corps use different methods and assumptions for floodplain delineation. The FEMA process assumes that levees without FEMA certification for flood protection (e.g., the salt pond levees) will fail completely, providing no flood protection. The Corps considers limited flood protection provided by the salt pond levees. The Corps computes an “actual” floodplain, which incorporates the effect of levee overtopping due to high tidal elevations and wave runup. Since these two methods can predict different flood effects, each are considered in separate detailed objectives.

Alternatives will be evaluated on the basis of sediment supply and delivery for the fifth detailed objective. The objective is to manage sediment processes, maintaining beneficial uses to marshes and mudflats while minimizing adverse effects. Criteria for evaluation includes the volume of dredging required for channel maintenance and the volume of sediment available for use in marsh/mudflat building. Objectives for sediment quality are detailed within Objective #4.

Levees and storm drain systems are considered elements of flood management. Therefore, effects to these facilities will be evaluated with the Flood Management criteria rather than the Infrastructure criteria.

Long-term maintenance and monitoring programs will be provided for the flood management facilities. These programs will involve identification of the public agency responsible for each facility and specification of the long-term monitoring programs. Adaptive management strategies will translate monitoring results into facility design improvements.

5.2.3 Public Access & Recreation

Objective 3. Provide public access and recreation opportunities compatible with wildlife and habitat goals.

The public access and recreation objectives include provisions for public use, creating public access, and providing and enhancing recreation opportunities for a variety of uses and user types on project lands. An important consideration for the detailed objectives is that individual recreational uses are not listed. This would require several additional objectives and would pose the risk of not being inclusive of all possible future activities or options. The planning framework is intended to provide objectives that encompass all opportunities for public access and recreation. Furthermore, the detailed objectives are not written to presuppose a particular design solution or ultimate outcome.

The first detailed objective states that the restoration plan will improve recreation and public access in the project area. This encompasses the idea that these lands have not had access prior to this time and public access and recreation will not only be provided, but also improved. The evaluation criteria ensures that recreation and public access is consistent with the land owning agencies (DFG and USFWS) missions as well as other applicable plans, policies and regulations, such as Bay Conservation and Development Commission ("BCDC") jurisdictional requirements as well as other agencies and organizations. The second detailed objective is directly related to the overall objective and has as one of its evaluation criteria a reference to USFWS "priority uses," which are established by Congress for wildlife refuges and take priority over all other recreation uses. Additionally, the word stewardship is included in this detailed objective to highlight the need and relationship for stewardship in the context of providing access and recreation.

The next three detailed objectives address three overall concepts related to recreation and public access: types of uses and user groups, connectivity of recreation and community links and the aesthetics of recreation and public access. The last detailed objective was originally part of the environmental impact detailed objectives, specifically addressing a CEQA requirement for "visual" impacts. It was suggested that this objective be included in Recreation and Public Access detailed objectives, and subsequently, the meaning was broadened to include more than just visual resources and experiences.

The third detailed objective addresses the range of possible recreational uses as well as the diversity of users and user groups. The Recreation and Public Access Work Group added specific language regarding not only the number of access points and staging areas but also references to the quality or type of amenities that are provided. Also, there is an evaluation criterion that allows for a range and diversity of recreation uses. Finally, the fourth detailed objective addresses the connectivity of the project area with the surrounding communities and the ability for new recreation and public access facilities to utilize existing links and enhance linkages in the future.

The "quality" of the recreational experience was also specifically left out as a detailed objective because it is extremely hard to "measure" and set criteria. The need for a way to incorporate the quality of the visitor experience into the objectives and criteria was discussed, and use of the "Recreation Opportunities Spectrum" ("ROS") was requested, however, it was noted that the complexity of these methodologies would reduce the ability to incorporate them into the alternative screening process. It was agreed that "more is not better" and the quality of the experience is essential for success and needs to be considered throughout the process, however for the planning framework, evaluation criteria that can be measured are required.

5.2.4 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.

