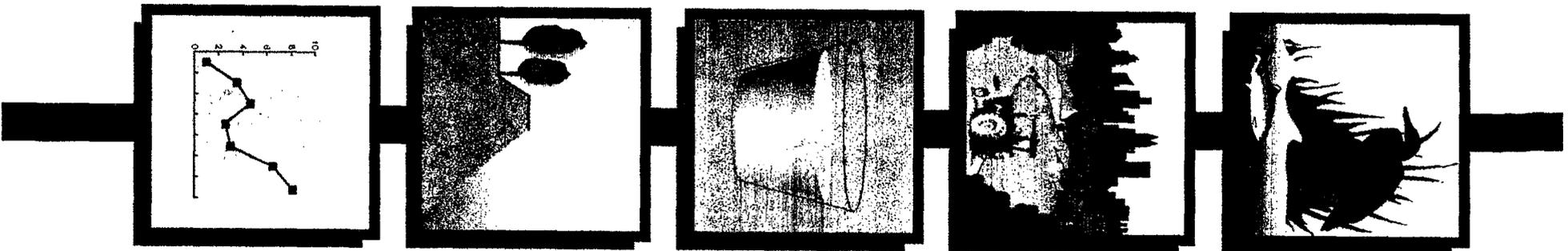




CALFED
BAY-DELTA
PROGRAM

Revised Phase II Report

December 18, 1998





**CALFED
BAY-DELTA
PROGRAM**

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December 18, 1998

To Interested Parties:

We are pleased to release a Revised CALFED Phase II Report on a framework for improving California's environment and water management programs. This report represents a significant achievement on behalf of the state and federal agencies, and representatives of urban, agriculture, environmental, business, rural and Delta stakeholders. This report contains proposed approaches for balancing and demonstrating improvement in all of the CALFED problem areas--ecosystem restoration, water quality, water supply reliability, and levee system integrity. While there is more work ahead, this report represents substantial agreement in many areas of the CALFED Program.

The purpose of the revised Phase II Report is to describe the CALFED Framework for resolving conflicts in the Bay-Delta system, which will be further developed and analyzed in a revised Draft EIS/EIR next year. The Report covers three main areas of information--background on CALFED, including the process, solution principles, objectives and fundamental concepts; a framework for a preferred alternative which includes a summary of the eight Program elements and their interrelationships; and a draft implementation plan, which includes proposed actions for the first seven years and a comprehensive monitoring and evaluation program to assure continuous improvement in water quality, ecosystem restoration, water supply reliability and levee system integrity.

The Report includes several significant and innovative features. The CALFED Ecosystem Restoration Program is the largest and most complex restoration program ever attempted in the United States. The integrated Water Management Strategy contains a broad range of water management tools (water transfers, water conservation, recycling, storage, and watershed management) to meet the Program's ecosystem, water quality, and water supply reliability objectives. A proposed Environmental Water Account concept provides the potential for greater flexibility in operating the state and federal water projects to protect fisheries and provide more certainty for water users.

The CALFED agencies recognize that there are many specific issues and stakeholder concerns that must be addressed as this framework is developed into a revised Draft and then Final EIS/EIR. During the next year, the Program will seek to develop performance

CALFED Agencies

<p>California</p> <ul style="list-style-type: none"> The Resources Agency Department of Fish and Game Department of Water Resources California Environmental Protection Agency State Water Resources Control Board 	<p>Federal</p> <ul style="list-style-type: none"> Environmental Protection Agency Department of the Interior Fish and Wildlife Service Bureau of Reclamation U.S. Army Corps of Engineers 	<ul style="list-style-type: none"> Department of Agriculture Natural Resources Conservation Service Department of Commerce National Marine Fisheries Service
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December 18, 1998
Page Two

objectives for each of the Program elements, to develop a financing strategy, and to further evaluate the degree of need for conservation, storage and other key elements of the water management strategy to meet the Program goals.

CALFED is planning public workshops early in 1999 in all regions of the state to solicit further public discussion of this document. CALFED will also continue to work with all interested stakeholders regarding the document. A revised Draft Programmatic EIS/EIR will be distributed for public comment with an updated Phase II Report later in 1999. We look forward to your continued participation in further developing the Program.

Sincerely,

A handwritten signature in black ink, appearing to read "Lester A. Snow", with a long horizontal flourish extending to the right.

Lester A. Snow
Executive Director

Either we have hope within us or we don't. It is a dimension of the soul and is not essentially dependent on some particular observation of the world. It is an orientation of the spirit, an orientation of the heart. It transcends the world that is immediately experienced and is anchored somewhere beyond its horizons. Hope in this deep and powerful sense is not the same as joy that things are going well or a willingness to invest in enterprises that are obviously headed for early success, but rather an ability to work for something because it is good, not just because it stands a chance to succeed. Hope is definitely not the same thing as optimism. It is not the conviction that something will turn out well, but the certainty that something makes sense regardless of how it turns out. It is hope, above all, which gives the strength to live and continually try new things.

-- Vaclav Havel

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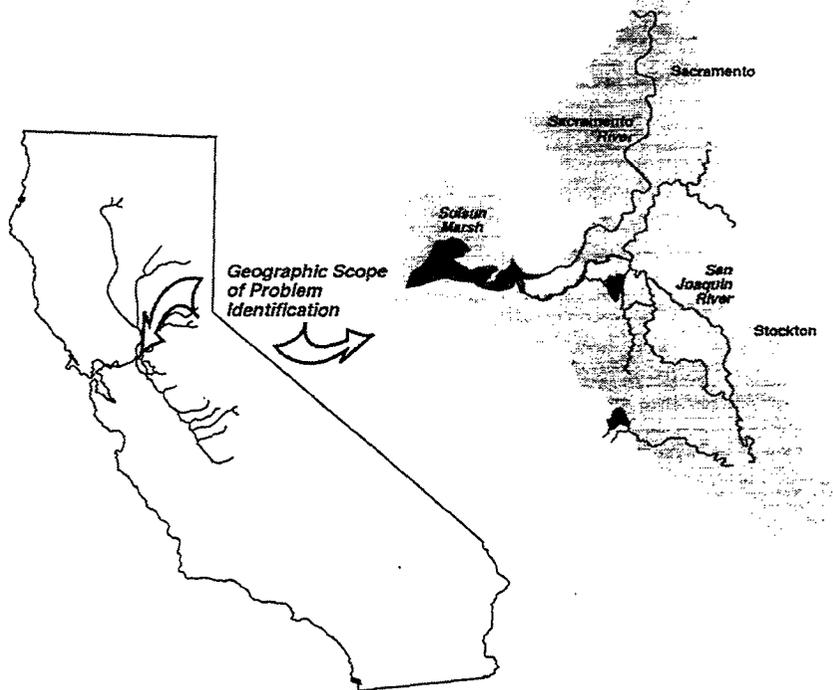
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1. INTRODUCTION

A maze of tributaries, sloughs, and islands, the San Francisco Bay/Sacramento-San Joaquin Delta estuary (Bay-Delta) is the largest estuary on the West Coast. It is a haven for plants and wildlife, supporting over 750 plant and animal species. The Bay-Delta includes over 738,000 acres in five counties. The Bay-Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for over 7 million acres of the most highly productive agricultural land in the world.

The Bay-Delta is also the hub of California's two largest water distribution systems - the Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation and the State of California's State Water Project (SWP). The CVP and SWP were built to provide river regulation, improvements in navigation and flood control, water supplies for irrigation, municipal, and industrial uses, and hydropower generation. In addition, at least 7,000 other permitted water diverters, some large and some small, have developed water supplies from the watershed feeding the Bay-Delta estuary. Together, these water development projects divert about 20 percent to 70 percent of the natural flow in the system depending on the amount of runoff available in a given year.

These diversions, along with the effects of increased population pressures



Geographic Scope for Problems and Solutions

The geographic scope for the problems consists of the legally defined Delta, Suisun Bay (extending to the Carquinez Strait) and Suisun Marsh.

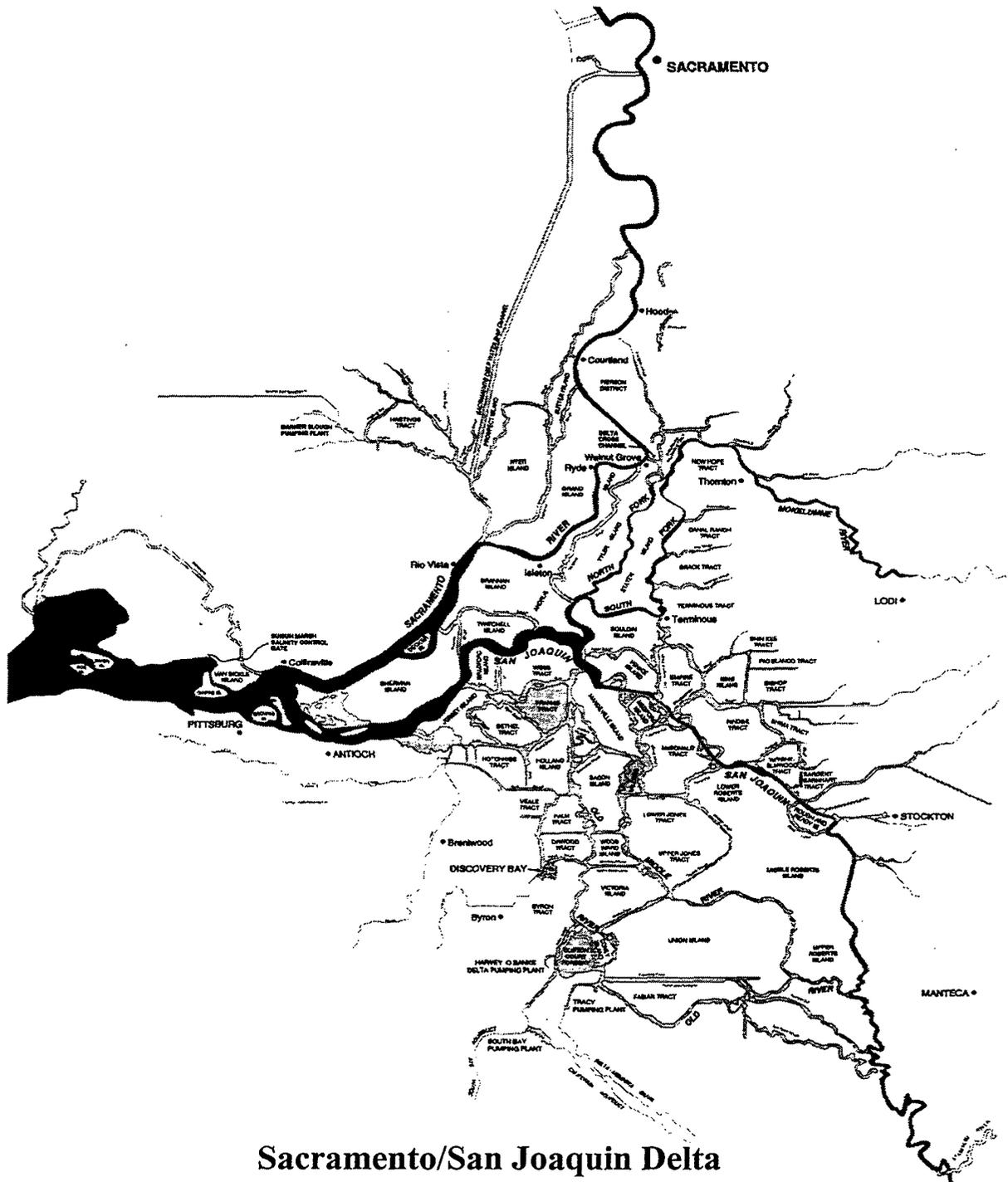
The geographic scope for developing possible solutions includes a much broader area that extends both upstream and downstream of the Bay-Delta. This solution scope includes the Central Valley watershed, the Southern California water system service area, San Pablo Bay, San Francisco Bay, near-shore portions of the Pacific Ocean out to the Farallon Islands and north to the Oregon border, and the Trinity River watershed, from which flows are diverted into the Bay-Delta system.

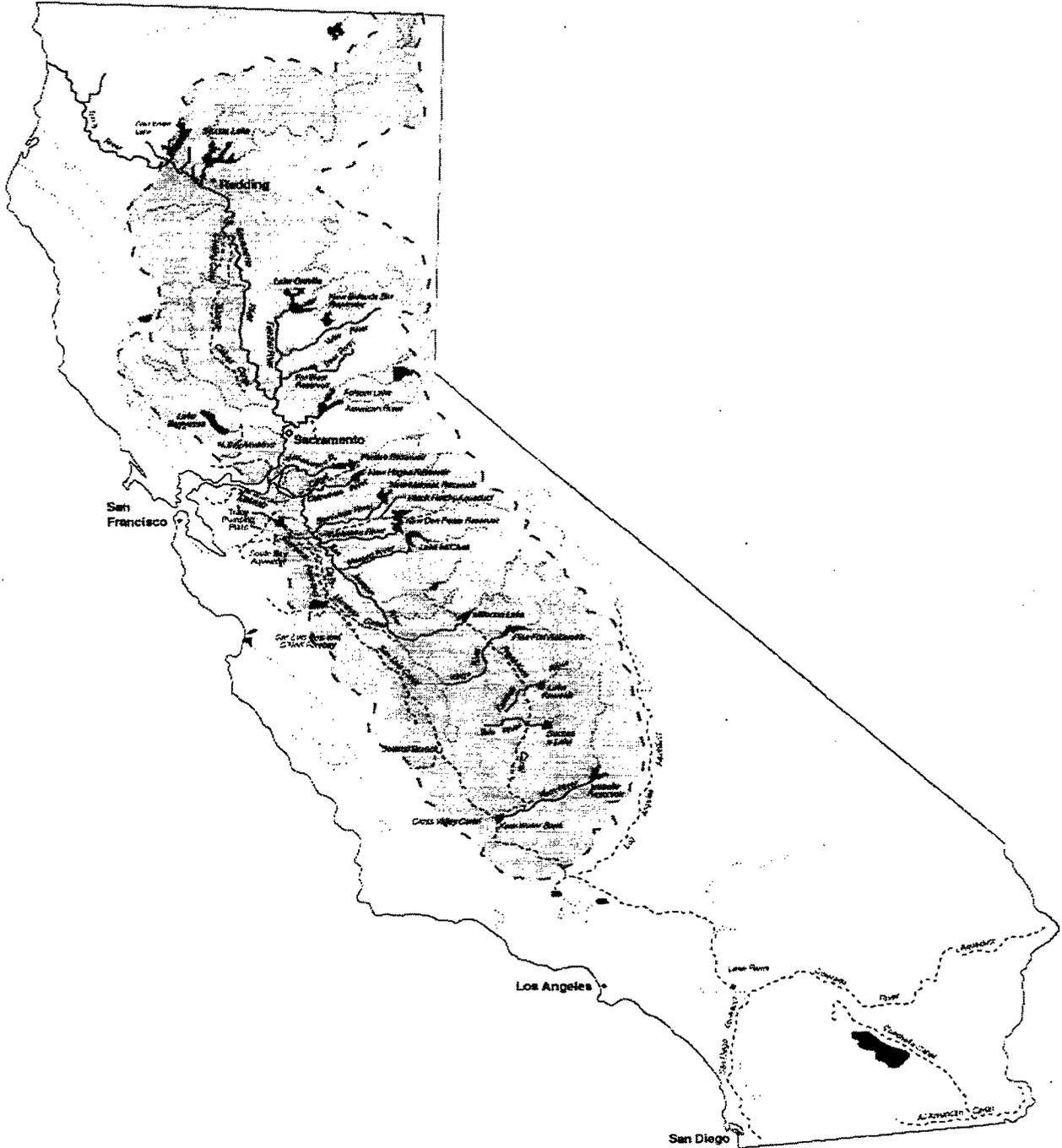
throughout California, the introduction of exotic species, water pollution, and numerous other factors have had a serious impact on the fish and wildlife resources in the Bay-Delta estuary. This impact, as well as other effects of the continued resource conflicts in the Bay-Delta system, is discussed in detail in Chapter 2.

Although all agree on the importance of the Bay-Delta estuary for both fish and wildlife habitat and as a reliable source of water, few agree on how to manage and protect this valuable resource. In the past two decades, these disagreements have increasingly taken the form of protracted litigation and legislative battles; as a result, progress on virtually all water-related issues has become mired down, approaching gridlock.

The CALFED Bay-Delta Program was established to reduce conflicts in the system by solving problems in ecosystem quality, water quality, water supply reliability, and levee and channel integrity. The Program seeks to do this by developing a long-term comprehensive plan that will restore ecological health and improve water supply and water supply reliability for beneficial uses of the Bay-Delta system. The Program has crafted alternatives that improve water quality so as to protect Delta drinking water supplies and improve the quality of aquatic habitat. Maintaining and improving the integrity of Delta levees and channels will protect agricultural, urban, and environmental uses within the Delta and protect the quality of water used elsewhere in the state. Water conservation and recycling programs can assure the efficient use of existing water supplies and any new supplies developed through the Program. **The CALFED mission, objectives, and solution principles shown in the box on page 6 guide how the Program will be implemented.** Carrying out the mission, achieving the objectives, and adhering to the solution principles will ensure that CALFED fulfills its commitment to continuous improvement in all of the four problem areas.

Given the history of conflict in the Bay-Delta system, CALFED recognizes that any proposed program to address this broad spectrum of resources will be controversial. Stakeholders participating in the CALFED process have already identified significant concerns about virtually every component in the Program. CALFED encourages all members of the public to review the material in this report and to provide comments for further consideration.





Watershed for the Sacramento/San Joaquin Delta

The Program

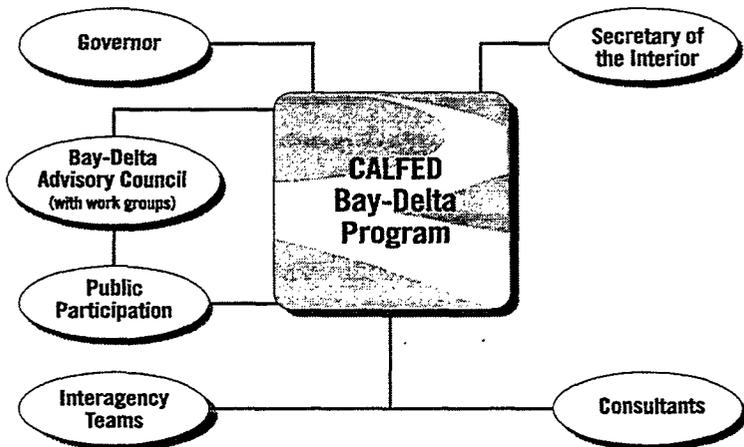
The CALFED Bay-Delta Program began in May of 1995 to address the tangle of complex issues that surrounds the Delta. The CALFED Program is a cooperative, interagency effort of 15 state and federal agencies with management or regulatory responsibilities for the Bay-Delta. In addition, other agencies, such as the California Department of Food & Agriculture, regularly participate in development of CALFED policies which affect their agencies.

