Summary of the Roles and Activities of the Science Team, South Bay Salt Pond Restoration Project during the Planning Phase

Lynne Trulio, Lead Scientist, South Bay Salt Pond Restoration Project
February 25, 2008

Science Team Roles and Project Contributions

This document provides a record and analysis of the activities of the South Bay Salt Pond Restoration Project Science Team, which was constituted in March 2004, and describes how the Team's work shaped the outcomes of the planning process.

In October 2003, the Project convened a 6-member Science Strategy Team, which expanded to an approximately 12-member Science Team in March 2004 (Table 1). The Science Team was composed of local and regional experts on physical, biological and social processes and is directed by the Lead Scientist. Science Team work was reviewed every 6 months by the National Science Panel (NSP), a group of nationally- and internationally-known scientists with expertise in restoration. During its tenure, the Science Team carried out the Project's science program, a series of activities designed to provide direction for designing, collecting, synthesizing and disseminating the best science during the planning process and beyond.

Very few large-scale ecosystem restoration projects have ever been undertaken and, those that do exist, are all quite different from each other. Since there was no blueprint to follow in developing the science program for the Project, the work of the Science Team evolved throughout the planning phase, in an adaptive way, to meet the needs of the Project and science development.

In their report to the NSP of April 2004, the 6-member Science Strategy Team described the role of the Science Team as primarily advisory, focusing on reviewing and commenting on key documents produced during the planning phase. However, the NSP strongly recommended that the Science Team be active in bringing the best information to the Project and in clearly setting direction for what scientific information should be collected to achieve the Project Objectives. Consequently, the Science Team embarked on a science program that significantly influenced the direction of the Project and the outcomes of the planning process. As their first primary task, the Science Team identified 8 key uncertainties relevant to achieving the Project Objectives and wrote science syntheses, i.e., focused literature reviews, to determine the state of our knowledge on those key uncertainties. The syntheses recommended restoration targets, monitoring needed to assess progress, and applied studies needed to reduce uncertainties. Technical workshops, held in 2004-2006, brought in more information on these uncertainties and helped educate the Project managers and the public on key issues.

In September 2004, the Science Team wrote a draft science plan to provide a blueprint for how the science program would be implemented; much of the Plan was based on the key uncertainties and science syntheses. At that time, the Project Managers envisioned the Science Team as having a substantial role in reviewing Consultant Team products. However, the Science Team made it clear that the planning process and most Consultant Team products moved far too quickly to allow for adequate scientific review. The product review role was not realistic nor the best use of the Science Team's talents. Thereafter, the Science Team directed its efforts toward

developing the Project's long-term plan for reducing uncertainties and achieving the Project Objectives through adaptive management. Through 2005 and 2006, a major task was to identify applied studies to address the 8 key uncertainties. Ultimately, the Science Team identified 21 applied studies and wrote basic descriptions of how those studies might be implemented.

By January 2005, the Science Team clearly stated its mission as providing guidance on short-term planning activities and developing a Science Program for the collection, synthesis and dissemination of best possible science to support long-term restoration activities and adaptive management, so that the South Bay Salt Pond Restoration Project may achieve its Project Objectives. The Science Team adopted a charter (Appendix 1) that listed the primary roles of the Science Team during planning as follows:

1. Science Development and Implementation Role. Develop and implement a long-term Science Program that will provide adaptive management and scientific information needed to address uncertainties in achieving the project objectives.
2. Review Role with respect to Selected Consultant Team Documents. Review select Consultant Team documents or segments of those documents as appropriate, following one of two procedures described in the charter.
3. Advisory Role of Individual Science Team Members. Provide *ad hoc* advice to the Consultant Team through informal interactions or formal collaboration.

A central question during the planning phase was how much pond acreage to restore to tidal marsh and how much must be left as managed pond to support species using the ponds. The Project participants all began to see that determining the final landscape arrangement and habitat balance was hindered by the uncertainties. At this point, the Science Team made a crucial contribution to the Project by conceptualizing the adaptive management "staircase", in which restoration and management is implemented in phases and each phase provides the information needed to design the next phases or actions. In this way, the landscape of the restoration project would evolve over time to meet the Project Objectives.