The water and sediment quality objectives include two tiers of protection for existing surface and ground water quality - an exclusionary criterion to at least maintain existing levels and a second criterion to improve water quality. Water quality will be evaluated at the pond cluster scale to address known "hot spots" and the range of potential site-specific impacts from restoration. Because of the importance of mercury, a separate objective was dedicated to limiting ecological risk associated with mercury methylation and bioaccumulation. An additional objective to address compliance with the San Francisco Bay Mercury Total Maximum Daily Load (TMDL) was considered and rejected because: (1) the Regional Board does not see restoration efforts as creating a new source under the mercury TMDL and (2) TMDLs will not determine which alternative to choose. However, the SF Bay Mercury TMDL was incorporated into the evaluation criteria for the ecological risk objective, by including language from the TMDL allocation for wetlands (i.e., "no net increase"). One other objective is aimed to address concerns about mobilization of existing contaminated sediments in specific ponds.

5.2.5 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.

The detailed objectives were chosen based on design measures that can help control nuisance species, and that can be predicted for the alternatives. Management measures will need to be implemented in all alternatives. There are a variety of other invasive species, both aquatic (e.g. mitten crabs) and terrestrial (e.g. peppergrass), that may require management actions, but do not necessarily distinguish between potential alternatives.

5.2.6 Infrastructure

Objective 6. Protect the services provided by existing infrastructure (e.g. power lines, railroads, wastewater treatment plants).

The potential risk of failure or service degradation due to restoration alternatives will be evaluated for individual structures. The evaluation will be based on the comparison of restoration-induced physical changes, such as scour or sedimentation, water inundation, increased environmental loads (wave action, hydrostatic pressure), direct construction impacts, and increased risk of vandalism from additional public access.

The maintenance access detailed objective considers changes in maintenance access due to physical conditions (i.e. tidal flooding, lowering of levees), and changes in the timing or methods of access that could result from sensitive species regulations applicable after restoration.

5.2.7 Cost Effectiveness

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.

Cost effectiveness objectives and criteria reflect both short- and long-term estimated project costs (i.e., construction costs, operation and maintenance, and monitoring). Operation and maintenance costs will be characterized over the period of economic analysis (50 years) and monitoring costs over the anticipated adaptive management period (10 years). Estimated project costs will include costs within the SBSP project area that can be clearly identified and quantified. The objectives also reflect the relative ability to institute a long-term funding strategy and achieve partnerships and alliances to support long-term funding. Corps funding will play an important role in project implementation; therefore one objective is aimed specifically at the Corps benefit/cost (b/c) ratio analysis. The b/c analysis will follow federal Corps practices for multi-purpose projects, reflecting the value of flood control, ecosystem restoration, and possibly other benefits like recreation and navigation. Because project delays could significantly affect cost, alternatives will also be evaluated for relative potential to cause delay.

5.2.8 Environmental Impact

Objective 8. Promote environmental benefit and reduce impact in topics other than biology.

The detailed objectives and evaluation criteria that address environmental impacts include thresholds for determining cultural resources, public services, land use, traffic, and air quality and noise impacts. These thresholds and criteria are commonly applied in CEQA and NEPA impact analyses and include both qualitative and quantitative measures. While formal environmental impact analysis will not be conducted until the project alternatives are identified, inclusion of these objectives and criteria will ensure that environmental effects are considered during the alternative screening process.

6. ALTERNATIVES FORMULATION AND EVALUATION PROCESS

The process for formulating and evaluating alternatives is depicted on the Alternatives Development Framework flow diagram (Figure 1). The first steps in the process – defining the objectives and evaluation factors, and the detailed objectives and evaluation criteria – were described previously in Sections 4 and 5. This section describes the remaining steps of the process.

6.1 Definition of Spatial Scales

Once the detailed objectives and evaluation criteria are developed, the alternatives formulation will proceed at two spatial scales – the landscape scale and the pond cluster scale. The landscape scale covers South San Francisco Bay, south of the San Bruno Shoal, and the South Bay Salt Pond Restoration Project area. The pond cluster scale refers to small groups of ponds organized around major slough systems, either separated by major sloughs from other ponds or grouped around major sloughs. There are seven pond clusters assumed at this time – four at Alviso, two at Baumberg and one at West Bay, though the groupings have not been finalized and are for early planning purposes only (see Figure 2). The pond clusters are similar to the pond "systems" developed for the Initial Stewardship Plan (ISP) based on logical physical groupings for the circulation of Bay water through the ponds; however, the ISP subdivided the four largest pond clusters for a total of 11 "systems."

6.2 Landscape Scale Scenarios

Five landscape scale scenarios are proposed:

A. No Project / ISP with minimal operations and maintenance
B. No Project / ISP with full operations and maintenance
C. Maximize Managed Pond Habitat
D. Mix of Tidal Marsh and Managed Pond Habitat (2:1 ratio)
E. Maximize Tidal Marsh Habitat

The three project scenarios (C, D, and E) address different balances of tidal marsh and managed pond habitat. These scenarios are further described in Section 6.