The CALFED agencies appointed an executive director to oversee the process of developing a long-term comprehensive plan for the Bay-Delta. The Executive Director selected staff from the CALFED agencies to carry out the task. In addition, the CALFED agencies and stakeholders worked with the interagency CALFED Program team through multi-level technical and policy teams.

The CALFED Program is a collaborative effort including representatives of agricultural, urban, environmental, fishery, business, and rural counties who have contributed

CALFED	
<u>State Agencies</u>	<u>Federal Agencies</u>
Resources Agency of California*	U.S. Department of Interior
- Department of Water Resources	- Bureau of Reclamation*
- Department of Fish and Game	- Fish and Wildlife Service*
	- Bureau of Land Management
	- U. S. Geological Survey
California Environmental Protection Agency	U.S Army Corps of Engineers*
- State Water Resources Control Board	
	U.S. Environmental Protection Agency*
California Department of Food and Agriculture	U.S. Department of Commerce
	- National Marine Fisheries Service*
	U.S. Department of Agriculture
	- Natural Resources Conservation Service*
	- U.S. Forest Service
	Western Area Power Administration

* Co-lead agencies for EIS/EIR



to the process. The Bay-Delta Advisory Council (BDAC), a 34-member federally chartered citizens' advisory committee, provides formal comment and advice to the agencies during regularly scheduled public meetings. In addition, the CALFED process has included members of the public in development of every Program component from ecosystem restoration to financing.

**CALFED BAY-DELTA PROGRAM
MISSION STATEMENT, OBJECTIVES
AND SOLUTION PRINCIPLES**

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system.

CALFED developed the following objectives for a solution:

- Provide good water quality for all beneficial uses;
- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species
- Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system
- Reduce the risk to land use and associated economic activities, water supply, infrastructure and the ecosystem from catastrophic breaching of Delta levees.

In addition, any CALFED solution must satisfy the following **solution principles**:

- **Reduce Conflicts in the System** Solutions will reduce major conflicts among beneficial uses of water.
- **Be Equitable** Solutions will focus on solving problems in all problem areas. Improvements for some problems will not be made without corresponding improvements for other problems.
- **Be Affordable** Solutions will be implementable and maintainable within the foreseeable resources of the Program and stakeholders.
- **Be Durable** Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.
- **Be Implementable** Solutions will have broad public acceptance and legal feasibility, and will be timely and relatively simple to implement compared with other alternatives.
- **Have No Significant Redirected Impacts** Solutions will not solve problems in the Bay-Delta system by redirecting significant negative impacts, when viewed in their entirety, within the Bay-Delta or to other regions of California.

The Program was divided into three discrete phases.

Phase I

In Phase I, completed in September 1996, CALFED identified the problems confronting the Bay-Delta, developed a mission statement and guiding principles, and devised three preliminary categories of solutions for Delta water conveyance.

Following scoping, public comment, and agency review, CALFED concluded that each Program alternative would include a significant set of Program elements addressing problems for levee system integrity, water quality improvements, ecosystem restoration, and water use efficiency measures. Two additional elements (water transfers and watershed management) were added to each alternative because of their value in helping the Program meet its multiple objectives. These six program elements have generally been referred to as the *common programs*. In addition, CALFED identified three preliminary alternatives to be further analyzed in Phase II. The three preliminary alternatives represented three differing approaches to conveying water through the Delta. The first conveyance configuration relied primarily on the existing conveyance system, with some minor changes in the south Delta. The second configuration relied on enlarging channels within the Delta. The third configuration included in-Delta channel modifications and a conveyance channel that would move some water around the Delta. Each of these alternatives also included consideration of new ground and surface water storage options.

Phase II

CALFED is currently in Phase II, which will end in late 1999 at the time of the Final Programmatic Environmental Impact Statement/Environmental Impact Report (EIS/EIR). A programmatic EIS/EIR, also referred to as a first-tier document, is typically prepared for a series of actions that can be characterized as one large project and is required for actions proposed by or approved by state and federal agencies. In Phase II, CALFED is developing a preferred program alternative, is conducting comprehensive programmatic environmental review, and is developing the implementation plan focusing on the first seven years (Stage 1) following the Record of Decision (ROD) on the EIS/EIR.

This Revised Phase II Report primarily focuses on the draft preferred program alternative including background, description, and implementation plan. The full draft Programmatic EIS/EIR which will be released separately, other technical appendices, and supporting technical reports -- comprising thousands of pages -- will be available from CALFED and major libraries throughout the state.

Phase III

In Phase III, following completion of the Final Programmatic EIS/EIR, implementation will begin. This period will include site-specific environmental review and permitting, as necessary. Because of the size and complexity of any of the alternatives, implementation is likely to take place over a period of decades. Part of the challenge for Phase II is designing an implementation strategy that acknowledges this long implementation period and keeps all participants committed to the successful completion of all phases of implementation.

Public Involvement

During Phase I, which ended September 1996, CALFED held scoping meetings, technical workshops, public information meetings, and public BDAC workgroup meetings. The commitment to active public involvement has continued through Phase II with additional public meetings, presentations before focused groups, media outreach, special mailings of newsletters, regularly updated information on the Program's web site, and a toll-free public information telephone line.

In addition to the general public meetings and stakeholder workshops, 17 formal public hearings on the draft programmatic EIS/EIR were held around the state between April 21 and May 28, 1998.

The Program has worked to involve California's diverse multi-cultural communities by producing fact sheets in five languages (Spanish, Chinese, Japanese, Korean, and Vietnamese), meeting with multi-cultural business, media, social service and agricultural organizations, and placing media notices in ethnic media outlets. Increasing awareness and knowledge among the multi-cultural communities is a continued goal of CALFED's public outreach.

WHERE TO FIND PUBLIC OUTREACH INFORMATION

- Program's website (<http://calfed.ca.gov>)
- Toll-free public information telephone line (1-800-700-5752)
- *CALFED News, EcoUpdate* and Factsheets (available from CALFED Bay-Delta Program, 1416 Ninth Street, Suite 1155, Sacramento, CA 95814; phone 916-657-2666)
- BDAC and other public meetings

Next Steps in Phase II

Between the Revised Draft Programmatic EIS/EIR and the Final EIS/EIR in late 1999, work will continue on refining and evaluating the preferred program alternative. This will include additional technical evaluations. CALFED will work with elected officials, local agencies, interest groups, and the public over the coming months to finalize the preferred program alternative.

A new public comment period on the Revised Draft Programmatic EIS/EIR will begin in early 1999, including public hearings throughout the state. The Final Programmatic EIS/EIR is scheduled for late 1999.

Some Delta Statistics

Area of the Watershed: The system drains more than 61,000 square miles, or 37% of the state.

Area of the Delta: The legal Delta includes 738,000 acres.

Delta Inflow*: Historic inflow ranges from 6 to 69 million acre feet (MAF) per year; average is 24 MAF.

Diversions: Over 7,000 diverters draw water from the system, including 1,800 in the Delta itself.

Delta Exports*: The SWP and CVP draw an average of 5.9 MAF (approximately 3.6 MAF for agriculture and 2.3 MAF for urban uses) from the Delta each year .

In-Delta Water Use: Net in-Delta water use averages approximately 1 MAF annually.

Flora: Over 400 plant species can be found in the Delta, not including agricultural crops.

Fauna: The Delta harbors about 225 birds, 52 mammals, and 22 reptile and amphibian species.

Fish: There are 54 fish species in the Delta, and a total of 130 in the Delta and Bay.

Marshes: There are 8,000 acres of tidal marsh in the Delta.

Levees and Channels: Over 700 miles of waterways are protected by 1100 miles of levees.

Subsidence: Some Delta lands are more than 20 feet below sea level.

Delta Farmland: Over 520,000 acres are farmed in the Delta.

Principal Crops: The most commonly grown Delta crops are wheat, alfalfa, corn, and tomatoes.

Agricultural Value: Average annual gross value of Delta production is \$500 million.

Recreation: Recreational use of the Delta is about 12 million user days per year

* Simulated flow based on historical hydrology, but with existing storage and conveyance facilities in place and operating to meet 1995 levels of demand.

2. BACKGROUND

2.1 Bay-Delta Problems/Objectives

There is a rich history of conflict over resource management in the Bay-Delta system. For decades the region has been the focus of competing interests--economic and ecological, urban and agricultural. These conflicting demands have resulted in several resource threats to the Bay-Delta: the decline of wildlife habitat; the threat of extinction of several native plant and animal species; the collapse of one of the richest commercial fisheries in the nation; the degradation of Delta water quality; the continued land subsidence on Delta islands; and a Delta levee system faced with a high risk of failure.

At the simplest level, problems occur when there is conflict over the use of resources from the Bay-Delta system. As population increases, California asks more of the system, and there is more conflict. Single-purpose efforts to solve problems often fail to address the conflict. To the extent that these efforts acquire or protect resources for one interest, they may cause impacts on other resources and increase the level of conflict. Major conflicts are summarized below.

- *Fisheries and Water Diversions.* The conflict between fisheries and water diversions results primarily from fish mortality attributable to water diversions. This includes direct loss at pumps, reduced survival when young fish are drawn out of river channels into the Delta, reduced spawning success of adults when migratory cues are altered, and reduced survival associated with inadequate stream flows and reduced Delta outflows. The need to protect species of concern has prompted restrictions on pumping and other regulations, which restrict the quantity and timing of diversions.
- *Habitat and Land Use.* Habitat to support various life stages of aquatic and terrestrial plants and animals in the Bay-Delta has been lost because of conversion of that habitat to agricultural and urban uses. In addition, some habitat has been lost or adversely altered due to construction of flood control facilities and levees needed to protect developed land. Efforts to restore the habitat can also create conflict with existing uses, such as agriculture and levee maintenance.
- *Water Supply Availability and Beneficial Uses.* As water use and competition for water have increased during the past several decades, so has conflict among users. A major part of this conflict is between the volume of instream water needs and out-of-stream water needs, and the timing of those needs within the hydrologic cycle.

-
- *Water Quality and Human Activities.* Water quality for ecosystem and consumptive uses can be adversely affected by a broad range of human activities. In addition to particular activities that discharge pollutants (such as abandoned mines or industrial sources), urban and agricultural areas produce degraded surface runoff that can seriously affect the Bay-Delta's many beneficial uses.

From these central conflicts, CALFED identified a series of problems in each of four problem areas. From each problem, a Program objective was developed. A complete set of identified problems and program objectives is contained in the *Program Goals and Objectives Appendix* to the Draft Programmatic EIS/EIR. The four problem areas for the Bay-Delta system are:

Ecosystem Quality - The Bay-Delta system no longer provides the broad diversity of habitats nor the habitat quality necessary to maintain ecological functions and support healthy populations and communities of plants and animals. The health of the Bay-Delta ecosystem has declined in response to a loss of habitat to support various life stages of aquatic and terrestrial biota and a reduction in habitat quality due to several factors including diversion of water, toxics, and exotic species.

The primary ecosystem quality objective of the Program is to "improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species." The strategy to achieve this objective is to begin recovery of ecosystem health by reducing or eliminating factors that degrade habitat, impair ecological functions, or reduce the population size or health of species.

The ecosystem restoration program (ERP) is the largest, most comprehensive, and most inclusive environmental restoration program in the United States. It provides a new perspective to restoration science by focusing on the rehabilitation, protection, or restoration of ecological processes which create and maintain habitats needed by fish, wildlife, and plant species dependent on the Delta and its tributary streams. The program is supported by an implementation strategy that emphasizes solid science, adaptive management, and local participation: an innovative approach that is becoming a model for similar efforts throughout the nation.

Water Supply Reliability - During the past several decades, as water diversions and recognition of environmental water needs have both increased, conflicts between these water uses has also increased. In response to declining fish and wildlife populations, water flow and timing requirements have been established for certain fish and wildlife species. Over the past decade, a number of actions including the Central Valley Project Improvement Act and the Delta Accord have reallocated over 1 million acre-feet (MAF) of CVP/SWP water supply for environmental purposes during the driest years. These requirements have reduced the projects' flexibility to meet the water demand both in

quantity and timing for exports from the Delta. Conflicts between protective environmental measures and Delta exports also reduce opportunities for market water transfers. There are concerns that additional restrictions that might be needed to protect species or for other regulatory purposes could increase the uncertainty of Delta water supplies. This basic disparity between water needs and water availability has created economic uncertainty in the water service areas and increased conflict over supplies.

The primary water supply objective of the Program is to “reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system.” The Program has a three-part strategy to reduce conflict and meet water supply reliability objectives. This strategy seeks to reduce the mismatch between supply and beneficial uses through a variety of actions including increasing the ability and flexibility to store and transport water, reducing the impact of water diversions on the Bay-Delta system, and managing demand by increasing conservation and recycling and by water transfer markets.

Water Quality - The Delta is a source of drinking water for millions of Californians and is critical to the state's agricultural sector. In addition, good water quality is required to maintain the high quality habitat needed in the Bay-Delta system to support a diversity of fish and wildlife populations. Bay-Delta water quality is a primary concern.

The primary water quality objective of the Program is to “provide good water quality for all beneficial uses.” Good water quality means different things to different users, and there are different ways to achieve the objective. For example, organic carbon that is naturally present in Delta water can contribute to carcinogenic treatment byproducts in drinking water, but this carbon supports the primary productivity and ecological function of the Bay-Delta system. The Program's strategy to achieve the water quality objective includes reducing or eliminating parameters that degrade water quality at its source. Many of the Program's water quality sub-objectives concentrate on this direct source control approach.

Levee System Integrity - Settlers first constructed levees in the Sacramento-San Joaquin Delta during the late 1800s. Initially settlers built levees to turn swamp and overflow lands into agricultural land and over time increased the levee heights to maintain protection as both natural settling of levees and shallow subsidence of Delta island soils occurred (biological oxidation, peat fires, and wind erosion have lowered interior island elevations over time). The increased levee heights combined with poor levee construction, and inadequate levee maintenance makes Delta levees vulnerable to failure, especially during earthquakes or floods. Delta island farmland, residences, wildlife habitat, and critical infrastructure can be flooded as a result of a levee failure. Levee failure on specific Delta islands can have direct or indirect impacts on water supply distribution systems. Direct impacts result from flooding of distribution systems such as

the Mokelumne Aqueduct, and indirect impacts result from salty water moving up into the Delta, as an island is inundated under non-flood conditions. The increased salinity in the Delta would be of particular concern in a low water year, when less freshwater would be available to flush out the salt water (such as occurred when the Brannan Andrus Island levee failed in 1972). Long-term flooding of specific Delta islands can have an effect on water quality by changing the rate and area of the mixing zone. A long interruption of water supply for in-Delta and export use by both urban and agricultural users could result, until the salt water could be flushed from the Delta.

The primary levee system vulnerability objective of the Program is to “reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.” Failure of Delta levees can result either from catastrophic events, such as earthquakes and floods, or from gradual deterioration. Subsidence of the Delta island peat soils and settling of levee foundations places additional pressure on levees and increases the risk of failure. The Program’s strategy for achieving the levee system integrity objectives is to implement a comprehensive plan to address long-term levee stabilization and develop an effective emergency response capability in the event of failure while providing opportunities to maintain and enhance ecosystem values.

The unprecedented scope of the CALFED Bay-Delta Program cannot be overstated. The vast geographic extent of the area under consideration, the variety and complexity of the hydrological and ecological process involved, the history of conflict among the affected interests, and the magnitude of the potential economic consequences for California’s commercial, agricultural, and industrial base all combine to make this effort the most ambitious of its kind anywhere in the world. In the United States, only the well-known efforts at addressing environmental and institutional problems in the Columbia River Basin, Chesapeake Bay, and in the Florida Everglades can serve as comparisons.

2.2 Fundamental Program Concepts

Three fundamental concepts related to the Bay-Delta system and its problems have guided the development of proposed CALFED solutions. These concepts are not new, but CALFED has looked at them in new ways to develop options for solving problems successfully.

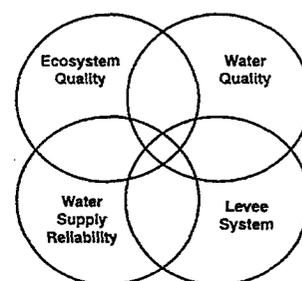
First, the four problem areas (ecosystem quality, water quality, water supply reliability, and levee system integrity) are **interrelated**. CALFED cannot effectively describe problems in one problem area without discussing the other problem areas. It follows that solutions will be interrelated as well; many past attempts to improve a single problem area have achieved limited success because solutions were too narrowly focused.

Second, there is great variation in the flow of water through the system and in the demand for that water at any time scale that might be examined (from year to year, between seasons, even on a daily basis within a single season). The value of water for all uses tends to vary according to its scarcity and timing. This leads to the need for an overall **water management strategy**.

Finally, the solutions must be guided by **adaptive management**. The Bay-Delta ecosystem is exceedingly complex, and it is subject to constant change as a result of factors as diverse as global warming and the introduction of exotic species. CALFED will need to adapt management of the system as we learn from our actions and as conditions change.

Interrelationships

In the past, most efforts to improve water supply reliability or water quality, improve ecosystem health, or maintain and improve Delta levees were single-purpose projects. A single purpose can keep the scope of a project manageable but may ultimately make the project more difficult to implement. The difficulty occurs because a project with narrow scope may help to solve a single problem but have impacts on other resources, causing other problems. This in turn leads to conflict. Ultimately no problem is solved, or one problem is solved while others are created.



The CALFED Program takes a different approach, recognizing that many of the problems in the Bay-Delta system are interrelated. Problems in any one problem area cannot be solved effectively without addressing problems in all four areas at once. This greatly increases the scope of our efforts but will ultimately enable us to make progress and move forward to a lasting solution.