The relationship between the Science Team and Consultant Team was not clearly defined at the outset of planning. The PMT envisioned a close relationship between the two teams, but the pace of planning did not permit that. The interaction evolved and, by early 2005, the Science Team and Consultant Team were relatively separate from each other and pursued different missions; the Science Team was primarily developing the long-term adaptive management program, based on the staircase concept, and the Consultant Team worked on the short-term planning process centered on the NEPA/CEQA process. However, the products of both Teams were complementary and, in 2006 and 2007, the Science Team focused on integrating its work with that of the Consultant Team for the benefit of the NEPA/CEQA process. A primary product of this process was the Adaptive Management Summary Table, a comprehensive guide that united the Project's restoration targets and monitoring parameters with the applied studies and management triggers for action. This Table became a central part of the FEIS/R and the Adaptive Management Plan.

From 2005-2007, the Science Team wrote and refined the Project's Adaptive Management Plan. This major product included much of the Science Team's previous work and serves as the culmination of the Science Team's work during the planning phase. This document is included

in the Final EIS/R for the Project and will provide guidance as the Project moves into implementation.

In 2007, the last year of the Project's planning process, the Science Team focused on completing the Adaptive Management Plan and helping the Project Managers begin the transition to implementation. This included initiating an adaptive management process to address California gulls and helping the managers look for a Lead Scientist for the implementation phase. In addition, they provided advice on designing the two large-scale applied studies experiments that will be implemented as part of Phase 1. They also helped the PMT cost out the applied studies and monitoring, developed a sequencing plan for implementing the applied studies, provided information on likely protocols for monitoring, and assisted with two workshops on the adaptive management of California gulls.

Science Team Products

During its existence, the Science Team produced a range of products in all three aspects of its mission, but especially in Science Development and Implementation. Table 2 lists Science Team accomplishments and how the work was used. Most of the work was in developing the scientific foundation for achieving the Project Objects, especially summarizing existing information, determining key uncertainties, and identifying what studies should be done to reduce uncertainties. This work ultimately resulted in: 1) the adaptive management "staircase" which is guiding programmatic planning for the EIR/S, and 2) the Adaptive Management Plan, which is a central component of both the Phase 1 restoration actions and the long-term, programmatic restoration.

The Science Team was able to achieve some limited research implementation (a.k.a. "applied studies") based on key project uncertainties. Implementing applied studies during planning was difficult because there were no funds identified for scientific study when the planning process was developed. At the time the planning process was funded, there was neither a Science Team nor a Lead Scientist to guide the Project managers on planning and budgeting for science. Thus, the applied studies element of the Science Program was added to the planning process by the Science Team. Despite the fact that applied studies were not included in the planning budget, the Project and Science Team successfully initiated a range of studies during planning using Project monies and funding from other sources (see Table 3).

Lessons from the Planning Process

One lesson from this Project is the need for scientific input, beginning at the earliest stages of planning. Early scientific input would have helped Project managers anticipate problems such as the water quality issues related to the discharge of effluent from managed ponds. In addition, the Science Team had to work hard to catch up with the Project, which was already moving quickly along when the Science Team was constituted. Participation of the Lead Scientist in early project planning would have resulted in better coordination of the science with the early phases of the planning process and, perhaps, resulted in fewer major role changes for the Science Team. However, it is important to realize that large interdisciplinary projects, such as the South Bay Salt Pond Restoration Project, are evolving processes and adaptive changes will be required by all Project participants throughout the life of the Project.