Scenarios at the landscape scale will be evaluated before proceeding to more detailed alternatives formulation. This will allow key system-wide questions to be addressed early on, such as sediment availability and habitat development, to define an achievable vision of the project's overall habitat mix. For example, in order to evaluate the benefits to tidal marsh species such as the salt marsh harvest mouse or the California Clapper Rail, the specific areas that would evolve towards tidal marsh if opened to the tides must be predicted. This requires an understanding of sediment availability at the landscape scale. Without enough sediment, a salt pond opened to tidal action with the intent of restoring tidal marsh might not reach elevations high enough for emergent marsh vegetation to grow. Understanding the broader hydrogeomorphic questions, and their biological consequences, is essential for developing more detailed restoration alternatives.

Habitat development for the five landscape scale scenarios will be assessed and the Biological Habitat evaluation criteria will be applied using the rating procedures outlined in Section 8. One "No Project" and one "Project Restoration" scenario will be selected by the PMT and carried forward to help frame pond cluster scale alternatives.

6.3 Pond Cluster Options

Based on the landscape scale scenario assessment and the desired habitat mix, a range of options will be created for each of the seven pond clusters. For this study, an option is defined as a component of an alternative at the pond cluster scale. The options will present integrated solutions for biological habitat objectives, flood management objectives, public access/recreation objectives, etc.

6.4 Alternatives Development

The project options will be combined into a matrix of alternatives. Initial screening will be used to reduce the full matrix of alternatives to a smaller set of preliminary alternatives. The preliminary alternatives will then be evaluated against the full set of detailed objectives and evaluation criteria. A weighting and sensitivity analysis will be conducted to assist in the selection of final project alternatives for the Environmental Impact Report/Statement (EIR/S). The EIR/S process will result in the selection of the preferred alternative for implementation.

Once the final project alternatives have been selected, a set of selection criteria will be developed for the Phase 1 Action. The alternatives for the Phase 1 Action will be evaluated and rated based on these criteria. Once the Phase 1 action is selected, the next steps are completion of NEPA/CEQA documentation and eventually for implementation of Phase 1.

6.5 Selection Process

At each step involving selection from among landscape scenarios, options, or alternatives, the PMT will solicit input from the Stakeholder Forum and Work Groups, the Science Team, and the Regulatory and Trustee Agencies Group. The final selection will be made by the PMT.

7. LANDSCAPE-SCALE RESTORATION STRATEGIES

7.1 Overview

In developing project alternatives we recognize that large-scale physical changes will be occurring throughout the South Bay over the next 50 years with or without the changes induced by large-scale restoration. These physical changes due to rising sea level, long term erosion of mudflats, reduction in sediment supply and changes in sedimentation patterns can significantly affect the size and distribution of both existing and potential restoring tidal wetland habitats. These habitats, the marshes, mudflats and tidal channels support special status species and bird use, and their restored extents are the major focus of the biologic detailed objectives and evaluation criteria described in Table 1.

The alternatives development framework is designed to anticipate and take advantage of how the South Bay is likely to evolve to insure that the proposed pond cluster scale alternatives will accomplish the specified habitat and bird use objectives. A set of five landscape scenarios that range from no action to full tidal restoration will be analyzed to identify the scale and sensitivity of habitat changes to the main changes in physical processes. Out of this analysis a preferred scenario will be selected that addresses on a landscape scale the tradeoffs between the extent of tidal restoration and maintaining managed ponds, and between tidal marsh and intertidal mudflat restoration. This analysis will address the following specific questions that influence how the options and alternatives are developed:

- How will the extent of marshes and mudflats change over time throughout the South Bay?
- How will tidal restoration affect erosion of existing mudflat and fringing marsh habitat?
- What phasing and locations of tidal restoration will maximize benefits in light of limited sediment supply?
- How will waterbird use respond to changing habitat and pond management?
- Will the extent of new restored mudflats compensate for losses expected under the no action alternative?
- What is the appropriate mix of tidal restoration and managed ponds?
- Can bayfront levees be removed to favor mudflat habitat restoration and limit sediment demand?
- Where would maintenance of managed ponds help reduce impacts on South Bay habitats?