Significantly, there are many linkages among the objectives in the four problem areas and among the actions that might be taken to achieve these objectives. Solving problems in four areas at once does not require a four-fold increase in the cost or number of actions. Most actions that are taken to meet program objectives, if carefully developed and implemented, will make simultaneous improvements in two, three, or even four problem areas.

Eight Program Elements Working Together to Solve the Four Problem Areas

- Long-Term Levee Protection Plan
- Water Quality Program
- Ecosystem Restoration Program
- Water Use Efficiency Program
- Water Transfer Program
- Watershed Program
- Storage
- Conveyance

What kinds of actions can be taken to solve problems in the Bay-Delta system? The actions can

be grouped into categories of levee system improvements, water quality improvements, ecosystem restoration, water use efficiency, water transfers, watershed management, water storage, and Delta conveyance modifications. Specific actions range from physical restoration of habitat in the Delta to water conservation measures. Programmatic descriptions of the eight program elements are presented in Chapter 4 of this document. More detailed descriptions for the first stage of implementation are presented in Chapter 5. Complete descriptions of Program elements are contained in various *Program Plans*.

While CALFED will generally not rely on new regulations to implement Program objectives, it does recognize that existing regulatory programs will continue to be implemented by CALFED agencies. CALFED represents a unique opportunity to provide high-level coordination of these regulatory programs so that regulatory implementation works in furtherance of CALFED Program goals. The CALFED Bay-Delta Program specifically defines incentives and voluntary partnerships to implement many individual actions in the Program. Incentives allow stakeholders to participate in CALFED actions which may not have been economical to them without the incentives. Partnerships allow stakeholders and CALFED agencies to leverage their individual resources by teaming on certain actions.

Some regulations, like those contained in the State and federal Endangered Species Acts (ESA) and Section 404 of the Clean Water Act, are ones that CALFED must satisfy as the Program is implemented. Many other regulatory actions can be made more effective and constructive as a result of CALFED actions. For example, water quality regulatory agencies are obligated to develop total maximum daily loads (TMDLs) for certain water quality constituents in the Bay-Delta system. CALFED efforts in monitoring and research will provide valuable information which will assist regulatory agencies in developing these TMDLs. CALFED incentive based source control actions will help reduce the load of these and other pollutants. In this way, many ongoing regulatory requirements will be easier to satisfy in the context of the CALFED Bay-Delta Program.

System Variability - Building a Water Management Strategy

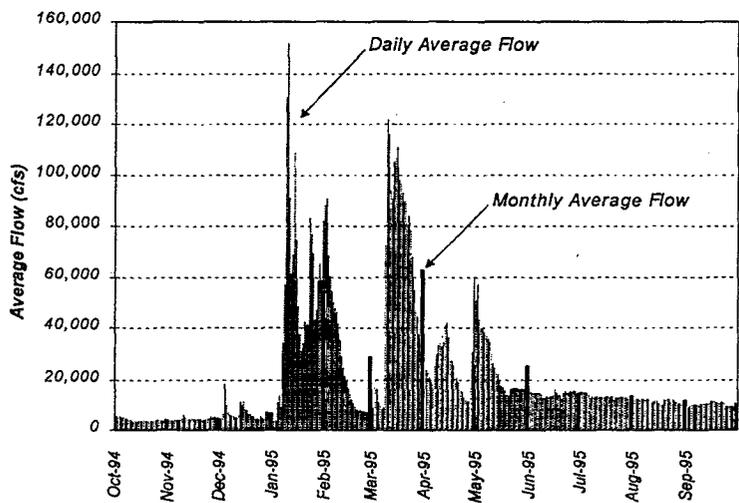
Variations in Supply and Demand

Any consideration of water management in California must start with a recognition of the immense variability in the availability of and demands for water. The watershed of the Bay-Delta system is subject to a highly variable rain and snowfall pattern. The total amount of precipitation and runoff in the watershed varies widely from month to month and from year to year. Year types are classified into five types from wet to critically dry, but even within each type there is considerable variation in the pattern of precipitation. Within any given year, whether wet or dry, most of the rain falls in the winter months, while snow pack typically melts in the late spring and early summer. In other months, water flow is typically much lower, leading to dramatically different flow levels for different months. Even within each month, flow can vary widely.

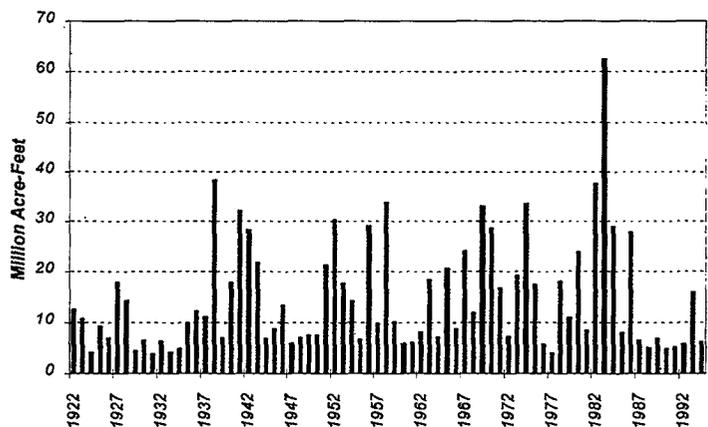
Two figures help illustrate the variability in the hydrologic system. Water flow variability is most notable when daily flows are examined. The first figure presents a graph of daily flows throughout a water year. For comparison, average monthly flows are also shown (thicker black bars). The average monthly flows mask the much greater variation exhibited in daily flows that rise and fall with the passing of each major storm system. It is quite typical for winter and spring storms to produce periodic peaks in flow such as those shown in January, March, and May.

The second figure shows a simulated yearly total Delta outflow for the period from 1922 to 1994. The simulated Delta outflow is based on historical hydrology, but with existing storage and conveyance

**Sacramento River Flow at Hamilton City
Water Year 1995**



Yearly Total Delta Outflow



facilities in place and operating to meet system-wide 1995 level of demand. The graph reflects the average annual variability that occurs from year to year. Memorable extremes, such as the drought of 1976-77, are quite apparent.

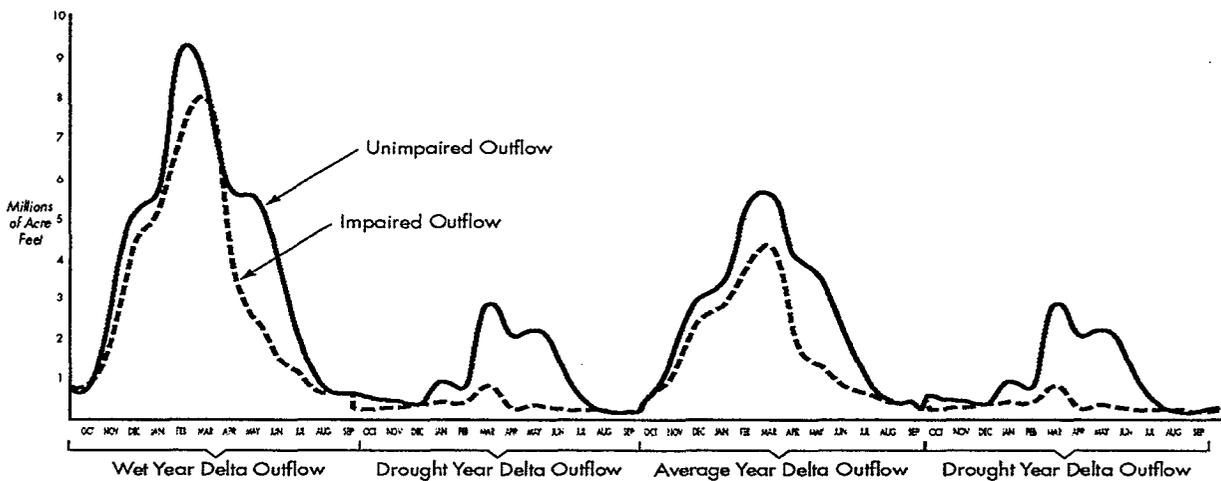
The demand for water also varies over time. Agricultural demands tend to be higher than average in dry years, because there is less precipitation available and plants need more irrigation. In addition, local supplies may be more limited in dry years, which imposes further demands on local groundwater and on water imported from elsewhere in the system. Agricultural water demand also varies substantially seasonally; the demand is highest in the summer, when natural flows are lowest.

Urban demands for water vary as well. Many urban areas experience substantial seasonal variation in demands for landscaping irrigation. In addition, urban areas dependent on the Bay Delta for some or all of their drinking water supply place a significant premium on the quality of water (in addition to the quantity). In dry years and in dry seasons, increased salinity in the Bay Delta (from both saltwater intrusion and upstream discharges), reduces the usefulness of Bay Delta water to urban users.

The value of water in the ecosystem varies over time. For example, high flows in the early spring have substantial ecosystem benefits, including maintaining river and stream channels and triggering behavioral changes in some species, such as anadromous fish, that have evolved in this variable system. Ecosystem water needs are generally more consistent with the natural seasonal flow pattern than consumptive water demand, but historic changes in the system have resulted in circumstances where existing flows are low during times of high ecosystem need.

Variation in ecosystem demands for water is highlighted in the figure, below, which illustrates the simulated impact of the water diversion system on natural flow patterns.

Change in Delta Outflow from System Development



This figure suggests that water diversions have had a relatively higher impact on the natural flow regime in drier water years than in wetter water years. As discussed below, many of the recent environmental protections imposed on the Bay Delta system have tried to reduce this relative stress on the environment during drier years. This discussion of the wide variability of both the supply of and demand for water suggests one important water management conclusion; averages don't tell the whole story.

Averages are misleading because they mask the variability in flows and demands. An increase in Delta outflow in an average year may have only a minor beneficial effect on the environmental health of the system, whereas a similar increase in a dry or critically dry period may yield much greater environmental benefits. Similarly, although average increases in supplies may be desirable for urban and agricultural users, dry and critical year supplies are substantially more important given the higher demand and reduced alternatives. This variation in water supply and demand results in conflicts over water in the state, and conflict increases substantially in dry and critical years when all water uses, both environmental and consumptive, demand more water.

Institutional and Operational Framework

In response to the substantial variations in hydrology and in water demands, California has developed an extremely elaborate water diversion, storage, and delivery system. The broad purpose of this system has been to collect water in times of availability and to deliver it at the time and place of need.

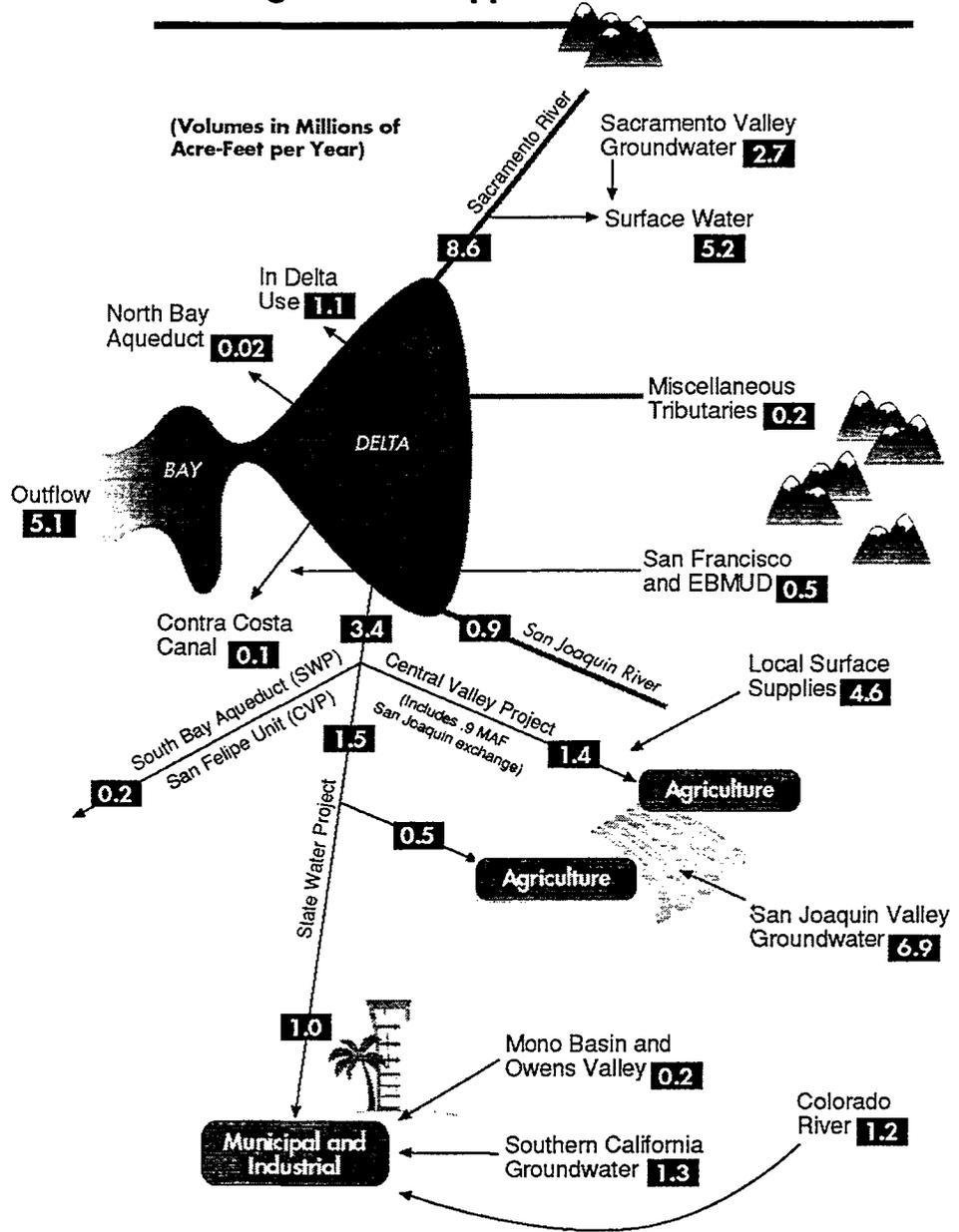
In addition to the physical water system infrastructure, California has also created a legal/management structure governing its water resources. This legal/management structure relies on a complex set of rights, regulations, and contractual relationships that define which water users (both consumptive and environmental) will have access to water at particular times. For consumptive users, this system relies heavily on the concept of junior and senior priorities - those water users with more senior rights generally have more reliable water supplies than those with more junior rights.

In addition to allocating shortages, the legal/management system also has the effect of allocating water savings. For example, if an upstream diverter introduces some water saving management techniques, the next downstream diverter with senior rights can have more access to water. Sometimes the allocation of savings is more complicated. In the State Water Project, water savings by one project user (Southern California urban users, for example) go back to the Project and are allocated by contractual rights to the next contractual project user (Kern County, for example).

Second, the figures show clearly an ongoing problem with groundwater overdraft in the San Joaquin Valley. This is especially true in the dry year scenario, where groundwater pumping has been used to make up for significant shortfalls of imported water. The problem of groundwater overdraft is critical to long term water management in California. Overdraft can cause land subsidence, deterioration of water quality, and increases in groundwater pumping. In addition, concerns about groundwater depletion and degradation are frequently voiced in the debate over water transfers in the State. Long-term effective groundwater management throughout California will be essential to the success of a range of CALFED programs, including water transfers, groundwater banking, watershed management, and water use efficiency programs.

Water Management in California

Drought Period Supplies 1995-level Demand



The preceding discussion of the hydrological and institutional framework of California water management is useful in understanding the current conflicts over water resources in the State. In recent years, the water management systems has experienced increasing stress as the regulatory

process has started addressing the environmental degradation evident in the Bay Delta system. In effect, these regulatory measures have increased Delta outflow and reduced diversions, forcing consumptive water users to place more reliance on other sources (groundwater pumping, water transfers, etc.) Given that the last several years have generally been wet water years, the impacts of these environmental measures have generally been muted.

The following table is a modeled example of how the recent changes in the regulatory regime would reduce water deliveries by the state and federal water projects in the driest of water years and is generally an indicator of reduced operational flexibility.

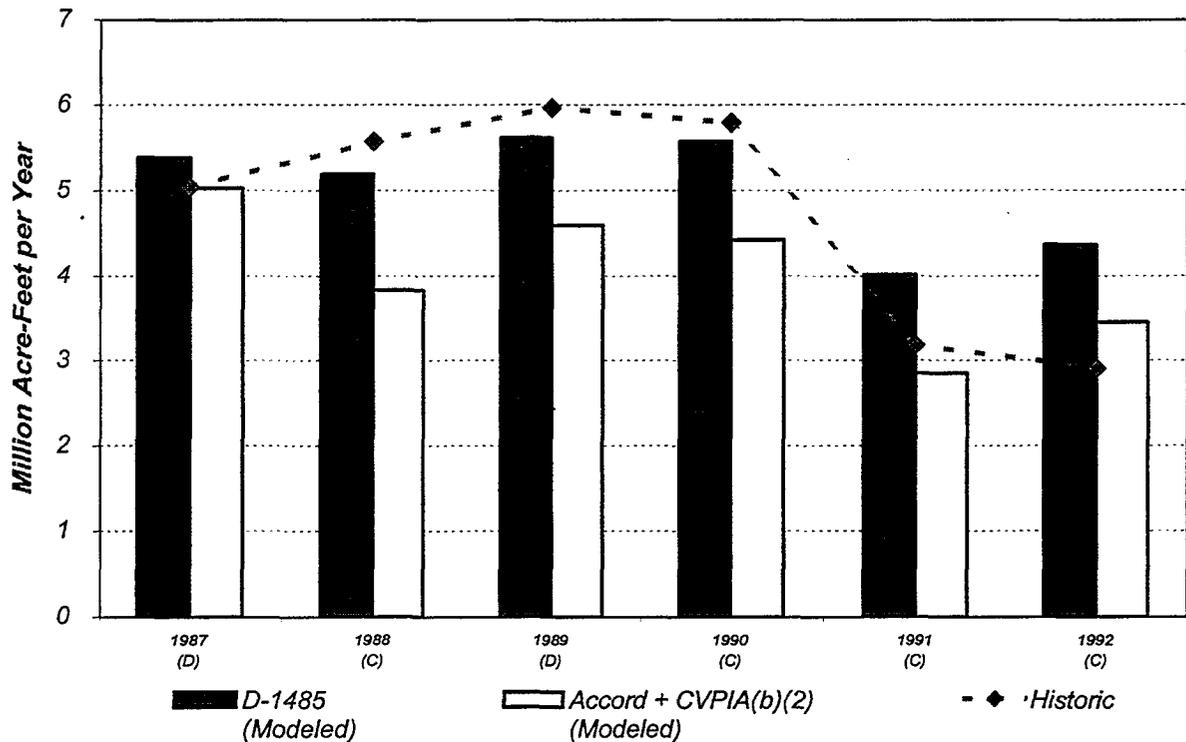
Modeled State and Federal Water Contract Deliveries
Impacts of Protective Operating Criteria
(in 1,000 Acre-Feet per Year)

Study	Condition	Long-Term Average Oct 1921 to Sep 1994			Dry Period Average Jun 1986 to Sep 1992		
		SWP	CVP	Total	SWP	CVP	Total
1.	Deliveries under D-1485	3,067	2,822	5,889	2,545	2,457	5,003
2.	<u>Incremental Water Supply Impacts Under:</u> 1994 Accord	-98	-231	-329	-357	-513	-870
3.	1994 Accord + CVPIA (b)(2)	-6	-171	-177	61	-283	-222
	Cumulative Water Supply Impacts:	-104	-402	-506	-295	-796	-1,092

This table highlights that conflicts over water in the state intensify in the driest water years, when all uses, both environmental and consumptive, are competing for a drastically reduced natural water supply. In addition, the regulatory regime itself has had another effect. Protecting environmental uses through regulatory constraints has restricted the use of the water delivery system at certain times and has reduced the capability of the system to respond to consumptive user needs.