Another lesson from this Project is the importance of requiring that researchers summarize and interpret their data in a manner that is useful for Project Managers and the public. During planning, the Project managers wisely funded extensive baseline monitoring of Project area conditions during planning. This work produced a tremendous amount of data, especially on bathymetry, water quality, and fish and bird use in the ponds and sloughs in the Project area. However, the Project managers did not incorporate in their planning and budgeting the requirement that the researchers analyze and interpret the monitoring data and to convert them into information that can be used by the Project. It essential that researchers interpret the data they collect and convert it into useful management information. Such processes will be essential for the Project to succeed.

Science program successes were primarily related to the Project managers' use of content generated by the Science Team. Science Program successes included:

- Providing clear understanding of uncertainties and the resulting need for monitoring and applied studies;
- Convincing the Project managers and public of the need for adaptive management;
- Developing an Adaptive Management Plan that clearly articulates the structure and processes for successful adaptive management of the Project over time;
- Having the adaptive management "staircase" incorporated in the EIS/R as an essential element of each programmatic alternative;
- Initiating applied studies during the planning phase of the Project;
- Having applied studies included in each Phase 1 Action.

Process issues posed challenges for the Science Program including the following:

- *Planning began in advance of science input.* This challenge remained largely unresolved. Over time, the role of the Science Team caught up to the planning process. The next three challenges resulted, at least in part, from this issue.
- *There was no Project funding for implementing a significant research program of applied studies during planning*. Funds for research during planning were not budgeted. The Project managers and Science Team members worked to overcome this challenge by freeing up some Project monies and seeking other funding sources outside the Project. Identifying key uncertainties and critical applied studies to address those uncertainties was instrumental in garnering funds from other sources. Since adaptive management of the Project will require funds for monitoring and research for many years, accepting these costs as part of each Project action is the first step to finding funding. Having clearly articulated research needs will be another key element in successful funding.
- *Role of the Science Team with respect to Consultant Team work was unclear*. The fast-paced planning process and uniqueness of this Project resulted in unclear interaction rules for these two Teams. Some level of this problem was inevitable, given the organic nature of large interdisciplinary projects. Focus on the EIS/R process in the latter two years helped clarify how the work of the two Teams should be integrated.
- *There was no clear mechanism/process for interpreting monitoring and applied studies data for use by managers for NEPA/CEQA or adaptive management.* The Project managers used several methods to get the information they needed, but these were developed later. Based on this, the Adaptive Management Plan includes a number of processes for ensuring data are interpreted for adaptive management decision-making.

TABLE 1. South Bay Salt Pond Restoration Project Science Team Members

Lynne Trulio, Lead Scientist	San Jose State University
John Callaway	University of San Francisco
Joshua Collins	San Francisco Estuary Institute
Edward Gross	Environmental Consultant
Bruce Herbold	US Environmental Protection Agency
Michael Josselyn	WRA, Inc.
Frederic Nichols	US Geological Survey (ret.)
Gillian O'Doherty	NOAA Fisheries
David Schoellhamer	US Geological Survey
Cheryl Strong	US Fish and Wildlife Service (formerly at San Francisco Bay Bird Observatory)
Lois Takahashi	UCLA
John Takekawa	US Geological Survey
Dilip Trivedi	Moffat and Nichol
Nils Warnock	PRBO Conservation Science