One can broadly examine the major questions by looking at two scenarios at either end of the spectrum, Scenario B and Scenario E. The first scenario is one in which no project is completed, but the Initial Stewardship Plan (ISP) is carried out with full operations and maintenance. The current salt pond levee systems are maintained with virtually no tidal restoration, and changes over time due to sea-level rise and continued sediment deposition and erosion are predicted. This would benefit waterbird species that use the existing salt pond/mudflat complex of habitats. The scenario represents minimal sediment demand since tidal restoration will be negligible. The second scenario is one in which virtually all of the existing salt ponds are restored to tidal marsh/intertidal mudflat habitat, representing the maximum potential sediment demand since deposition will be required to raise pond elevations to allow for vegetation

establishment. This would benefit salt marsh and brackish marsh associated species, including the salt marsh harvest mouse, California Clapper Rail, and a variety of fish species. Depending on the sediment supply and the system response the sediment demand places on existing habitats, there may be net benefits for waterbirds and fish that rely on the intertidal or subtidal mudflat habitat as well.

Three other scenarios will be examined. The first scenario is one in which no project is completed, but the ISP is carried out with minimum levels of operation and maintenance (Scenario A). The levees are allowed to fail over time and tidal restoration is passively accomplished. That option would ultimately benefit the same suite of species as Scenario E; however, the time frame for the restoration will be extended, the benefits are not likely to be as great, and the negative impacts could be significant. The second scenario leaves the levees in place, but reconfigures and manages the former salt ponds to maximize bird use, including breeding (Scenario C). The final scenario combines tidal restoration with managed ponds, roughly in same proportions as those proposed by the Baylands Ecosystem Habitat Goals (Goals Report[2]) program (Scenario D). Those proportions will allow for an examination of the system-wide response to a more moderate level of tidal restoration.

A more detailed description of each scenario is presented below.

7.2 Scenario A. No Project / ISP with minimal operations and maintenance.

This "No Project" Scenario assumes that the ISP will be implemented, but with minimal operations and maintenance. Under this scenario, the land owners (California Department of Fish and Game (CDFG) and the United States Fish and Wildlife Service (USFWS)) would be unable to fund levee maintenance and on-going water level management in the ponds. This scenario eventually restores tidal action and creates tidal salt marsh and intertidal mudflat habitat throughout the South Bay. However, tidal marsh restoration will occur in an unpredictable and potentially unsafe manner.

Since on-going levee maintenance is discontinued in this scenario, levees gradually deteriorate and eventually fail, allowing tidal action. Some levees will likely overtop and begin to breach within the next ten years, allowing tidal salt or brackish marsh to become established. The existing borrow ditches will capture much of the tidal prism and will not maximize reestablishment of the remnant historic channels. Natural estuarine sedimentation will gradually rebuild the marsh plain to elevations at which vegetation could reestablish. These marshes will evolve over a period of decades. Tidal inundation will increase tidal flows and scour and deepen the major sloughs.

Under this scenario, active management of the ponds will end, and no flow circulation will occur. Any water that is accumulated in the ponds will be allowed to evaporate. The existing levees and water control structures will be allowed to deteriorate. Uncontrolled breaching under this scenario may lead to

[2] Goals Report. 1999. Baylands Ecosystem Habitat Goals: A report of habitat recommendations. Oakland, California: San Francisco Bay Area Wetlands Ecosystem Goals Project.

significant impacts to existing infrastructure as well as inland flooding where interior levees are not sufficient to keep out tidal and/or flood waters.

The purpose of examining this scenario is to compare passive restoration of tidal marsh to the active restoration described above in Scenario E. The benefits of passive restoration can be judged against those of active restoration. Furthermore, differences in the timing of restoration and in the impacts of allowing such uncontrolled restoration can be assessed.

7.3 Scenario B. No Project / ISP with full operations and maintenance

This scenario assumes that the ISP will be implemented with full long term operations and maintenance. New baseline conditions will be established. The USFWS and CDFG will continue to manage the ponds as proposed under the ISP, and maintain the pond levees.

Under this management, the operations will include:

- Circulating bay waters through ponds systems and back into the Bay.
- Managing a limited number of ponds (A3N, A8, E6A, E6B, E8, E11, E12, E13, E14) as seasonal wetlands to optimize habitat for migratory shorebirds and waterfowl
- Three ponds (A19, A20, A21) will be restored to full tidal influence.
- Several ponds (A12, A13, A15) will be managed as “batch ponds” where salinity levels are to be allowed to rise to support specific wildlife populations.