The following figure shows the results of the application of these measures during the 1987-92 drought. The environmental measures (Accord and CVPIA) were not yet in force during that period, but the figure shows simulated exports as if they were in place. The figure shows that their application would have resulted in decreased deliveries. Decreased deliveries also cause loss of system flexibility. This is a current matter of concern, one that is not dependent on projected increases in future water demand.

**Delta Exports Under Various Protective Operating Criteria
June 1986- September 1992 Dry Period**



Defining water supply reliability

CALFED has identified water supply reliability as one of the major problem areas it will address. Unfortunately, this term means different things to different people. Some interpret the term as meaning average water deliveries or average deliveries during dry periods. As shown above, average deliveries don't adequately account for the extreme variation in California hydrology. Further, a focus on dry period deliveries is generally just another way of restating the fact that conflicts over water are most intense during dry periods. Some stakeholders have suggested that the proper measure of water supply reliability is the ability of the system to support both a

sustainable urban and agricultural economy and a healthy ecosystem.

CALFED believes that an appropriate working definition of success in water supply reliability is the following list of objectives:

- Reduce water diversion conflicts between instream beneficial uses (environmental uses) and out-of-stream beneficial uses (consumptive uses).
- Decrease drought impacts, both for the environment and for other water users.
- Increase water supply availability by providing means for water users and the environment to acquire additional water at high priority times and places.
- Increase operational flexibility by improving the ability of the system to respond appropriately to unforeseen or unpredictable future events.
- Increase the utility of the water used for all beneficial uses by improving water quality.

CALFED's water supply reliability goal is to develop and implement a water management strategy that achieves each of these five qualitative objectives.

Water management tools

There are seven general categories of tools that can be used to manage water in the California system. Each of these tools is already being implemented in California to some degree. The tools are:

- Water conservation
- Water recycling
- Water transfers, both short term and long term
- Storage, both groundwater and surface water
- Watershed management
- Water quality control
- Monitoring and real-time diversion and facilities management

In evaluating these tools, there are three fundamental factors to consider: (1) costs, (2) flexibility, and (3) environmental impacts.

Costs - The different tools differ substantially as to cost. One important measure of cost is the estimated cost per acre-foot of water supply. Some estimates of this cost measure have been generated by CALFED and are shown in the following table. This table illustrates the wide differences in the costs of tools, both between types of tools (recycling versus transfers) and within a particular tool (conservation, for example).

Potential Water Supply Reliability Measures (with 1995-Level Population and Water Deliveries)		
Reliability Measures	Potential Water Supply (MAF per Year)	Estimated Cost Range (\$/acre-foot)
Urban Conservation (Irrecoverable Loss Portion)	1.1 - 1.5	\$50 - \$1,600
Agricultural Conservation (Irrecoverable Loss Portion)	0.25 - 0.50	\$50 - \$850
Urban Recycling	0.5 - 1.0	\$800 - \$1,500
Storage (Stage 1) ¹	0 - 0.32	\$250 - \$500
Water Transfers ²	0.6 -1.2	\$50 - \$250
Notes: ¹ Dry period water supply with 1.3 MAF of storage (small Shasta enlargement, Madera Ranch, enlarged Kern Water Bank, and In-Delta storage) plus increasing SWP export capacity and joint use of facilities. ² From <i>Least-Cost CVP Yield Increase Plan</i>		

Although cost per acre-foot is an important cost measure, other cost factors must also be assessed. For example, the cost of water will further increase depending on improvements required to meet water quality objectives (salinity, mercury, etc.). Depending on the water source, the costs for source control measures and treatment measures will vary. These cost differences are important in deciding the proper mix between watershed actions and treatment actions to attain the water quality goals. Finally, there are also significant regional differences with respect to the suitability and cost of tools.

Flexibility - Water management tools also differ as to their flexibility - that is, their adaptability to varying hydrologic conditions and management objectives. For example, many water conservation measures have substantial benefits in reducing overall demand, but, once implemented, don't provide flexibility to react to changes in hydrological circumstances. Surface storage facilities are very effective at providing a rapid reaction in either releasing or collecting large amounts of flow. In contrast, although groundwater storage may hold more volume, it is slower to fill and draw down, and would have to be operated in conjunction with surface storage to attain the same level of flexibility. Thus, it will be important to evaluate not only individual tools, but combinations of tools for flexibility.

Environmental Impacts - Finally, water management tools differ as to their potential negative effects on environmental resources. Generally, water conservation measures are viewed as more environmentally benign, given that they may reduce the overall demand for water diverted out of the environment. Nevertheless, even here, there may be adverse environmental effects. For example, substantially increasing farm or landscape irrigation efficiency may reduce water runoff that currently sustains aquatic or aquatic-dependent ecosystems.

Water storage facilities also differ in their potential negative effects on environmental resources. Generally, groundwater projects are viewed as having more benign on-site environmental and land use impacts than surface storage. Off-stream surface storage projects are generally viewed as having significantly less environmental impacts than new on-stream projects. However, all surface and groundwater storage projects create some environmental impacts.

In evaluating any particular set of water management tools, CALFED will consider the relative value of the tools as to these three fundamental factors of cost, flexibility, and environmental impacts.

CALFED's Water Management Strategy

In light of the substantial variability of demand and supply, as well as the different utility of the various water management tools, CALFED believes that the appropriate water management strategy will not be a single approach, but the proper combination of all of the available tools. This concept is best portrayed as a matrix of measures, shown in the following figure.

Integrated Water Management Strategy											
Water Management Objectives	Water Management Tools										
	Transfers		Conservation			Recycling	Storage		Watershed Management	Water Quality Control	Monitoring and Real-Time Diversion Management
	Long-Term	Short-Term	Agricultural	Urban	Wetlands		Groundwater	Surface			
Reduce Diversion Conflicts											
Decrease Drought Impacts - Environmental Flows - Ag/Urban supply											
Increase Supply Availability - Drought - Average											
Increase Operational Flexibility											
Increase Supply Utility (WQ)											

As it moves to fill in the values of this Water Management Matrix, CALFED is relying on a number of important principles, including:

- The recognition that water is a scarce resource in California, and that it must be used wisely for all beneficial purposes
- A desire to rely on market mechanisms and market approaches wherever possible
- The recognition of the variability in the value of water for all uses (both environmental and consumptive)
- As discussed in more detail below, the need to adaptively respond to new information or new conditions in the system

In addition to technical evaluations discussed in this Phase II Report, CALFED is conducting economic analyses that evaluate different combinations of water management tools to identify

least-cost ways of meeting CALFED's water supply reliability objectives. These analyses are expected to better define the available mix of demand management options and new facilities.

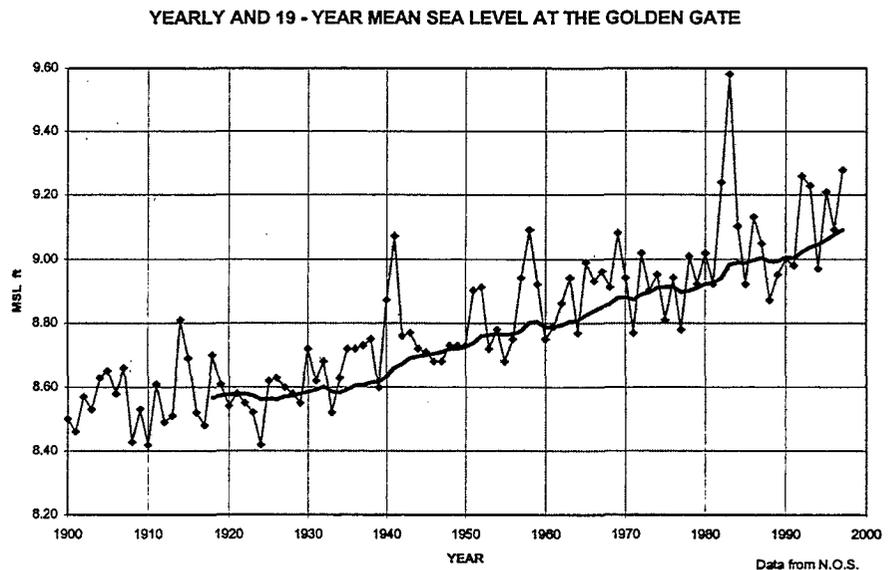
The details of CALFED's water management strategy are described as part of the Draft Preferred Alternative in Chapter 4. The first steps CALFED proposes are detailed in the list of Stage 1 actions in Chapter 5. As to particular water management tools, Stage 1 needs to ensure that:

- A high level of water use efficiency (both conservation and recycling) will be achieved.
- Substantial progress in refining and implementing the water transfers institutional framework will be demonstrated.
- Storage, both groundwater and surface storage, will be thoroughly investigated and, where appropriate, implemented.
- Watershed management studies and projects will be implemented to improve the timing, volume and quality of water resources.
- Water quality source control and other management measures will be implemented to address salinity in the system.
- Monitoring and diversion management improvements will be evaluated and, as appropriate, implemented on an ongoing basis.

Adaptive Management

A third fundamental concept of the Program is adaptive management.

No long-term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system. For example, how will the CALFED levee program be adapted in the future if sea levels continue to rise?



The fundamental concept of adaptive management is that management prescriptions will be assessed and refined (adapted) according to new information in order to meet program goals and objectives. Adaptive management is an iterative process that involves: 1) identifying clear goals and objectives for the program elements; 2) using models to identify our understanding of the Bay-Delta system and to assess and prioritize a range of potential actions to improve the system; 3) implementation of actions and research most likely to achieve goals and objectives and to improve our knowledge of the system; 4) monitoring and assessment of actions to gain information to refine the models and alter future actions in order to meet program goals and objectives; and 5) changing management activities based upon new information.

Adaptive management, as an essential Program concept, acknowledges the need to constantly monitor the system and adapt the actions to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as CALFED learns more about the system and how it responds. The Program's objectives will remain fixed over time, but actions can and should be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. In every part of the Program, new or more intensive actions are proposed. Along with these proposed actions comes uncertainty. What actions work best to achieve program objectives? How can these actions be modified to work better, cost less, or be simpler to implement? How should the emphasis among actions change over time? Are there new or different actions that should complement or replace those that are being implemented? An adaptive management approach helps to answer these questions and act on those answers.

More detailed concepts of an adaptive management approach are included in the implementation plan in Chapter 5.

3. Preferred Program Alternative Development

At the beginning of Phase II of the CALFED Bay-Delta Program, seventeen alternative variations were developed around the three broad alternatives (existing system conveyance, modified through-Delta conveyance, and dual Delta conveyance) resulting from the Phase I work. Five alternative variations were eliminated due to technical problems or to reduce duplication where two or more alternatives achieved the same Delta conveyance function. The remaining twelve alternative variations were described in the *Project Alternatives Technical Appendix* to the Draft Programmatic EIS/EIR in March 1998.

The March Draft Programmatic EIS/EIR did not specify a preferred program alternative but presented impact analyses of the twelve alternative variations. The twelve alternative variations represented a range of different configurations of Delta conveyance and storage assembled with the other program elements for levee system integrity, water quality, ecosystem quality, water use efficiency, water transfers, and watershed management. CALFED believed that the features and impacts of the preferred program alternative, when developed, would be within the range of analyses in the *Draft Programmatic EIS/EIR*. CALFED realized that some additional analyses may be required where impacts of the preferred program alternative fell outside this range.

To help the comparison of alternatives, the twelve alternative variations were grouped into the three broad categories:

Alternative 1 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 1 proposes the use of existing Delta channels, with some modifications, and various storage options.

Alternative 2 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 2 proposes significant modifications of interior Delta channels to increase water conveyance across the Delta, combined with various storage options.

Alternative 3 - Includes program elements for ecosystem restoration, water quality, levee and channel integrity, water use efficiency, water transfers, and watershed management. In addition, Alternative 3 includes Delta channel modifications coupled with a conveyance channel that takes water around the Delta, combined with various storage options.

Based on assumptions made for evaluations in the March *Phase II Interim Report*, the dual Delta conveyance with an isolated facility appeared to provide greater technical performance than the other alternatives. At the same time, however, the dual Delta conveyance appeared to present the

most serious challenges in terms of "assuring" that this solution would achieve and could be implemented to achieve the intended results. Since March 1998, development of the draft preferred program alternative has focused on assurances and on refining the technical analyses. The need for better assurances and scientific information led CALFED to more fully integrate adaptive management throughout the program elements. This led to a draft preferred program alternative that will be implemented in stages over time. Each stage begins implementation of certain actions, gathers scientific information to help future decisions on other actions, and provides greater assurances that actions within each stage will move forward together and will be operated as intended. The draft preferred program alternative is discussed in more detail in Chapter 4.

Since March 1998, CALFED used a number of additional analyses to help sort through the performance of the alternatives, answer additional questions, and develop a draft preferred program alternative that best meets the CALFED Bay-Delta Program purpose. These are summarized in the following sections.

3.1 Distinguishing Characteristics

Looking simultaneously at all the information on how well the alternatives meet the objectives and how well they satisfy the solution principles would be nearly impossible due to the large amount of information. Furthermore, many aspects of the alternatives do not vary from one alternative to another. They all include program elements that make significant progress toward meeting program objectives and reducing conflict in the system.

On the other hand, there are aspects that do differ among the alternatives and it is these aspects, or distinguishing characteristics, that guided the evaluation. These characteristics are important when assessing the performance, impacts and overall merits of each alternative. Following are the eighteen identified distinguishing characteristics:

- **In-Delta Water Quality** - provides a measure of **salinity** and **flow circulation** for four areas of the Delta. The measure focuses on water quality for in-Delta agricultural uses.
- **Export Water Quality** - provides a measure of **salinity**, **bromide**, and **total organic carbon** for four export diversion locations from the Delta. The measure focuses on municipal/industrial uses for the North Bay Aqueduct and Contra Costa Intake and for agricultural and municipal/industrial uses for the SWP and CVP export pumps in the south Delta.
- **Diversion Effects on Fisheries** - intended to include only the **direct effects on**

fisheries due to the export diversion intake and associated fish facilities.

These will vary depending on diversion location, size, type, method of handling bypassed fish, and annual volume of water diverted. The effects on flow patterns in the Delta as a result of the diversion are addressed in the distinguishing characteristic for "Delta Flow Circulation". The loss of fish due to diversion to another route is covered in this effect.

- **Delta Flow Circulation** - is intended to include the **direct and indirect effects of water flow circulation on fisheries due to the export diversions and changes in cross-Delta water conveyance facilities.** These will vary depending on diversion location, size, type, and operation of conveyance facilities, and annual volume of water diverted.
- **Storage and Release of Water** - provides a measure of the environmental benefit or adverse effects of storing water in new Program storage facilities and releasing that water at a later time of need. Storing the water will generally result in some degradation of environmental conditions while releasing that water, for whatever use, will generally result in some environmental benefits.
- **Water Supply Opportunities** - is a measure of the change provided by the alternatives for water supply for the environment and for agricultural and urban uses.
- **Water Transfer Opportunities** - is an estimate of how well each alternative can carry water that may be generated through market sales or trades at different locations in the system. This estimate assumes that a certain amount of conveyance capacity has already been allocated for state and federal project water.
- **Operational Flexibility** - provides an indication of how well each alternative can shift operations as needed from time to time to provide the greatest benefits to the ecosystem, water quality, and water supply reliability.
- **South Delta Access to Water** - is a measure of how the alternatives affect local beneficial use of water in the vicinity of the state and federal Delta export facilities due to changes in water levels and water quality in the channels.
- **Risk to Export Water Supplies** - is intended to provide a measure of which alternatives best reduce the risk to local and export water supplies from a catastrophic earthquake.
- **Total Cost** - will include the initial capital costs for the Program as well as annual costs. Initial costs will include study, design, permitting, construction, mitigation,

acquisition, and other first costs of the Program. Annual costs will include operation and maintenance, monitoring, reoccurring annual purchases, and other annual costs.

- **Assurances Difficulty** - is an estimate on how difficult it will be to formulate an assurance package and get consensus among agencies and stakeholders. It is not an assessment on the perceived effectiveness of the assurance package.
- **Habitat Impacts** - is an assessment of the adverse habitat impacts due to implementation of the CALFED actions.
- **Land Use Changes** - is primarily a measure of the amount of agricultural land that would change to other uses by implementation of the Program.
- **Socio-Economic Impacts** - include adverse and beneficial impacts on commercial and recreational fishing, farm workers, power production, and others indirectly affected by Program actions.
- **Consistency with Solution Principles** - provides a qualitative measure of how well the alternatives meet the Program solution principles. Alternatives which violate the solution principles are not likely to be practicable or implementable. The solution principles provide insight in considering tradeoffs among the other distinguishing characteristics in a balanced manner.
- **Ability to Phase (Stage) Facilities** - provides an indication on how easy it will be to stage implementation of storage and conveyance facilities over time.
- **Brackish Water Habitat** - In the Bay-Delta system there is a salinity gradient between fresh and salt water. The western Delta is an area of important aquatic habitat with salinity levels of approximately 2 parts per thousand. The location of this salt concentration, known as X2, is an indicator of effects on this critical brackish water habitat among the alternatives.