TABLE 2. Science Team Activities from March 2004 to December 2007

Science Team Activity	Where Products Appear
Role: Science Development and Implementation	
Identified Key Uncertainties	Adaptive Management Plan
Wrote Science Syntheses containing: Summary of knowledge and unknowns, restoration targets, monitoring parameters, key applied studies to reduce uncertainties	Peer-reviewed papers posted on Project Website
Wrote Draft Scientific Basis for the Project Objectives	Adaptive management staircase
Developed Adaptive Management "Staircase"	Adaptive Management Plan and EIS/R
Wrote Adaptive Management Plan, including Applied Studies list, Adaptive Management Summary Table, and Institutional Structure	EIR/S and Record of Decision
Held technical workshops	Summaries posted on Project Website
Implemented Applied Studies through a competitive proposal process and other funding approaches	Future syntheses of monitoring and studies to be used by Project managers to manage Phase 1 and design Phase 2
Held a South Bay Science Symposium	Presentation and poster summaries posted on the website
Applied Studies Sequencing	EIR/S; Future syntheses of monitoring/studies
Completed two Call for Proposal Processes: Island Ponds and California Gull Applied Studies	Products forthcoming to assist in adaptive management of the Project
Role: Review Role for Project Documents	
Science Team modelers memos on modeling and the LSGA	Modeling results in EIR/S
Science Team recommendations memo on the Phase 1 Actions	EIS/R and Adaptive Management Plan
Review and revision of integrated Applied Studies document	Adaptive Management Plan
Review and revision of Adaptive Management Summary Table, including monitoring parameters and protocols	Adaptive Management Plan
Role: Advisory/Collaboration of Individual Science Team Members with the Consultant Team	
Dave Schoellhamer, USGS, worked as advisor to Consultant Team on model development	EIS/R
Nils Warnock and PRBO, worked on bird habitat modeling as part of the Consultant Team modeling	EIS/R
Many Science Team members provided advice to the Consultant Team on their work and products	EIS/R

TABLE 3. Monitoring and Applied Studies undertaken during Project Planning

	Monitoring Project or Study*	Funded By*	Funding Amount
	Monitoring Project		
1	Pond and Project Area Monitoring—USGS, Takekawa, Schoellhamer, Jaffe (2003-05)	SCC and WCB	~$600K/year
2	Pond and Project Area Monitoring—USGS, Takekawa, Schoellhamer, Jaffe (2005-06)	SCC and WCB	~$350K
3	LIDAR Survey of South Bay--TerraPoint	SCC and WCB	$178K
4	Bathymetry of the South Bay--Sea Surveyor, Inc.	SCC and WCB	$380K
5	Urban Levee Flood Management Requirements, Hydrologic Data Collection, Inventory of Discharge Facilities, Hydrodynamic Modeling Tools and Techniques Report--Moffat and Nichol	SCC and WCB	$300K
6	ISP Water Quality Monitoring--USGS, Takekawa	RLF	~$200K/year
7	ISP Mercury Monitoring—USGS, Keith Miles (2005-06)	RLF and FWS	~$50K
	Applied Study or Modeling Project		
1	Bird and Habitat Change Modeling--PRBO	SCC	$215K
2	Water Quality Data QC and Compilation—USGS, Cloern	USGS	In-kind
3	Pond A8/South Bay Mercury Study--SFEI, USGS, SCVWD	SCVWD, FWS, SFF, SCC	~$440K (~$300K in-kind)
4	Bird Diversity and Abundance on Newark Ponds--SFBBO	SFF and FWS	$80K for 2 years
5	Bird Use of Mature and Restored Marshes--PRBO	SFF	$60K for 2 years
6	Snowy Plover use of Managed Ponds; Harbor Seal Response to Watercraft; CA Gull Impacts to Nesting Birds—SJSU, Trulio	SJSU	In-kind
7	Hg in SF Bay-Delta Birds—USGS, Josh Ackerman	CALFED	unknown
8	Invasive *Spartina* Project (mapping and control)	SCC, FWS	unknown
9	Initiate development of 3-D, integrative and predictive model	SCC	unknown
10	Island Ponds Adaptive Management Studies: Initial physical and vegetation change	SCC	~$100,000
11	California Gull Applied Studies: Literature Review and Movement Study	SCC	$100,000

* Acronyms: FWS=US Fish and Wildlife Service; DFG=California Department of Fish and Game; RLF=Resources Legacy Fund; SCVWD=Santa Clara Valley Water District; SFF=San Francisco Foundation; SCC=State Coastal Conservancy; COPC=California Ocean Protection Council; SJSU=San Jose State University; WCB = Wildlife Conservation Board

APPENDIX 1: Charter for the Science Team (01/27/05)

Mission of the Science Team:
Provide guidance on ongoing short-term planning activities and develop a Science Program for the collection, synthesis and dissemination of best possible scientific information to support long-term restoration activities and adaptive management such that the objectives of the South Bay Salt Pond Restoration Project can be achieved.