Under this scenario, ponds levees will be maintained and heights increased to compensate for sea level rise. In addition, culverts and water control structures will require routine maintenance or re-positioning due to sea level rise. Various flood-control projects will continue to be maintained and/or constructed as currently proposed, but the basic structure of the former salt pond levees will remain intact.

This scenario will not meet the basic goal of the project, namely to restore wetlands in the South San Francisco Bay. Nonetheless, it will meet a number of the objectives of the project, namely providing benefit to the suite of waterbird species that use the salt ponds exclusively, as well as those that use the complex of salt ponds and intertidal mudflats. Therefore this scenario can serve as a metric for judging the benefits of restoration, and the changes that can be expected in the tidal portions of the Bay over time.

7.4 Scenario C. Maximize Managed Pond Habitat

Scenario C is based upon the understanding that the salt pond system that has been in place for the past 50 or more years, was designed to maximize salt production and not to maximize habitat for waterbirds. Nonetheless, a suite of salt pond “specialists” and a broader array of waterbirds use many of the existing salt ponds extensively and opportunistically. In contrast to the current pond configuration and ISP management regime, if these ponds were configured and managed to maximize habitat value for these waterbirds, there could be considerably greater use by existing and future species. This assessment of

potential greater use is based upon data collected at ponds designed and managed for many of these same species in the San Joaquin Valley. Very high breeding and migrant shorebird densities were achieved at these Central Valley ponds. These data are applicable and can be utilized to estimate attainable densities at managed ponds within the tidal/managed pond habitat complex of the South Bay.

This scenario assumes that the levees remain intact and are maintained. The existing ponds are to be reconfigured to include extensive islands for breeding and roosting. These islands will be positioned and protected to the extent possible to minimize the intrusion by terrestrial predators.

Pond management is to be altered to create extensive shallow water foraging habitat (1-6 inches deep) as well as a range of depths up to about the current levels. This design provides extensive foraging opportunities when tides cover the intertidal mudflats. A range of water salinities will be incorporated into the design, but shallow water habitats are to be maintained at higher salinities to help discourage vegetation growth.

The purpose of exploring this option on a landscape scale is to develop an understanding of the limits of the system for supporting waterbirds, in the absence of tidal restoration. The numbers and densities of birds that use the ponds currently on a regional and pond-complex-wide basis will be used to estimate species and total system numbers of birds under this concept. This will also help to develop predictions of the number of acres (within the restored habitat mix- Scenario D) of reconfigured and managed ponds that will be required to maintain, or enhance, current (existing conditions) numbers on a regional level.

This scenario examines the changes in the mudflat/bay complex over time, in the absence of tidal restoration.

7.5 Scenario D. Mix of Tidal Marsh and Managed Pond Habitat (2:1)

Under this scenario, approximately two-thirds or more of the ponds are to be restored to tidal salt and brackish marsh, while the remaining one-third will be managed as ponds or restored to mudflats and salinas (salt pan).

Tidal marsh restoration of the ponds will proceed as outlined in Scenario E. Identification of specific areas to be restored to tidal marsh and specific ponds that are to be managed will be based on a variety of factors, including public access, contaminant and water quality issues, pond elevation, and flooding concerns. The selection will be based upon the optimal mix and locations of habitats to maximize ecological functions and values of the South Bay ecosystem. Individual ponds will be managed according to specific target species and detailed goals. Management of the ponds will be similar to that described above in Scenario C. That mix of habitats and their locations will approximate those that are suggested in the Goals Report.

This scenario provides a framework to analyze the system-wide responses to this habitat mix. If sediment supply is a constraint on the restoration process, then a reduced level of tidal restoration may provide the

best opportunity for maximizing habitat value over the habitat assessment period (50-years). This scenario also meets most of the objectives of the restoration. The 2:1 habitat mix has been proposed as one that may provide the most benefit for the suite of bird species associated with the South Bay Restoration area; the analysis should help determine if that is accurate.