The March 1998 *Phase II Interim Report* provided a summary of preliminary analyses with these eighteen distinguishing characteristics. In these analyses, two key distinguishing characteristics were particularly important in identifying how well the alternatives perform. **Export Water Quality and Diversion Effects on Fisheries**, are highly dependent on the alternative selected. Therefore, irrespective of whether these two characteristics are the most important to selection of the preferred program alternative, they are the characteristics most dependent on that decision.

As mentioned previously, based on assumptions made for evaluations in the March 1998 *Phase II Interim Report*, the dual Delta conveyance with an isolated facility appeared to provide greater

technical performance than the other alternatives. Since March, CALFED staff have refined analyses of these eighteen distinguishing characteristics using updated modeling and data. These refined analyses support the earlier conclusion that the dual Delta conveyance with an isolated facility appears to provide greater technical performance than the other alternatives. At the same time, however, there are still major assurances issues associated with this approach, and CALFED needs to obtain better scientific information plus information on an array of other water management options to assess the need for the dual Delta conveyance. In addition, while the dual Delta conveyance may have technical advantages over other Delta conveyance, it would likely take a decade or more to plan, design, permit, and construct.

To address the assurances, need for better scientific information, and long lead time required for the dual Delta conveyance, CALFED more fully integrated adaptive management throughout the program elements. This led to structuring implementation in stages over time. Each stage begins implementation of certain actions, gathers scientific information to help future decisions on other actions, and provides greater assurances that actions within each stage will move forward together and will be operated as intended. With this approach, a more informed decision on the need for the dual Delta conveyance can be made in the future.

For all of the reasons noted above, the strategy of the CALFED Program is to initially develop a through-Delta conveyance based on the existing Delta configuration with some channel modifications. If CALFED's goals and objectives cannot be accomplished by the through-Delta conveyance strategy, the preferred program alternative includes additional actions that may be taken toward these goals and objectives after thorough assessment of a variety of factors. For example, a decision to proceed with implementation of an isolated facility may occur if, in combination with vigorous implementation of relevant common program elements and improvements to through-Delta conveyance, and consideration of other water management options, an isolated conveyance facility is still deemed necessary. Such a facility would have to be demonstrated to be the most cost effective and least environmentally damaging alternative, and to be necessary for significantly advancing CALFED's commitment to seek continuous water quality improvement (see more detailed discussion in **Conveyance** in Chapter 4).

Additional technical work is proceeding on drinking water quality and diversion effects on fisheries as summarized in the following two sections.

3.2 Bromide Panel

CALFED analyses indicate the selection of a preferred program alternative can have profound effects on concentrations of bromide in drinking water supplies taken from the Delta. This is true because the Pacific Ocean is a major source of bromide in the system. Bromide is a concern to drinking water purveyors because it can undergo chemical reactions that produce unwanted and potentially harmful chemical byproducts during disinfection of drinking water. Because the choice of storage and conveyance alternatives will affect bromide concentrations more than any other actions that have been studied, effects of the alternatives on bromide concentrations was identified as a key feature that will distinguish the selection of a preferred program alternative.

To better understand the significance of bromide in Delta drinking water supplies, CALFED assembled a panel of independent, nationally recognized scientific experts to deliberate and provide relevant recommendations. The panelists were chosen with the collaboration of the members of the water quality technical group, the body of agency staff and stakeholders who provide technical advice and recommendations to the CALFED water quality program. The primary areas of expertise of the panelists included chemistry of disinfection byproduct formation, source control, health effects of disinfection byproducts, water treatment, and drinking water regulation development. The panel met on September 8 and 9, 1998.

The following is a summary of the findings contained in the panel report, published in November 1998:

- The major source of bromide within the Delta is seawater derived from tidal exchange with San Francisco Bay.
- There are major concerns about public health effects of the disinfection byproducts of drinking water treatment, including cancer, mutation, and reproductive effects. Those containing bromine may be of particular concern.
- The U.S. Environmental Protection Agency is required to consider more stringent standards for disinfection byproducts in drinking water which may make it more challenging to balance adequate microbial disinfection and the capacity to further reduce harmful chemical byproducts.
- Because both bromide and organic carbon are involved in disinfection byproduct formation, their co-occurrence in the Delta is important. Similarly, the co-occurrence of pathogenic organisms resulting from pollution in the Delta may significantly influence the feasibility of simultaneously controlling for both DBPs and pathogens under future drinking water regulations.

-
- Economically efficient options for removing bromide through treatment are very limited, though organic carbon, that also reacts to form disinfection byproducts, can be effectively reduced by treatment. Removal of organic carbon generally does not remove bromide, thus continuing to allow formation of bromine-containing disinfection byproducts.
 - Options exist for minimizing formation of bromine-containing disinfection byproducts, and for removing such byproducts once formed, but there are water quantity and technological constraints on the ability to do this.
 - Management of bromide can best be realized through a combination of treatment and source control. The three CALFED alternatives reflect different options for managing the mixing of seawater with fresh water as it is conveyed through the Delta.
 - There must be a short-term (before implementation of an alternative) and a long-term (after alternative implementation) strategy for drinking water utilities using Delta water. Emphasis in the short term should be on treatment and on possibilities for source control of bromide, organic carbon and pathogens. In the long term, other hydraulic management options might provide improvement in source water quality over that currently obtainable from the Delta.

3.3 Diversion Effects on Fisheries

Direct and indirect effects of the existing state and federal water projects are thought to be important, perhaps critical, factors in the decline and endangerment of some fish species.

Aspects of the current problem include:

- Predation in Clifton Court Forebay; entrainment of fish, eggs, and larvae at the SWP and CVP export pumps (partly due to inadequate fish screen facilities)
- Mortality associated with the need to capture, sort and transport fish to Delta channels away from the screens
- Adverse flow patterns induced by the transport of Sacramento River water across the Delta for diversion, which affects the migration and spawning of fish species.
- Reductions in habitat quality and availability induced by changes in flow conditions in the system caused by project operations and the north-to-south transport of water across the Delta to the export facilities

There is a fair degree of agreement on the relative magnitude of fish losses due to diversion effects that would occur under the various alternatives. However, there is much less agreement

on the role of diversion mortality in controlling population abundance when compared to other stressors such as habitat loss.

The focus for diversion effects on fisheries is on particular estuarine and migratory fish: chinook salmon, delta smelt, splittail, striped bass, and steelhead. Observations over the last half century indicate that these species are quite vulnerable to having their behavior disrupted by the transport of water from the Sacramento River to the export pumps in the south Delta. Other Delta resident fish such as tule perch and several members of the sunfish family were not specifically evaluated but would benefit from improvements made for the above estuarine and migratory fish. Fish such as starry flounder and longfin smelt, and other organisms such as bay shrimp, live primarily downstream of the Delta. Although they are potentially affected by changes in the amount of water flowing from the Delta through San Francisco Bay to the ocean, they appear to have little vulnerability to diversion effects of the export pumps.

CALFED has formed interagency/stakeholder groups to address the technical issues related to diversion effects on fisheries. The Diversion Effects on Fish Team (DEFT) was formed in February 1998 to evaluate the technical issues related to diversion impacts on fisheries. In its review, the DEFT considered both the direct effects of entrainment and the related effects of Delta flow circulation. CALFED first asked the DEFT to evaluate the likelihood of fisheries recovery under the three existing alternatives. The DEFT reported that, while the dual conveyance alternative would result in the greatest benefit to fisheries, they were not confident that any of the alternatives as described would necessarily recover all affected fish species. CALFED then asked DEFT to develop modified alternatives that would recover these species. Given the concerns about the implementability of the dual Delta conveyance, the DEFT was instructed to begin this effort by developing a modified through-Delta conveyance alternative that, if implemented, would result in the recovery of these fish species. DEFT's activities since then have focused on a modified through-Delta alternative.

The NoName Group (NoName) was established in 1994 as part of the Operations Group effort at real-time project management. In June of 1998, NoName was asked by CALFED to recommend water supply and water quality measures that are capable of being implemented within Stage 1 (first 7 years) of the Program.

Because of the long lead time required to plan, design, permit, and construct any major water facility, the existing Delta channels must be used for many years even if CALFED needs to construct a dual Delta conveyance in the future. Therefore, the effort for diversion effects on fisheries focused on developing through-Delta options for fisheries and on determining the risk and potential success of species recovery considering all available actions.

In evaluating fishery effects of Delta exports, the DEFT identified several species and life stages which have experienced episodes of substantial entrainment loss in recent years during operations under the Accord. These episodes have occurred in spite of operational conditions

(e.g. export/inflow ratios) in the Accord or during periods which the Accord and CVPIA did not address. The DEFT recognized the need for CALFED to develop the means to reduce entrainment losses or other effects of the water project operations for the following:

1. Delta smelt adults (entrainment in December - March).
2. Delta smelt young (entrainment in April - August; take exceeded in late May/early June of recent years).
3. San Joaquin salmon fry (usually following high flows in January - March).
4. San Joaquin salmon smolts (portion of outmigrants not covered by 31-day VAMP).
5. Spring-run salmon yearlings (outmigrating in November - January).
6. Steelhead outmigrants (period variable from February - May, but passage swift).
7. Striped bass young of year (especially May - July).

The DEFT developed eight programmatic actions to maximize the chances of the through-Delta conveyance meeting the CALFED purpose:

- Restore a wide range of depleted habitat types for spawning, rearing, and migrating resident and anadromous fish.
- Manage the volume, durations, and pathways of flow, nutrient inputs, and other factors to assure adequate food supply in the Delta.
- Improve screens, screen unscreened diversions, change diversion locations, and consolidate diversions to improve survival of fish at the point of diversions.
- Change operations to improve survival of fish and to protect and improve food supply.
- Establish appropriate environmental cues to improve survival of migratory fish through the Delta.
- Identify and reduce, eliminate, and/or trap inputs of toxics throughout the watershed to reduce or eliminate toxicity of water and sediment in Delta channels.
- Reduce loadings and mobilization of contaminants and metals to reduce body burdens of contaminants and metals in aquatic organisms as necessary to eliminate human health risks from eating these organisms.
- Manage exotic species to reduce their populations to levels that will not adversely impact native species.

The DEFT is proceeding with evaluation of benefits, costs and institutional measures of suggested flexible operations. The DEFT and NoName teams are working together to develop a recommended through-Delta alternative that meets all of the CALFED objectives and principles. Of greatest concern is continuing exports from the south Delta and the associated entrainment and salvage of important fish species. To address this concern, both teams agree that a key component for most fish species is to provide new fish screen facilities to reduce direct entrainment and predation. Both teams also agree that fish losses can be reduced by an additional increment with flexible operations of the export pumps aided by more intensive use of real time monitoring. Flexible operations would allow reducing export pumping at times critical to fish and increasing export pumping at other times.

3.4 Summary of Response to Comments on Draft Programmatic EIS/EIR

The Draft Programmatic EIS/EIR was released for public review on March 16, 1998. The Program received 1836 individual public comment letters which included 469 speakers at 17 public hearings. Thousands of post cards, form letters and letter writing campaign letters were also received. The comments have been used to improve the program plans and assist in evaluation and development of the preferred program alternative.

The top 5 public issues based on volume of comments have been identified as:

- Water Conservation
- New Facilities
- Agricultural Issues
- Area of Origin/ Water Rights
- Finance/ Beneficiary Pays

Conservation and storage received the largest number of comments. The comments associated with these two topics were generally linked, with those who believe water conservation is the sole solution being opposed to new facilities, and those who believe increased water conservation still will not solve the problem being in support of new facilities. The following summarizes how the Program is responding on each of these issues.

Response to Water Conservation Issues

Water conservation is an important part of any Bay-Delta Program, and will contribute to a comprehensive solution to the problems facing the Bay-Delta including a degraded Bay-Delta

ecosystem, declining water quality, a levee system vulnerable to failure, or the uncertainty of water supplies to meet beneficial uses.

Water conservation, along with water recycling, is at the core of the Water Use Efficiency Program element. In the past two decades, many agricultural and urban water users have made significant improvements in their water use efficiency, and the Program intends to amplify these gains by further expanding the implementation of water use efficiency measures. To stimulate the implementation of these efficiency measures, the Program will work with local, state, and federal government agencies provide both financial and technical assistance to water providers and water users. The Program has also recommended reporting mechanisms/processes to track the implementation of water use efficiency measures and to ensure compliance with water use efficiency targets/objectives.

Response to New Facility Issues

CALFED's strategy is to develop a through-Delta alternative based on the existing Delta configuration with some modifications, evaluate its effectiveness, and add additional conveyance and/or other water management actions if necessary to achieve CALFED goals and objectives. The initial through-Delta conveyance will be continually monitored, analyzed, and improved to maximize the potential of the through-Delta approach meeting CALFED goals and objectives, consistent with its Solution Principles. If the through-Delta conveyance still fails to meet the CALFED goals and objectives, there will be a reassessment of the reasons and the need for additional Delta conveyance and/or water management actions.

If CALFED's goals and objectives cannot be accomplished by the through-Delta conveyance strategy, the preferred program alternative includes additional actions that may be taken toward these goals and objectives after thorough assessment of a variety of factors. For example, a decision to proceed with implementation of an isolated facility may occur if, in combination with vigorous implementation of relevant common program elements and improvements to through-Delta conveyance, and consideration of other water management options, an isolated conveyance facility is still deemed necessary. Such a facility would have to be demonstrated to be the most cost effective and least environmentally damaging alternative, and to be necessary for significantly advancing CALFED's commitment to seek continuous water quality improvement.

An isolated conveyance facility also may be necessary if there is inability to achieve fishery recovery due to continuing impacts of diversions from the south Delta. A combination of these two factors also could result in a decision to proceed with implementation of an isolated facility and/or other additional water management actions to meet CALFED goals and objectives after assessment of the effectiveness of the initial through-Delta conveyance actions, and after a determination that such a facility and/or actions would be effective in resolving these problems. These factors will be continually reevaluated during Stage 1 as part of the adaptive management

process, and will form the basis for a comprehensive set of additional improvements in Stage 2.

Considering the magnitude of conflicts over available water in California, CALFED believes that it must evaluate and implement a broad range of water management options to achieve the Program's objectives. Therefore, new storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, and a protective water transfer market, as appropriate to meet CALFED Program goals. During Stage 1, CALFED will evaluate and determine the appropriate mix of surface water and groundwater storage, identify acceptable projects, and initiate permitting and construction if program linkages and conditions are satisfied.

Response to Agricultural Issues

The CALFED Program could result in the conversion of agricultural land for Program purposes such as ecosystem restoration, improved water supply reliability, and improved levee stability as the Program is implemented over the next 25 to 30 years. The Program intends to minimize the conversion of farmland, including prime and unique farmland, to the extent possible. In addition to its overall approach of acquiring land in voluntary transactions with willing sellers, CALFED is proposing to adopt several implementation policies that will minimize the adverse impacts to agricultural land and water resources. They include :

- Maintaining land in private ownership to the greatest extent practicable
- Prioritizing use of existing government owned lands for habitat restoration
- Working with local landowners and organizations to develop projects that meet CALFED objectives while also benefitting local landowners.

Agricultural water users throughout the state will benefit from various program elements. The objective of the Water Quality Program is to improve water quality for all beneficial uses of the Bay-Delta. The Long-Term Levee Protection Plan will bolster and maintain the Delta levees that protect important agricultural resources, infrastructure, habitat and water quality. The Water Use Efficiency Program will provide planning, technical, and financial assistance to agricultural water users to implement water use efficiency measures, which will help reduce agricultural water costs. The Water Transfers Program will facilitate water transfers; agricultural water users can generate transferable water by implementing water use efficiency measures and can acquire water in the transfer market to improve their water supply reliability. New storage facilities could benefit agricultural water users by providing increased flood protection, increased water supply, and groundwater recharge. By recovering healthy populations of endangered or threatened species, the Ecosystem Restoration Program will help improve water supply reliability.

Response to Area of Origin/Water Rights Issues

The Program is proposing to evaluate whether additional protection of water rights is appropriate. The Program will operate within the system of existing water rights including existing laws and regulations protecting areas of origin. Although the State Water Resources Control Board is one of the CALFED agencies working to develop a long-term Bay-Delta solution, the Board retains its independent regulatory authority over water rights and water quality protection in California. The Board is engaged in water right hearings concerning the allocation of responsibilities to water right holders for meeting Bay-Delta water quality standards.

The CALFED Bay-Delta Program is designed to address a wide variety of problems and concerns affecting the Bay-Delta system. While it focuses on the Delta region, it has the potential for affecting land use throughout the vast solution area. CALFED seeks to accomplish its objectives in partnership with landowners, stakeholders, and communities throughout the solution area, being especially mindful of the potential impacts on private property owners and existing landowner rights.

Response to Finance/Beneficiary Pays Issues

CALFED will use a benefits-based approach to allocate the costs of the program. Simply put, those who benefit from the program will pay for their fair share of it. This means that a combination of both public and user funds will be needed. Many of the proposed program actions serve multiple benefits, including public benefits. These could include protection of key Delta functions including agriculture and levee system integrity, conveyance and ecosystem restoration.

CALFED has developed a draft financing plan. It includes financial strategies which need to be further developed in 1999 and could be implemented in Phase III. A complete financial strategy for Stage 1 will be available at the time of the Record of Decision.

4. DRAFT PREFERRED PROGRAM ALTERNATIVE

The description of the alternative is programmatic in nature, intended to help agencies and the public make decisions on the broad methods to meet Program purposes. The alternative is not intended to define the site specific actions that will ultimately be implemented. See Chapter 5 Implementation Plan for more specific Stage 1 actions.

The preferred program alternative for the CALFED solution is assembled from hundreds of programmatic actions. To simplify the discussion of the alternative, the actions are grouped under each of the eight program elements summarized below. These will be implemented in stages utilizing adaptive management over the next 30 years:

- **Long-Term Levee Protection Plan** - Provides significant improvements in the reliability of the Delta levees to benefit all users of Delta water and land.
- **Water Quality Program** - Makes significant reductions in point and non-point pollution for the benefit of all water uses and the Bay-Delta ecosystem.
- **Ecosystem Restoration Program** - Provides significant improvements in habitat, restoration of critical flows, and reduces conflict with other Bay-Delta system resources.
- **Water Use Efficiency Program** - Provides support and incentives at the local level through expanded planning, technical, and financial assistance for efficient use of water for agricultural, urban, and environmental purposes.
- **Water Transfer Program** - Provides a framework of actions, policies and processes to facilitate, encourage, and streamline an active yet protective water market which will allow water to move between users, including environmental uses, on a voluntary and compensated basis.
- **Watershed Program** - Promotes locally-led watershed management activities and protections relevant to achieving the CALFED purpose through financial and technical assistance.
- **Storage** - New storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, and a protective water transfer market, as appropriate to meet CALFED Program goals. During Stage 1, CALFED will evaluate and determine the appropriate mix of surface water and groundwater storage, identify acceptable projects, and initiate

permitting and construction if program linkages and conditions are satisfied.