Purpose of the Charter:
The mission of the South Bay Salt Pond Restoration Project is to provide a publicly supported and scientifically sound planning process. While long-term science implementation can be planned and executed through an appropriate scientific review process, the pace of the short-term planning process does not allow for a thorough scientific review of planning documents.

This charter clarifies the role of the Science Team in the review of documents in the short-term planning process and emphasizes the role of the Science Team in long-term adaptive management and science implementation. The roles described here mirror the recommendation of the NSP, in their November 2004 report, that "review of the consultant's products should not be a priority for the Science Team given their need to focus on the science syntheses and other tasks."

Roles of the Science Team:

1. Science Development and Implementation Role. The Science Team is best suited to developing and implementing a long-term Science Program that will provide adaptive management and scientific information needed to address uncertainties in achieving the project objectives. This primary role of the Science Team is described thoroughly in the *Draft Science Plan* (dated September 30, 2004) for the Restoration Project. Key components of science development and implementation are:
   - Develop the Adaptive Management Plan and Scientific Information Collection Program.
   - Prioritize those questions that require more scientific investigation to reduce project uncertainties for PMT review. Ultimately, the PMT will determine the questions that will be addressed through further study.
   - Oversee a competitive proposal process for research activities related to data collection and analysis, information synthesis, and modeling strategies, and a undertake science outreach which will include workshops, conferences and other activities that advance South San Francisco Bay ecosystem restoration science.
   - Provide and review scientific information developed for public outreach.

2. Review Role with respect to Selected Consultant Team Documents. Science Team members will review Consultant Team documents or segments of those documents as appropriate. Such review can be time consuming and will not occur for all documents nor will all Science Team members be involved in the review of any particular document. Consultant Team presentations to the Science Team and subsequent discussion do not equate to peer review by the Science Team. Formal document review by the Science Team will follow one of two procedures:

A. Science Team-Consultant Team Loop--

- The Science Team or subset of the Team reviews a specific Consultant Team document.
- Science Team comments are provided in a letter or memo to the PMT.
- The PMT gives the Science Team comments, along with its own comments, to the Consultant Team. The Consultant Team will prepare a response to Science Team and PMT comments and provide them to the PMT.
- The Science Team reviews the Consultant Team's response to Science Team comments, to determine if comments were accurately understood and whether they will be addressed appropriately, and provides a letter or memo to the PMT.
- The Consultant Team finalizes its document(s).
- The Science Team provides a synopsis of its review of the final document and the extent to which the Consultant Team addressed Science Team comments on the draft document. This synopsis should be appended to the final public review document. While the Consultant Team may not have the time to address all the Science Team comments, there may be risk to the Project when comments are not addressed. Thus, where possible, the Science Team synopsis will discuss the risks associated with comments not addressed by the Consultant Team.
- *This type of interaction equates to peer review by involved Science Team members.*

B. Public Comment Procedure—Science Team members may also provide comments on Consultant Team documents during the public comment period. The Consultant Team will address these comments just as they would any other public comment. *This type of interaction does not equate to peer review by the Science Team.*

3. Advisory Role of Individual Science Team Members. Science Team members may provide *ad hoc* advice to the Consultant Team through informal interactions or formal collaboration. In either case, the final Consultant Team documents must state clearly the specific members of the Science Team who provided advice on the document. Individual members do not speak for the Science Team and *this type of interaction does not equate to peer review by the Science Team.*

Responsibilities of the Science Team:

Members will:

- Assist in developing Science Team products that support science development and implementation. This is a primary and mandatory responsibility.
- Participate in advising the Consultant Team, to the extent that they are able.
- Participate in reviewing Consultant Team documents and provide comments, to the extent that they are able.
- Attend Science Team meetings.
- Interact in a constructive and collegial manner with all contributors to the South Bay Salt Pond Restoration Project. This will include occasional involvement in clarifying scientific issues during public involvement.