7.6 Scenario E. Maximize Tidal Marsh Habitat

Scenario E restores full tidal inundation to virtually all of the South Bay Salt Ponds. Because this scenario necessitates removal or breaching of former salt pond levees which currently provide some level of flood protection, it is assumed that flood management and infrastructure issues that would arise from these efforts are resolved. Levees are to be breached at historic channels, restoring natural tidal flows to the ponds. Pickleweed-dominated marsh and vegetation will establish quickly in areas already at high intertidal elevations. Natural estuarine sedimentation on the lower mudflat areas will gradually build up until these areas are high enough for cordgrass and pickleweed to establish. By partially filling the borrow ditches, cutoff berms are to be created to prevent tidal capture by the existing borrow ditches, allowing the natural channel system to reestablish. Interior berms and levees are to be selectively lowered or removed to the extent possible, creating additional tidal habitat. Existing levees required to protect infrastructure from wind-wave erosion are to be left in place, or modified to improve either the level of protection, or the value of the habitat.

This scenario does not assume that dredged materials or other sources of fill are used to create upland fringe habitats, but rather considers the restored marsh complex in light of sediment supply availability through natural deposition. This approach will allow analysis of changes over time in the marsh complexes, as well as changes in the mud flat and sub-tidal habitat of the South Bay.

Restoration is to be active and planned, with consideration of flood control infrastructure detailed. Other active restoration techniques might be used (e.g., selective use of dredged materials along upland fringes), but those techniques are not part of this initial analysis. The primary purpose of the analysis is to predict the ability of the Bay to supply the sediment for such restoration, the length of time it would take to accomplish tidal marsh restoration, the interim conditions during the restoration, and the changes in the intertidal mudflats and subtidal habitat of the South Bay that result from this level of restoration.

This scenario meets the basic goal of the project, namely to restore wetlands in the South San Francisco Bay. However, it may not meet a number of the objectives of the project. It benefits those species dependent on the tidal marshes of the bay, and may provide net benefit to those dependent on the intertidal mudflat habitats as well.

7.7 Landscape Scenario Comparisons

To compare the ecologic value of the five landscape scenarios a simplified assessment will be carried out based on the following four performance criteria that aggregate 11 out of the 14 biologic detailed objectives evaluation criteria. These are:

1. Area of vegetated tidal marsh. This encompasses the metrics for habitat for the salt marsh harvest mouse, clapper rail, and estuarine fish that use tidal channels that are an inherent feature of the tidal marsh.
2. Area of intertidal mudflats. This incorporates metrics for shorebird use [see below], and invertebrate populations that utilize intertidal mudflats.
3. Area of managed pond This incorporates the metrics for breeding birds that use the salt ponds, habitat available for salt pond specialized birds, and availability of forage areas within the ponds. Potential improvements in habitat and management of ponds will be incorporated in this criterion
4. Bird populations. This will be a set of criteria that will integrate the metrics for birds that use the managed ponds with bird use of intertidal mudflats and tidal marsh.

This assessment will depend on our ability to predict the geomorphic evolution of South Bay habitats, which in turn is dependent upon our understanding of the sediment budget and sediment dynamics of the system. The analysis approach is described in a separate document, the Analysis Strategy and Model Selection Memorandum (currently in draft version).

After the initial landscape level analysis is completed, and a agreement is reached regarding the appropriate habitat mix for the system at the landscape scale, the bulk of the remaining analyses will focus on the pond cluster scale.

8. EVALUATION, RANKING, AND WEIGHTING PROCEDURES

Each alternative will be evaluated against each detailed objective based on how well the objective is achieved, using a nine-point scale from highly achieved (H) to not achieved (L) The scale is subdivided into three regions, Low (L^-, L, L^+), Medium (M^-, M, M^+), and High (H^-, H, H^+), which are represented graphically on Figure 2. An alternative that is rated H^+ for a particular objective is ideal and maps at the outside of the circle on Figure 3, whereas a rating of L^- means the alternative does not satisfy the objective and is graphed as a dot in the middle.

It is important to note that the ratings themselves do not dictate the selected alternative. The ratings will not necessarily be totaled across all detailed objectives. Rather, the ratings provide a transparent and consistent means of comparing alternatives, providing insight and understanding to inform decision-making. Rating guidance will be prepared to facilitate consistency between disciplines in the use of the nine-point scale. Figure 3 readily shows how a given alternative pulls toward certain objectives where high success is likely and away from others where success is less likely. Also, multiple alternatives can be "graphed" as overlays and their differences readily seen. The "No Project" alternative can also be graphed.