- **Delta Conveyance** - CALFED's strategy is to develop a through-Delta conveyance alternative based on the existing Delta configuration with some modifications, evaluate its effectiveness, and add additional conveyance and/or other water management actions if necessary to achieve CALFED goals and objectives. For example, inability to meet CALFED program goals for drinking water quality or fishery recovery using this strategy could lead to a decision to move forward with modifications to this strategy including an isolated facility to carry a portion of export water around the Delta and/or other water management options.

All of these will employ an adaptive management approach with careful monitoring of performance to help modify (adapt) future actions as more is learned about the system and how it responds. The implementation of the preferred program alternative is supported by an Assurances Plan, Financing Plan, and a Comprehensive Monitoring, Assessment and Research Program.

4.1 Staged Implementation and Staged Decision Making

The complexity of the Bay-Delta system and the inability to predict future events and how the system will respond to management actions requires that an adaptive management philosophy and process be employed for every program element.

CALFED has decided to implement the Program through stages. The preferred program alternative is composed of hundreds of individual actions that will be implemented and refined over the 20 to 30 year implementation period. Therefore, it is logical to implement the Program in stages according to major program milestones. The challenge in implementing the Program in stages is to allow actions that are ready to be taken immediately to go forward, while assuring that everyone has a stake in the successful completion of each stage.

Like implementation, the decision process will be

Staged Implementation

- Identify certain actions at the outset (for all stages).
- Identify possible actions for future stages with associated conditions and linkages to guide the decisions. This will allow some decisions when more scientific information will be available and the effects of previous actions will be better known.
- Stage assurances that include specific agreements among agencies and stakeholders

staged to allow better decisions in adaptive management at the appropriate time. The programmatic nature of the EIS/EIR provides the general direction for long-term implementation but not the specific information necessary for every decision required during the 20-30 year implementation period. Not all decisions need to, or can, be made at the outset of implementation. Therefore, stages will be identified where there are logical implementation milestones and decision making points. In this way, adaptive management can be applied equally well to a series of incremental actions such as ecosystem restoration or for major single decision projects such as surface storage or conveyance.

Staged implementation for the CALFED preferred program alternative involves identifying certain actions for implementation for which there is general agreement and justification, and also developing conditions for future decisions and for moving beyond Stage 1. For some actions, certain predefined conditions would need to be met before actions could proceed. For example, certain conditions would be linked to the decision to construct major facilities. These linked decisions on several program elements may be required at each stage of implementation. These require assurances that certain linkages, such as performance measures for each program element, are satisfied before making a decision to proceed.

Stage 1 begins with a series of actions which are considered the most cost-effective and environmentally sound for the comprehensive, long-term CALFED solution. Stage 1 does not have a predefined outcome, since future implementation decisions are conditioned by what we learn from implementation experience and monitoring of results. However, Stage 1 actions will be designed to provide continuous improvement in all problem areas. Stage 1 actions will be carefully selected to minimize the potential for spending money on improvements that would not be useful, considering the range of future potential implementation actions. CALFED recognizes that some Stage 1 actions may need refinement, or other actions may be introduced, as information improves.

In order to succeed Stage 1 must:

- Result in overall continuous improvement for all resource areas for the Bay-Delta system.
- Provide stability in the water resources management framework and reduce conflicts in the system.
- Improve conditions in the Bay-Delta system for listed and proposed species. These actions should provide for species protection and begin the process of recovery.
- Have a mix of public and private funds based on "beneficiary pays" principle.
- Build the information base for the transition to Stage 2.
- Address the conditions and linkages (assurances) necessary before proceeding with storage and conveyance.
- Include an ongoing stakeholder process to provide input to the decision making

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- and adaptive management process.
 - Include, wherever possible, measurable performance goals or indicators of success for all Program goals areas.
 - Refine implementation plans and agreements to finish Stage 1 and to move to subsequent stages for each program element:

CALFED will continue work until release of the Final EIS/EIR in late 1999 on grouping the Stage 1 actions into a series of bundles (packages) which can provide additional assurances for balancing benefits. For example, a bundle of actions in the Delta could include levee work, habitat improvements, water quality work, and facilities and operations to improve water supply reliability. Bundles for some actions may be geographical, based on timing, oriented around permitting needs like Clean Water Act Section 404, or other grouping. Linking the actions would assure that they all move forward together. These may be linked within the same site specific EIS/EIR, tied by contractual documents, dependent on the same funding, or other means.

Discussion is continuing on conditions and linkages for a draft preferred program alternative. There are many potential linkages (many are assurance issues) among the various actions in the draft preferred alternative, which includes common program elements, storage, and conveyance. Future decisions can be made depending on how the conditions and linkages are satisfied.

There is generally broad agreement on proceeding with the program elements for water quality, water use efficiency, ecosystem restoration, levee system integrity, water transfer framework and the watershed program, but only if implementation is linked to reasonable progress in all program elements. However, there is not agreement on the need for surface storage and dual Delta conveyance (with and isolated facility) to achieve the CALFED goals and objectives.

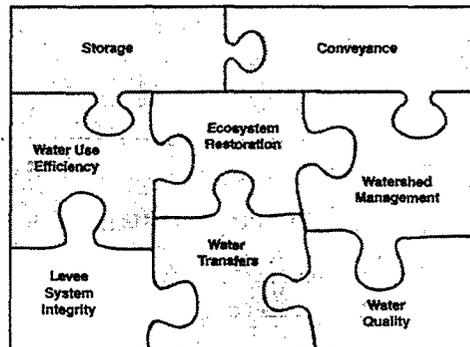
Meeting the CALFED mission statement and goals is dependent on improvement in all problem areas (ecosystem, water quality, levee system integrity, and water supply reliability). Linkages between improvement in the problem areas are key to consistent and continuous progress towards meeting the CALFED purposes. The eight program elements and linkages between the elements are the mechanisms to achieve improvement in the four problem areas.

4.2 Program Elements

Meeting the CALFED purpose is dependent on improvement in all four problem areas (ecosystem, water quality, levee system integrity, and water supply reliability). The eight program elements and linkages between the elements are the mechanisms to achieve improvement in the problem areas.

Long-Term Levee Protection Plan

The Sacramento-San Joaquin Delta is an area of great regional and national importance, which provides a broad array of benefits including agriculture, water supply, transportation, navigation, recreation and fish and wildlife habitat. Delta levees and islands are the most visible man-made features of this system. Levees are an integral part of the Delta landscape and are key to preserving the Delta's physical characteristics and processes including definition of the Delta waterways and islands.



Given the numerous public benefits protected by Delta levees, the focus of the Long-Term Levee Protection Plan is to improve levee integrity. The levee plan will build on the successes of existing programs in achieving its goals. The state has participated in existing levee programs for the past 25 years. However, the federal government has no such authority for non-project levees in the Delta. The Corps' Sacramento-San Joaquin Delta Special Study may be used to establish a federal authority. There are five main parts to the levee plan:

- **Base-Level Protection Plan** - Base-level funding provides equitably distributed funding to participating local agencies in the Delta. One of the primary goals of the CALFED Program is to reconstruct all Delta levees to a particular standard. CALFED has tentatively selected the U.S. Army Corps of Engineers PL 84-99 standard. Base level funding will provide for reconstruction and maintenance of Delta levees to the PL84-99 standard. Required levee work may include removal of vegetation and debris, maintenance of water control devices, repair or replacement of existing bank protection, addition of material to achieve required cross section, removal of flood deposits, extermination of burrowing rodents and crustaceans (mitten crab), repairing and shaping access roads, repairing slipouts and erosion damage, dredging as required for minor repairs, controlling vegetation on the waterside of the levee, and other actions necessary to maintain levee integrity and appurtenances. This component will seek continuity with and build on the successes of the Delta Levee Subventions Program which is currently administered by DWR.

Identifying and Managing the Risks to Delta Levees

Delta levees and islands are at risk of failure from earthquakes, floods, subsidence, seepage and other threats. The Levee Program is taking steps to identify the risks to Delta levees and present a suite of options to manage this risk.

Over the past 25 years, the existing Delta levee program has reduced the flood and seepage risk by improving Delta levees. Research and demonstration projects are being conducted to quantify the effects of subsidence and determine how to reduce its threat to Delta levees.

Over the past year, a seismic risk assessment was made by a group of experts in the fields of seismology and geotechnical engineering. The results of this investigation found that a "significant seismic risk is present, however, improved preparedness can reduce the potential damage."

In an effort to further quantify the risks to levee dependent systems, CALFED will augment this group based on stakeholder recommendations, and charge them with the following tasks:

1. Design and perform a risk assessment. Identify contributors to levee risk and quantify the risk to levee dependent systems.
2. Provide recommendations for seismic upgrades to critical Delta levees and other measures to reduce levee failures. Include an evaluation of the reduction in levee vulnerability and cost estimates, (\$/mile), for various recommendations.
3. Review the Subsidence Subteam's report and comment on the concept of a zone of influence and the influence of inner island subsidence on levee integrity.
4. Review the Levee Program's CMARP scope, particularly the CMARP recommendations for subsidence, emergency response, and seismic risk assessment. Comment on the proposed scopes and develop cost estimates for completing the monitoring, assessment and research.

Once the risk to Delta levees and the systems dependent on them is quantified and the consequences evaluated, CALFED will implement an appropriate risk management strategy.

Several risk management options have been developed for inclusion in the CALFED Preferred Program Alternative. The available risk management options include but aren't limited to:

- Improving emergency response capabilities
- Developing storage south of the Delta
- Reducing the fragility of the levees
- Improving through-Delta conveyance
- Releasing more water stored north of the Delta
- Restoration of tidal wetlands
- Controlling and reversing island subsidence
- Curtailing Delta diversions
- Continued monitoring and analysis of total risk
- Constructing an isolated facility

The final Risk Management Plan may include a combination of these options and others identified as a result of the risk assessment.

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- **Special Improvement Projects** - The special improvement project funding continues a funding mechanism for special habitat improvement and levee stabilization projects to augment the base-level funding, within specific policy guidelines. Under the special improvement projects, flood protection would be enhanced for key islands that provide statewide benefits to the ecosystem, water supply, water quality, economy, and the infrastructure. Special improvement project funding is based on the benefit to the public, not solely on the need for improvement. This component will seek continuity with and build on the successes of the Special Flood Control Protections Program which is currently administered by DWR.
 - **Delta Island Subsidence Control Plan** - Numerous factors including oxidation, compaction and erosion of peat soils have caused some Delta islands to subside several feet below sea level. Today, these islands, and the environmental and water resources dependent upon them, are protected from seawater inundation by a network of Delta levees. The Levee Program will implement current BMPs to control subsidence on levees and coordinate research to quantify the effects and extent of inner-island subsidence as it relates to all CALFED objectives. Subsidence control measures will be implemented through the base-level protection component of the Levee Program and supplemented by research grants to develop BMPs through the CMARP program. If cost effective and feasible, interior island subsidence and control measures will be recommended by CALFED during stage 1.
 - **Emergency Management Plan** - The most recognizable threat to Delta islands and resources in the Delta is inundation due to winter flood events. In addition, other potential disasters can be caused by high tides and high winds, earthquakes, burrowing animals whose actions can cause levees to fail, toxic spills, failure of Delta levees during low flow periods, and fire. Approximately 20 islands have flooded since the 1960s, including repeated flooding of some islands. The emergency management plan will build upon existing state, federal, and local agency emergency management programs to improve protection of Delta resources in the event of a disaster.
 - **Seismic Risk Assessment** - Earthquakes can cause levees to fail by slumping or liquefaction of underlying soils. To date, there have been no known Delta island inundations as a result of seismic events. However, there are several active faults located sufficiently close to the Delta to present a threat to Delta levees. The seismic risk assessment will identify and increase the understanding of seismic risks to Delta resources and develop recommendations to manage the risk.

Overall benefits of the Delta Long-Term Levee Protection Plan include:

- Funding for upgrade and continued maintenance of levees to protect Delta functions
- Suitable funding, equipment and material availability, and coordination to rapidly respond to levee distress and failure
- Subsidence reduction, management, and reversal which helps long-term Delta system integrity
- Increased reliability for water supply needs from the Delta and in-Delta water quality
- Increased reliability for in-Delta land use
- Increased reliability for in-Delta aquatic and wildlife habitat

Long-Term Levee Protection Plan
Facts and Figures

- Helps protect land uses, water quality, and water supply reliability.
- Provides new opportunities for habitat.
- Meets Program objectives for reducing vulnerability to the Delta system. However, seismic risk is uncertain.
- Requires additional research on seismic vulnerability.
- Could exceed \$ 1.5 billion over 20-30 years or more. Annual investment rates may exceed \$3050 to \$3555 million.

Work is continuing on the following issue:

Suisun Marsh Levees - CALFED is investigating the merits of including the Suisun Marsh levee system in the Levee Program. At this point, the following two options are being considered:

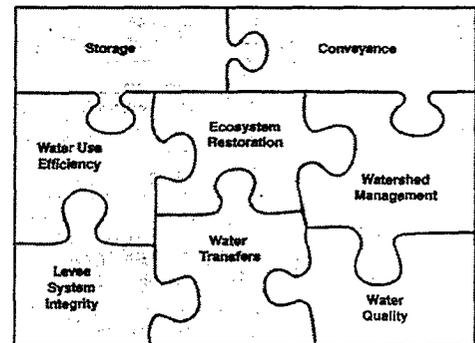
1. Include all the exterior levees (approximately 230 miles) into CALFED's Levee Program. The existing "Suisun Marsh Exterior Levee Standard" would be adopted.
2. Protect part of the levee system. Reconfigure the Marsh to protect existing managed wetlands and develop new tidal wetlands. Some landowners have expressed opposition to this alternative because it would affect their current land use.

In 1999, CALFED staff will further develop these two options.

More information on the levee program will be included in the revised *Long-Term Levee Protection Plan*.

Water Quality Program

CALFED is committed to achieving continuous improvement in the quality of waters of the San Francisco Bay-Delta estuary with the goal of minimizing ecological, drinking water, and other water quality problems, and to maintaining this quality once achieved. This objective extends to the watersheds of the estuary to the extent that water quality problems in these watersheds affect beneficial uses dependent on the estuary. "Continuous" as used here means a steady or step-wise trend over the 30-year time horizon of the CALFED Program, and does not include short-term fluctuations that may be brought about by wet or dry hydrologic conditions, other shorter term, temporary, events or time needed to initiate and implement improvement measures. Although specific water quality targets have been established to gauge the success of the Water Quality Program, CALFED commits to seeking water quality that exceeds these targets where feasible and cost effective.



The Water Quality Program contains numerous actions directed at improving the quality of water to support ecological resources and to protect CALFED investments in ecosystem restoration projects. Other program actions are directed at improving the quality of Delta waters to support agricultural, industrial, and recreational uses of the resource. Drinking water supply is another important beneficial use of Delta waters, as the Delta is a source of drinking water for about two-thirds of the State's population. Drinking water elements of the Water Quality Program are emphasized in this section because, as noted below, drinking water issues have great significance to the selection of a Preferred Alternative.

Water Quality Targets

For many water quality parameters, numerical and/or narrative objectives for the protection of ecological and other beneficial uses already exist in water quality control plans adopted by the State and Regional Water Quality Control Boards. The CALFED Water Quality Program has adopted these regulatory objectives where appropriate as its targets for water quality improvement, such as for selenium and mercury. For some water quality parameters, objectives do not presently exist. This is particularly true for drinking water that receives further treatment prior to use. As the Water Quality Program evolves, it is anticipated that periodic re-evaluation of water quality targets will be one feature of adaptive management as applied to this program.

With respect to drinking water beneficial uses, the CALFED objective is to continuously improve source water quality that allows for municipal water suppliers to deliver safe, reliable, and affordable drinking water that reliably meets, and where feasible, exceeds applicable drinking water standards. CALFED program actions will be aimed at reducing the levels of

bromide, organic carbon, and pathogens in Delta drinking water sources. CALFED's target for providing safe, reliable, and affordable drinking water in a cost effective way is to achieve either: a) average concentrations at Clifton Court Forebay and other south and central Delta drinking water intakes of 50 ug/L bromide and 3.0 mg/L total organic carbon; or b) an equivalent level of public health protection utilizing a cost effective combination of alternative source waters, source control, and treatment technologies.

CALFED Program actions will be implemented to provide continuous water quality improvement for Delta drinking water supplies, including central and south Delta water quality, toward the long-term water quality targets. To ensure this outcome, CALFED will work with stakeholders prior to the Record of Decision to develop agreed upon measurable milestones to be used as indicators of continuous improvement in water quality during Stage 1.

Enabling Delta water users to substitute higher quality source water for Delta water of current quality offers important opportunities to provide safe drinking water, and will be intensively investigated as a Stage 1 approach within the CALFED Program. However the importance of developing adequate source water quality in the Delta cannot be ignored.

In seeking to meet its commitment to provide urban agencies with water sufficient in quality to produce safe and affordable drinking water that meets and, where feasible, exceeds standards for public health protection, CALFED will consider additional water management options including, but not limited to, provision of alternate sources, use of storage facilities to improve drinking water quality, and an isolated facility to provide source water of better quality. The degree of improvement needed, if any, will be determined based on developments in treatment technologies, future regulatory directions and results of new health effects studies. CALFED plans an active role in fostering development of the information that will make such determinations possible.

CALFED will obtain expert advice on drinking water issues related to users of Delta water by establishing a Delta Drinking Water Council. The Council would comprise independent, nationally recognized scientists and other experts. With the support of CALFED staff, the Council will collect information as needed, including monitoring data from CMARP, health effects research results, status of water quality standards development, and treatment technology improvements. This information will be used by the Council to perform a broad-based evaluation of the performance of the Program with regard to providing safe drinking water to consumers. The Council will prepare annual reports, to be submitted to CALFED, the Legislature, and Congress that document progress towards Stage 1 water quality goals. The success of the Council in advising CALFED, and CALFED's success, will be dependent on adequately implementing necessary information collection processes and having adequate resources to perform thorough program reviews.