There are numerous detailed objectives under consideration, and Figure 3 treats each detailed objective as equal to all others – in effect, a form of 1:1 weighting as to the relative importance. An examination of a set of alternatives plotted in this way may lead to a conclusion as to a final project alternative. However, it is highly likely the relative importance of selected detailed objectives will be explored (for example, the 14 biological habitat objectives) and/or the relative importance of one overall objective versus the others (i.e. Biological Habitat v. Flood Protection v. Public Access/Recreation).

The relative importance of select detailed objectives will be varied, and "sensitivity runs" will be conducted to see how the ranking of alternatives may change. Ratings on the nine-point scale of how well a given alternative responds to the detailed objective will be prepared with input from the Science Team and others. These displays and the dialogue that they will generate will become the primary tool for arriving at the preferred final action among all parties.

9. LIST OF PREPARERS

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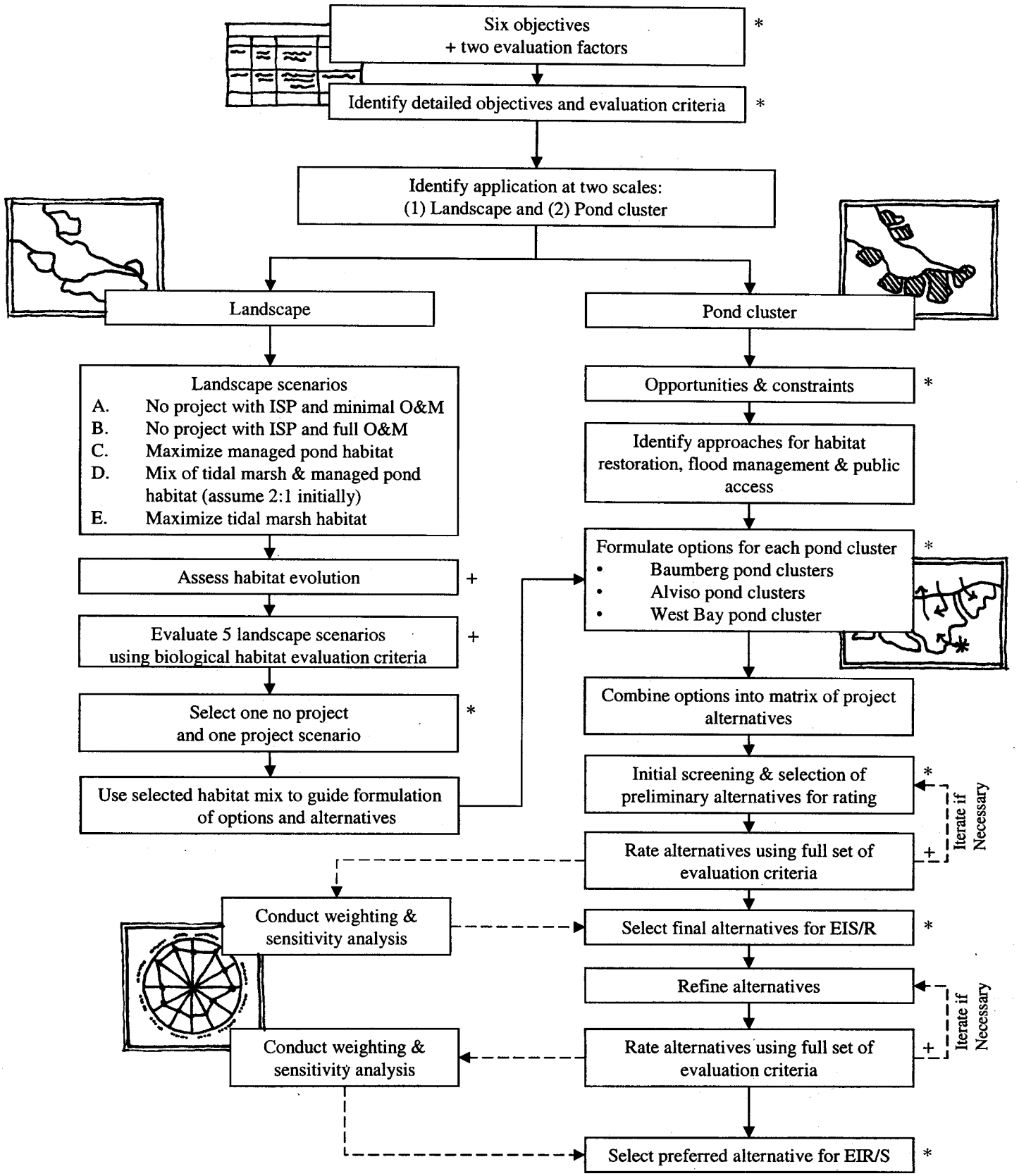