Program Actions

The Water Quality Program has relied on the technical expertise of a variety of stakeholders to define approaches to solving water quality problems, and to develop programmatic actions to meet CALFED objectives. While some actions are sufficiently developed for early implementation, others rely on comprehensive monitoring, pilot studies, and research to improve our understanding of effective water quality management and to influence future actions to control water quality problems at their sources. This approach allows actions to be taken on known water quality problems and sources of those problems, while allowing further monitoring, research, and testing of potential problems and solutions. Actions will be adapted over time to ensure the most effective use of resources.

In summary, the Water Quality Program component includes the following broad categories of programmatic actions:

- **Drinking Water Parameters** - Reduce the loads and/or impacts of bromide, total organic carbon, pathogens, nutrients, salinity, and turbidity through a combination of measures including source reduction, alternative sources of water, treatment, and storage and conveyance improvements.
- **Pesticides** - Reduce impacts of pesticides (including diazinon and chlorpyrifos) through development and implementation of Best Management Practices, for both urban and agricultural uses, and support of pesticide studies for regulatory agencies while providing education and assistance in implementation of control strategies for the regulated pesticide users.
- **Organochlorine Pesticides** - Reduce the load of organochlorine pesticides in the system, including residual DDT and chlordane, by reducing runoff and erosion from agricultural lands through Best Management Practices. Sediment control will also protect valuable topsoil and prevent costly maintenance of drainage systems.
- **Trace Metals** - Reduce impacts of trace metals such as copper, cadmium, and zinc in upper watershed areas, near

Further research is needed for some water quality problems.

For example, as to mercury, not enough is understood about the relative contribution of various mercury sources; factors affecting the transformation of mercury from one form into another (particularly the formation of methyl mercury, the most bioavailable form); specific control measures that will reduce the levels of bioavailable mercury within the estuary; and, ultimately, the level of load reductions needed to reduce fish tissue concentrations to levels that will render the fish safe for human consumption. In addition, research is needed to determine what effect wetlands restoration activities will have on the bioavailability of mercury in soils in these restoration areas.

abandoned mine sites. Reduce impacts of copper through urban stormwater programs and agricultural Best Management Practices. Study the ecological impacts of copper in the Delta. Determine the feasibility of copper reduction.

- **Mercury** - Reduce mercury in rivers and the estuary by source control at inactive and abandoned mine sites. Determine current mercury levels in water, sediment and fish in the estuary, rivers and affected tributaries. Implement comprehensive monitoring and research program to determine loadings and sources of total and methyl mercury, transport of mercury in sediment, factors affecting mercury transformation and bioaccumulation in the estuary, and concentrations of mercury in indicator species. Use this information to prioritize remediation or cleanup of mercury sources.
- **Selenium** - Reduce selenium impacts through reduction of loads at their sources, and through appropriate land fallowing and land retirement programs (including those under the CVPIA). In the San Joaquin River watershed, reduced loads will be accomplished through implementation of on-farm and district source control measures, development of treatment technology, implementation of projects such as the Grasslands bypass Use Agreement (if shown effective), and appropriate land fallowing and land retirement. Increased assimilative flows are anticipated as a result of FERC actions on San Joaquin River tributaries and VAMP flows. Selenium impacts from industrial sources in the Suisun Bay will be reduced by improved source control.
- **Salinity** - Actions are planned to reduce salt sources in urban and industrial waste water to protect drinking and agricultural water supplies, and to facilitate development of successful water recycling, source water blending, and groundwater storage programs. For the San Joaquin River watershed, a strategy should be developed using a continuous monitoring technology to minimize water quality impacts of salt movement through the system. This strategy will be consistent with CVPIA and VAMP requirements. CALFED will not pursue resolution of salinity problems of the San Joaquin Valley through a San Joaquin Valley Drain, which is beyond the scope of the CALFED Program. Long term solutions will be sought through the San Joaquin Valley Drainage Implementation Program, with CALFED support. Salinity in the Delta will be controlled both by limiting salt loadings from its tributaries, and through managing seawater intrusion by such means as using storage capability to maintain Delta outflow and to adjust timing of outflow, and by export management.
- **Turbidity and Sedimentation** - Reduce turbidity and sedimentation which affect several hydraulic areas in the Bay Delta and its tributaries. Study ecological impacts of sedimentation. Control sedimentation in several watersheds to protect

spawning beds and maintain capacity of streams.

- **Low Dissolved Oxygen** - Reduce impairment of rivers and the estuary caused by substances that exert excessive demand on dissolved oxygen. Oxygen depleting substances are found in waste discharges, agricultural discharges, urban stormwater, sediment, and algae.
- **Toxicity of Unknown Origin** - Through research and monitoring, identify parameters of concern in the water and sediment within the Delta, Bay, Sacramento River and San Joaquin River regions and implement actions to reduce their toxicity to aquatic organisms.

Bromide and Organic Carbon Management

Drinking water supplies from the Delta contain higher bromide concentrations than are found in the drinking water supplies of about 90% of the nation. Bromide (a salt) reacts with disinfection chemicals to form harmful chemical byproducts that have increasingly raised health concerns for consumers. Most of this bromide comes from the ocean as a result of its connection with the Sacramento-San Joaquin Bay-Delta estuary, and will continue to impact the quality of water exported by the state and federal projects.

An analysis (currently under peer review) of bromide and organic carbon sources in Delta drinking water supplies was undertaken to develop a realistic expectation of what level of reductions in bromide and organic carbon concentrations might be expected as a result of Water Quality Program actions. This analysis indicates that the Pacific Ocean is the predominant source of bromide in Delta waters. Further analysis of the San Joaquin River indicated that about 80% of the bromide found there can be accounted for by bromide entering the Delta through the Central Valley Project pumps at Tracy. Evidence suggests that other sources of bromide, such as pesticide use in the Valley or natural sources in San Luis Reservoir are not as important; therefore, it appears that a large majority of bromide found in the San Joaquin River is from recirculated Delta water containing bromide from the ocean. This bromide analysis indicates that, because bromide in Delta drinking water supplies comes mostly from the ocean, it is probably not possible for water quality source control actions to reduce bromide concentrations by more than 20%. Control of bromide associated with seawater intrusion is described above, under Salinity.

Water flowing through the Delta to municipal water intakes picks up additional organic carbon. Studies have demonstrated that a majority of this added carbon comes from drainage off Delta islands. Organic carbon, unlike bromide, is subject to removal, at least to some extent, through conventional water treatment processes. While a number of practical problems would affect the feasibility and economics of reducing organic carbon to acceptable levels, it may be feasible to meet this objective through water quality program actions involving land and water management

and treatment either on Delta islands or at treatment plants, and relocation of agricultural discharges away from municipal supply intakes. Other management actions could include timing of diversions, separation of drinking water supplies, and blending with higher quality source waters. Storage capability can provide important flexibility for enabling these water management actions to be successful. Further studies will be required to quantify more fully the results of potential water quality actions, and to establish the feasibility of implementing these actions.

Unlike most of the other water quality parameters of concern to CALFED, the choice of CALFED conveyance options can influence concentrations of bromide, other salts, and organic carbon in Delta waters. Therefore, the bromide question, in particular, is linked to conveyance and other water management options to improve source quality within the CALFED program. See the **Conveyance** section in this chapter.

Coordination Between CALFED and Other Responsible Agencies

Success in achieving the CALFED water quality objectives through the CALFED Water Quality Program will depend upon close coordination and collaboration between the State Water Resources Control Board, Regional Water Quality Control Boards, California Environmental Protection Agency, California Department of Health Services, U.S. Environmental Protection Agency, and other responsible State and Federal agencies, in implementation and regulation of water quality targets, goals, objectives and standards for municipal wastewater discharges, urban and agricultural runoff, and agricultural and mine drainage to the Delta and its tributaries. In 1999, CALFED will establish a working group of stakeholders and agency representatives to identify appropriate linkages, develop specific coordination mechanisms, and regulatory actions to assure that agency actions are consistent with and conducive to meeting CALFED's water quality goals.

Relation to Other Program Elements

Other components of the CALFED Program can affect water quality. Surface storage can help in the management of flows and improve water quality by providing additional storage for higher quality, wet period flows and for blending. As previously discussed, improved conveyance to south Delta export pumps can substantially improve water quality for those diversions. However, such changes have the potential to change the quality of water in Delta channels, either for the better or worse. Water use efficiency measures can improve water quality entering the Delta by reducing some agricultural and non-agricultural discharges containing pollutants, but also have the potential to decrease water quality. Ecosystem restoration actions may degrade drinking water quality by increasing organic carbon loads; therefore these actions will need to be structured so as to minimize adverse water quality impacts.

Water quality can affect the ability to expand water use efficiency measures such as conservation, wastewater reuse, and conjunctive use, all of which depend on the availability of high quality water to prevent salt damage of irrigated land or groundwater basins, prevent corrosion of industrial equipment, and to achieve blended water salinity objectives.

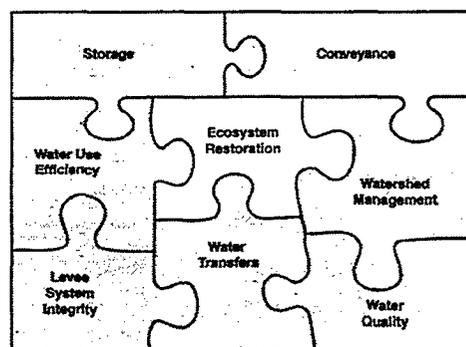
In the event of a catastrophic levee failure in the Delta, the amount of saline water entering the system could be such as to make Delta waters unusable for many months. Besides making the water unusable for agricultural, industrial, or domestic purposes, it could also destroy delicate ecosystem balances and ruin CALFED investments in ecosystem restoration. Therefore, it is difficult to overestimate the importance of a successful Delta levee program to achieving and maintaining good water quality for the beneficial uses of Delta waters.

The CALFED Comprehensive Monitoring, Assessment, and Research Program (CMARP) will be the primary vehicle for measuring the extent to which continuous water quality improvement is achieved. Performance will be measured by comparing ambient water quality (where appropriate) to specific water quality objectives that have been established for the parameters of concern. An independent panel established to evaluate the progress of the Stage 1 water quality actions against objectives will also provide oversight of the CMARP effort as part of its reports to CALFED and the California Legislature.

More information on the water quality program will be included in the revised *Water Quality Program Plan*.

Ecosystem Restoration Program

The Ecosystem Restoration Program (ERP) is the principal mechanism that CALFED will use to restore the health of the Bay-Delta ecosystem. The overarching goal of the ERP is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. The ERP is described in three volumes: Volume I contains vision statements that describe the ecological attributes and desired future Bay-Delta conditions; Volume II outlines over 700 programmatic restoration actions for the 14 ecological management zones delineated within the Bay-Delta ecosystem; and the Strategic Plan describes the ecosystem-based, adaptive management approach that will be used to implement the restoration program.



The ERP is predicated upon an ecosystem-based management approach that emphasizes the restoration of ecological processes. By restoring the natural processes that create and maintain

diverse and vital habitats, the ERP aims to meet the needs of multiple plant and animal species while reducing the amount of human intervention required to maintain habitats. Through this ecosystem-based approach, the ERP will contribute to or assist in the recovery of endangered and threatened species that use the Bay-Delta, and it will help improve the population abundance and distribution of unlisted plant and animal species, thereby reducing or precluding future species listings. In this manner, the ERP will help reduce conflicts between endangered and threatened species and water supply opportunities.

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other Program components. Although we know much about how the Bay-Delta functions, there are still significant information gaps that hamper our ability to sufficiently define problems and design restoration actions to address them. To account for this uncertainty, the ERP uses an adaptive management approach to restoring and managing the Bay-Delta ecosystem. In an adaptive management approach, restoration actions are designed and monitored so that they improve our understanding of the system while simultaneously restoring it. This approach allows revision of restoration activities or better design future restoration actions based upon the information gathered from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and address resource conflicts and trade-offs.

CALFED convened a group of technical experts to work with CALFED in developing the Strategic Plan for the ERP. The Strategic Plan outlines the following steps as part of the adaptive management approach:

- Define the problem or set of problems to be addressed
- Define goals and objectives for resolving identified problems
- Develop conceptual models
- Develop and design alternative restoration or management actions
- Implement restoration actions
- Monitor the ecosystem
- Update restoration and management actions

Throughout that adaptive management process, CALFED will rely on the advice of expert panels, particularly the ERP Science Review Panel that is identified in the Strategic Plan. These panels would assess the results of CALFED actions, monitoring and research data from CMARP, and other relevant information to provide advice to CALFED regarding future monitoring, research, and program actions. Such advice will be particularly relevant to decisions regarding future ERP actions and decisions regarding future conveyance and storage actions that will affect ecosystem restoration.

CALFED will use this adaptive management process to refine and implement the 700 programmatic restoration actions contained in the ERP. Representative ERP actions include:

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- Restoring, protecting, and managing diverse habitat types representative of the Bay-Delta and its watershed.
 - Restoring critical instream and channel-forming flows in Bay-Delta tributaries.
 - Improving Delta outflow during key springtime periods.
 - Reconnecting Bay-Delta tributaries with their floodplains through the construction of setback levees, the acquisition of flood easements, and the construction and expansion of flood bypasses.
 - Developing, assessment, prevention, and control programs for invasive species.
 - Restoring aspects of the sediment regime by relocating instream and floodplain gravel mining, and by artificially introducing gravels to compensate for sediment trapped by dams.
 - Reducing or eliminating fish passage barriers, including the removal of dams, construction of fish ladders, and construction of best available technology fish screens.
 - Targeting research to provide information needed to define problems sufficiently and to design and prioritize restoration actions.

More information on the ecosystem restoration program will be included in the revised *Ecosystem Restoration Program Plan*.

CALFED seeks to preserve as much agricultural land as possible during implementation in Phase III consistent with meeting all Program goals. Some of the land needed for Program implementation is already owned by the government and that land will be used when appropriate. Partnerships with landowners, including easements with willing land owners, will be pursued when appropriate to obtain mutual benefit if the appropriate government land is not available. Acquisition of fee title to land will be from willing sellers only, and will be used when neither available government land nor partnerships are appropriate or cost effective for the specific need.

Many entities have expressed concerns about the effects of the CALFED Program (including especially the ERP and levee programs) on agricultural land. Agricultural resources are an important feature of the existing environment of the state and are recognized and protected under CEQA and state and federal policy. One of the major principles of the State's agricultural policy is to sustain the long-term productivity of the State's agriculture by conserving and protecting the soil, water, and air which are agriculture's basic resources. It is CALFED policy that adverse environmental effects to agricultural resources resulting from CALFED programs, projects, and

actions will be fully assessed and disclosed under CEQA and NEPA, and avoided or mitigated as required by law. Assessment, disclosure, and avoidance and other mitigation strategies shall be developed at the programmatic and project-specific levels in consultation with other state, federal, and local agencies with special expertise or authority over agricultural resources which may be affected by the Program, such as California Department of Food and Agriculture.

CALFED agencies have committed, through the July 1994 Framework Agreement, to promote maximum coordination, communication, and cooperation among themselves and other interests. CALFED agencies have also agreed that coordination shall not constrain or limit the agencies in carrying out their statutory responsibilities. Numerous activities and programs are ongoing or proposed that convert agricultural land to habitat for fish, wildlife, and wetland purposes. Examples are actions being taken through the Central Valley Project Improvement Act and the Central Valley Habitat Joint Venture to protect and restore significant areas of land in the Central Valley. To the extent that these activities and programs establish habitat that is also proposed in the ecosystem restoration program, that habitat reduces the amount of habitat that is needed to achieve the ecosystem restoration program goals. Also, to the extent that these activities and programs propose water acquisition for specific watersheds that is also proposed in the ecosystem restoration program, that water reduces the amount of water that is needed to achieve the ecosystem restoration program goals on those specific watersheds. Every effort will be made to fully integrate actions being taken by the various state, federal, and local agencies with the CALFED Program.

Several entities have expressed concern that CALFED is not directly focusing on promoting the health of San Francisco Bay, particularly the Central and South Bay areas. It is true that the Program has not included San Francisco Bay as part of its defined problem area (which includes the legally defined Delta, Suisun Bay extending to Carquinez Strait, and Suisun Marsh). Nevertheless, because the Bay-Delta system is part of a larger water and biological resource system, solutions to address the problems in the system will include a broader geographic scope extending both upstream and downstream. This solution scope includes San Pablo Bay, San Francisco Bay, and portions of the Pacific Ocean out to the Farallon Islands. In particular, the Program will address interactions between the Delta and San Francisco Bay, such as flow or sediment, by examining the "inputs" and "outputs" from the defined problem area. In addition, given CALFED's solution principle that solutions should have no significant redirected impacts, consideration needs to be given to how each alternative might negatively affect San Francisco Bay. The Draft Programmatic EIS/EIR evaluates impacts (both adverse and beneficial) of the CALFED alternatives on the San Francisco Bay region.

Many stakeholders have recommended that CALFED give serious consideration to restoring salmon runs below Friant Dam on the San Joaquin River as a means of attaining ERP goals. For example, some have suggested that this goal could be coupled with a tailored water transfer and groundwater storage program to attain multiple CALFED objectives. CALFED will continue to evaluate fishery restoration in the mainstem San Joaquin River as a part of the ERP, while

remaining cognizant of the specific hydrological and water management considerations in the San Joaquin basin.

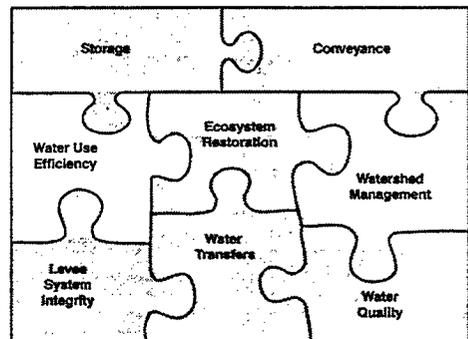
Water Use Efficiency Program

The CALFED Water Use Efficiency Program is one of the cornerstones of CALFED's water management strategy. The CALFED policy toward water use efficiency is a reflection of the State of California legal requirements for reasonable and beneficial use of water: existing water supplies must be used efficiently, and any new water supplies that are developed by the Program must be used efficiently as well.