Figure 1. Alternatives Development Framework

+ Input from technical analyses and Science Team

* Input from Stakeholders and Regulatory Agencies

PWA

Figure 2. Location of Pond Clusters

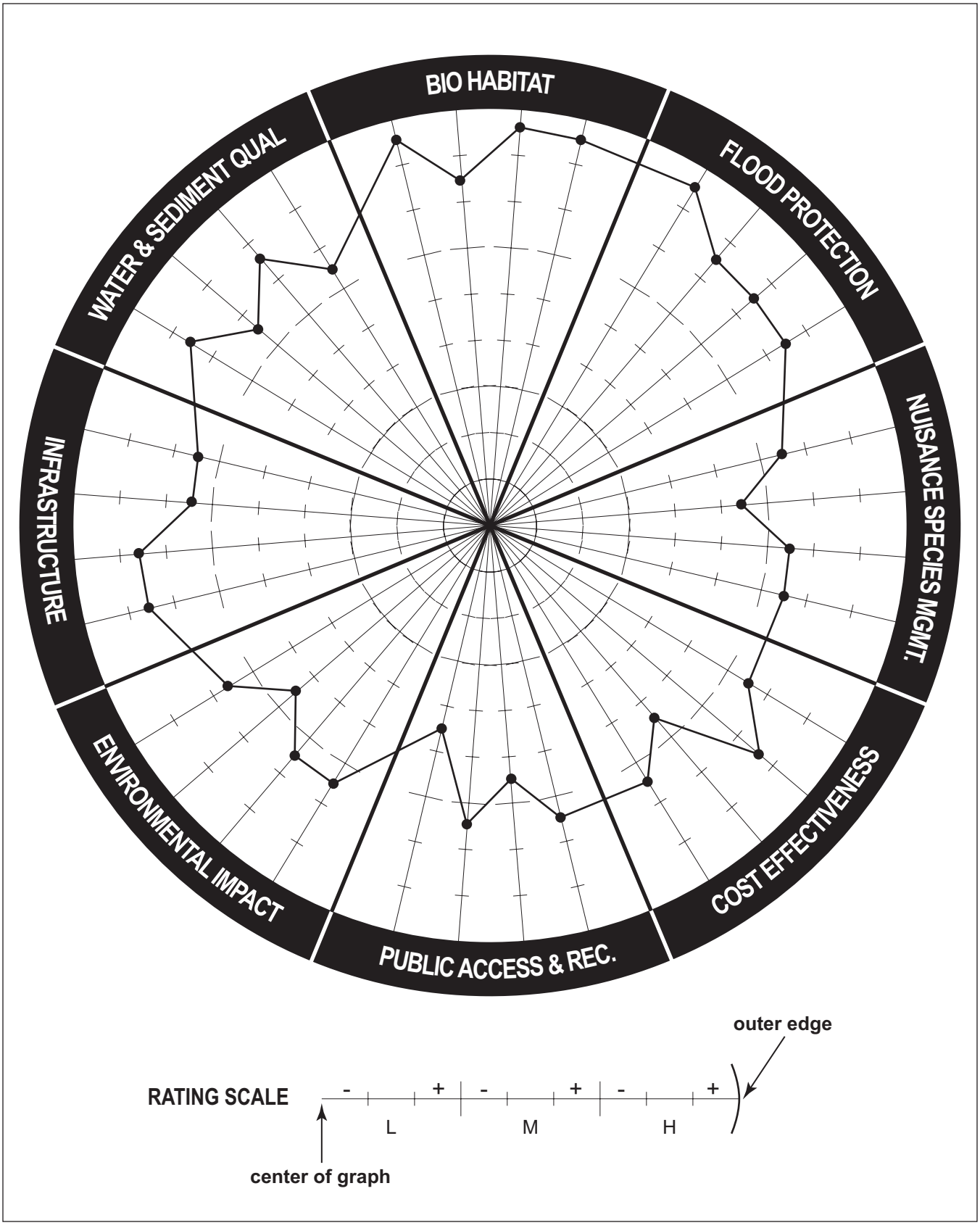

Figure 3. Example Format for Displaying How an Alternative Responds to Each Detailed Objective