The CALFED Water Use Efficiency Program is based on the recognition that implementation of efficiency measures occurs mostly at the local and regional level. The role of CALFED agencies in water use efficiency will be to offer support and incentives through expanded programs to provide planning, technical, and financial assistance. CALFED agencies will also support institutional arrangements that give local water suppliers an opportunity to demonstrate that cost-effective efficiency measures are being implemented. Some potential water use efficiency benefits, such as water quality improvements, may be regional or statewide rather than local. These are situations in which CALFED planning and cost-share support may be particularly effective.

The CALFED Water Use Efficiency Program will 1) establish measurable objectives, 2) offer support and incentives through expanded programs to provide planning, technical, and financial assistance; 3) monitor progress towards objectives; and, 4) if these objectives are not met, re-evaluate management options. The Program will periodically evaluate the measurable objectives in light of new information and make appropriate revisions (up or down) to the objectives.

Water use efficiency measures can make available additional water supplies for environmental or consumptive users, and can serve as a useful tool for addressing many of the problems in watershed management. Improvements in water use efficiency are anticipated from a wide range of CALFED programs, and not all of these are reflected in this discussion of the Water Use Efficiency Program. As with other program elements, actions and activities undertaken throughout the CALFED Program can have corollary benefits in other CALFED program areas. For example, CALFED expects to generate water use efficiency incentives through improvements in the water market and through willing-seller water acquisitions for Ecosystem Restoration Program instream flows. In addition, improvements in water quality in the Water Quality Program can assist in meeting water use efficiency goals by reducing the need for water



to meet soil leaching requirements and by enhancing water reclamation opportunities. Similarly, actions taken under the Water Use Efficiency Program are expected to have ancillary benefits for other CALFED objectives. Reducing unnecessary surface runoff from farms and urban areas can enhance water quality by reducing the discharge of unwanted substances into watercourses. In addition, water use efficiency measures can improve water supply reliability by increasing the number of opportunities available to water managers. Finally, through the planning and implementation of water use efficiency measures, the cost effectiveness of various storage components will become better defined.

Based on analysis provided in the Water Use Efficiency Program Plan, estimates of potential reduction of water application and irrecoverable losses are summarized in the following table. Values in the table represent potential reductions of water application and irrecoverable losses that are most likely to occur for future conditions regardless of the outcome of a CALFED solution (termed no-action) as well as the incremental savings expected from a CALFED solution. Representative values shown in this summary table are all midpoints in value ranges contained in the Revised Water Use Efficiency Program Plan.

The purpose of this table is to give a perspective of the order of magnitude of the potential effects of water use efficiency improvements both with and without the CALFED solution. The values presented are not goals or targets. Rather, they are intended to provide the relative magnitude of potential results of expected efficiency actions. Because stakeholders disagree on the magnitude and/or the feasibility of achieving these values, the values will be further refined before the CALFED Programmatic EIS/EIR is finalized. Stakeholders do agree, however, that water conservation can provide significant benefits for multiple purposes and therefore is a significant contribution to the CALFED solution. Consistent with a programmatic analysis, specific actions or programs that would have to be implemented to achieve these results have not been specified.

The table describes three types of potential reductions:

- Recovered Losses with Potential for Rerouting Flows - These losses currently return to the water system, either as groundwater recharge, river accretion, or direct reuse. Reduction in these losses would not increase the overall volume of water, but might have other benefits such as making water available for irrigation or instream flows during dry periods, improving water quality, decreasing diversion impacts or improving flow between the point of diversion and the point of reentry.
- Potential for Recovering Currently Irrecoverable Losses - These losses currently flow to a salt sink, deep aquifer, or the atmosphere, and are unavailable for reuse. Reduction in these losses would increase the volume of useable water.
- Potential Reduction of Application - This is the sum of the previous reductions.

Summary of Year 2020 Estimated Conservation and Recycling Potential (1,000 acre-feet)¹

	No Action (in absence of CALFED)			CALFED Increment (result of CALFED actions)			Total Conservation Potential		
	Recovered Losses with Potential for Rerouting Flows (A=C-B) ³	Potential for Recovering Currently Irrecoverable Losses (B) ³	Total Potential Reduction of Application (C) ³	Recovered Losses with Potential for Rerouting Flows (A=C-B) ³	Potential for Recovering Currently Irrecoverable Losses (B) ³	Total Potential Reduction of Application (C) ³	Recovered Losses with Potential for Rerouting Flows (A=C-B) ³	Potential for Recovering Currently Irrecoverable Losses (B) ³	Total Potential Reduction of Application (C) ³
Urban (Total Delivered Water: 12.0 MAF)	475	685	1,160	435	845	1,280	910	1,530	2,440
Agricultural (Total Applied Water: 31.5 MAF)	2,145	190	2,335	1,676	160	1,836	3,821	350	4,171
Urban Recycling ²	90	420	510	185	570	755	275	990	1,265
TOTAL	2,710	1,295	4,005	2,296	1,575	3,871	5,006	2,870	7,876

¹ All figures are forecast for year 2020 and are from CALFED's Revised Water Use Efficiency Program Plan.

² No Action urban recycling values do not include existing recycling level of 485,000 acre-feet (the March 1998 Phase II Interim Report inadvertently included the existing values).

³ The values in Column B (Potential For Recovering Irrecoverable Losses) and Column C (Total Potential Reduction of Application) were computed explicitly from regional values of applied water, depletion, evapotranspiration of applied water and other factors. The values in Column A (Recovered Losses with Potential for Rerouting Flows) were computed as the difference between the values in Columns B and C.

There appears to be emerging agreement between agricultural and environmental interests on distinctions between different types of potential reductions. This is a significant breakthrough in the debate over agricultural water conservation potential as it enables the CALFED program and stakeholders to focus on effectively reducing specific types of losses to obtain desired benefits.

With respect to urban and agricultural water conservation, CALFED proposes to rely largely on locally-directed processes to provide endorsement or certification of urban and agricultural water suppliers that are properly analyzing conservation measures and are implementing all measures that are cost-effective and feasible. Organizations composed of water suppliers and public interest or environmental groups already exist that may be able to serve this function. Endorsement or certification of water suppliers will enable CALFED agencies to target assistance programs and other measures to assure efficient water use. The agricultural water

conservation certification process would operate within the context of measurable objectives established through the strategic planning process described below and an assurance package.

The draft Water Use Efficiency Program includes the actions listed below.

Water conservation related actions include:

- Work with the Agricultural Water Management Council to identify appropriate agricultural water conservation measures, set appropriate levels of effort, and to certify or endorse water suppliers that are implementing cost-effective feasible measures.
- Work with California Urban Water Conservation Council to establish an urban water conservation certification process and set appropriate levels of effort to ensure water suppliers are implementing cost-effective feasible measures.
- Expand state and federal programs to provide sharply increased levels of planning, technical, and financing assistance and develop new ways of providing assistance in the most effective manner.
- Help urban water suppliers comply with the Urban Water Management Planning Act.
- Help water suppliers and water users identify and implement water management measures that can yield multiple benefits including improved water quality and reduced ecosystem impacts.
- Identify and implement practices to improve water management on wildlife refuges.
- Gather better information on water use, identify opportunities to improve water use efficiency, and measure the effectiveness of conservation practices.
- Develop, in consultation with the Agricultural Water Management Council, a program of technical and financial incentives to achieve local-level implementation of water use efficiency measures in the agricultural sector.
- Identify, in region-specific Strategic Plans for Agricultural Areas, measurable objectives to assure improvements in water management.

Water recycling actions include:

- Help local and regional agencies comply with the water recycling provisions in the Urban Water Management Planning Act.
- Expand state and federal recycling programs in order to provide sharply increased levels of planning, technical, and financing assistance (both loans and grants), and develop new ways of providing assistance in the most effective manner.
- Provide regional planning assistance that can increase opportunities for use of recycled water.

Assurances will play a critical role in the Water Use Efficiency Program element. The assurance mechanisms are structured to ensure that urban and agricultural water users implement the appropriate efficiency measures. As a prerequisite to obtaining CALFED Program benefits (for example, participating as a buyer or seller in a water transfer, receiving water from a drought water bank, or receiving water made available solely because of supply enhancements such as new, expanded, or reoperated facilities) water suppliers will need to show that they are in compliance with the applicable urban or agricultural council agreements and applicable State law. This requirement will result in careful analysis and implementation of cost-effective conservation measures identified in those agreements.

A high level of water use efficiency is also expected to be required as a condition for permitting of any new surface storage projects. Widespread demonstration of efficient use by local water suppliers and irrigation districts will be a prerequisite to CALFED implementation of new storage projects. The definitions of "high level of water use efficiency" and "widespread demonstration of efficient use" will be established prior to the ROD.

Local water suppliers will rely on CALFED agencies to provide a high level of technical and financial assistance to support local conservation and recycling efforts. Adequate funding for assistance programs will be an important assurance for local agencies. CALFED's initial Stage 1 cost estimate for state and federal financial assistance is \$700 million which may be increased as the program is further refined.

Economic analyses are underway that will compare water use efficiency options (including conservation, recycling, and transfers) and new facilities and identify least-cost ways of meeting CALFED objectives. These analyses are expected to better define the mix of demand management and water supply options and water supplies from new facilities. CALFED will work with stakeholders on technical and implementation issues as these analyses proceed.

Also, CALFED will develop, after consultation with CALFED agencies, the Legislature, and stakeholders, state legislation that requires appropriate measurement of water use for all water

users in the state of California. In developing this legislation, important technical and stakeholder issues will be addressed to define "appropriate measurement," which is expected to vary by region. Aspects of this definition include the nature of regional differences, appropriate point of measurement, and feasible level of precision.

Development of Agricultural Water Use Efficiency Program. The March 1998 draft Programmatic EIS/EIR proposed that an existing group, the Agricultural Water Management Council established pursuant to AB3616, play a pivotal role in assuring demonstration of efficient water use in the agricultural sector. Concerns about this proposal, and about the agricultural water use efficiency program more generally, led to the formation of both a formal stakeholder-agency focus group to evaluate and propose improvements to the program and a technical review panel to review the technical basis for the program and proposals included in the EIS/EIR. The Focus Group has met several times. CALFED has incorporated many of the Focus Group recommendations in the draft, but this section does not necessarily reflect the views of all Focus Group members. Before the CALFED Programmatic EIS/EIR is finalized, CALFED will incorporate comments received from these two groups, as well as from the public, and will proceed with program refinement in an open public process.

The ultimate goal for CALFED is to develop a set of agricultural water use efficiency programs and assurances that contributes to CALFED goals and objectives, has broad stakeholder acceptance, fosters efficient water use, and helps support a sustainable agricultural economy. The CALFED Program will not use fallowing or land retirement solely as water use efficiency measures. In developing the agricultural water use efficiency programs and assurances, CALFED must develop a program that:

- Promotes the use of water in a way that optimizes both on-farm and environmental (including water quality) benefits.
- Takes into account the regional differences in available water management options.
- Includes effective linkages to other CALFED programs.

The Focus Group is developing a program structured around four broad elements. These elements – listed below and enumerated in greater detail in the accompanying section on action steps – are mutually supporting and are presented as a package.

- **Incentives** - Develop, in consultation with the Agricultural Water Management Council, a program of technical and financial incentives for the implementation of water use efficiency measures in the agricultural sector. The financial incentives should generally take the form of loans for actions or activities that have been

identified as cost-effective for the district in a water management plan approved by the Agricultural Water Management Council. The financial incentives should generally take the form of incentive grants for water use efficiency measures that are supplemental to measures that are cost-effective at the district level.

- **A locally tailored program that incorporates the work of AB3616.**
- **Measurable objectives** - Measurable objectives are objectives for improvements in water management, which can be measured or otherwise tracked to assure that such improvements occur. Objectives will include outcome indicators based on actual water use. Objectives must be related to specific CALFED objectives. Objectives may vary by region. These objectives will be developed prior to the ROD.
- **Assurances** - Assurances will play a critical role in the Water Use Efficiency Program element. The assurance mechanisms are structured to ensure that urban, agricultural, and refuge water users implement the appropriate efficiency measures.

Before finalizing the CALFED Program, CALFED will develop a Strategic Plan for Agricultural Water Use Efficiency. The purpose of the Plan will be to articulate a prioritized, strategic, aggressive program for the achievement of efficient water management for all purposes throughout the many different agricultural regions of the state. The plan will focus in detail on specified regions, basins, and districts on a prioritized basis. The plan will draw on the work of local agencies and other sources to assess:

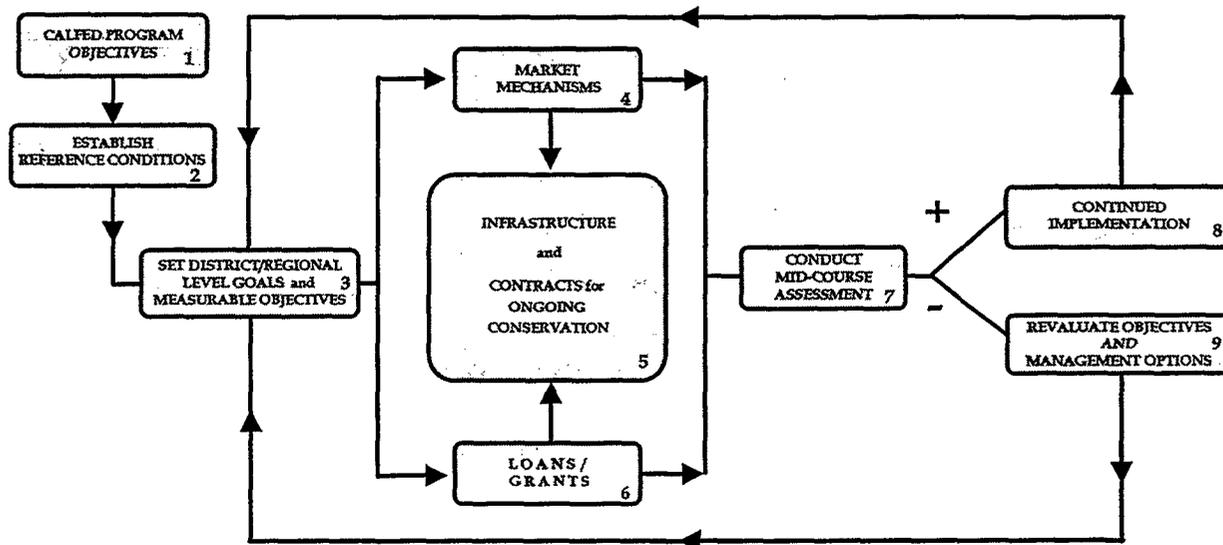
- What efficient practices are already being carried out
- Identify additional opportunities for improved water management
- Recommend goals
- Recommend incentives and other means to overcome any barriers to adoption of more efficient water management practices

The Strategic Plan is to be developed by the end of 1999. A facilitated process for such development, including non-agency stakeholders, will be undertaken.

The development and implementation of the proposed water use efficiency program is depicted in the figure on the following page.

More information on the water use efficiency program will be included in the revised *Water Use Efficiency Program Plan*.

Approach to Agricultural Water Use Efficiency Program

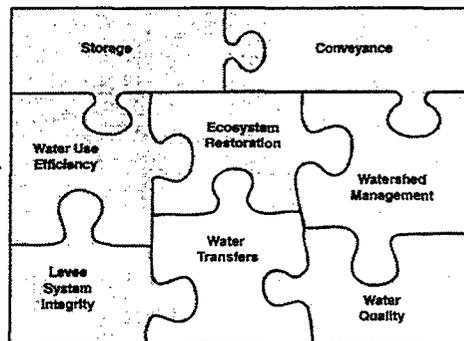


The overall approach for the agricultural water use efficiency program, as illustrated in the above figure, is as follows:

- 1) The CALFED Program Objectives establish the basic foundation for the Agricultural Water Use Efficiency Program.
- 2) Establish reference conditions, in order to evaluate future progress. There will be an independent review conducted in conjunction with AWMC for this purpose.
- 3) Set district/regional level goals and measurable objectives. Goals and measurable objectives will be set within the context of overall CALFED objectives. These goals will include outcome based indicators related to actual water use.
- 4-6) The Focus Group believes that a package of market mechanisms, loans and grants is essential to initiating and supporting ongoing conservation efforts to improve agricultural water use efficiency. Certain water use efficiency improvements are cost-effective at the District level. CALFED will develop a loan program to help with capitalizing these projects, which will typically involve infrastructure improvements. A still higher level of water use efficiency is possible when cost-effectiveness is considered from a regional or statewide perspective. CALFED will develop a grant program to achieve these additional efficiency improvements. The market can be harnessed to help drive efficiency improvements. Specifically, district level assessments will indicate how much water is available for transfer to environmental or consumptive use at various levels of cost. This information could be made available to the water transfer clearinghouse, enabling contracts, option agreements or other arrangements for either infrastructure improvements, or ongoing conservation/water management improvements.
- 7) An independent team, in conjunction with AWMC and the district, will conduct a mid-course assessment to evaluate progress toward achieving stated objectives.
- 8) Information gained during the mid-course assessment will be used to further refine and improve district level water use efficiency program.
- 9) By the end of Stage I, the program provides for the reevaluation of objectives and management options.

Water Transfer Program

Water transfers are currently an important part of water management in California and offer the potential to play an even more significant role in the future. Transfers can provide an effective means of moving water between users on a voluntary and compensated basis, as well as a means of providing incentives for water users to implement management practices which will improve the effectiveness of local water management.



Every year, hundreds of thousands of acre-feet of water are transferred between willing parties. Most of these transfers consist of in-basin exchanges or sales of water among Central Valley Project (CVP) or State Water Project (SWP) contractors. For example, in 1997 nearly 288,000 acre-feet of CVP water was transferred by CVP contractors south of the Delta. Since 1993, over 1.4 million acre-feet of CVP water has been transferred north and south of the Delta by contractors within the various divisions of the CVP. In addition, approximately 230,000 acre-feet of non-CVP water has been purchased and transferred by the Interior Water Acquisition Program to meet established instream flow purposes.

Generally, past transfers have been successful, and CALFED actions must not interfere with the historical ability to transfer water. Some transfers have raised concerns regarding adverse impacts to other water users, to rural community economies and to the environment. They have also highlighted contradictory interpretations of state law, the lack of reliable ways to transport the transferred water across the Delta, and complicated approval processes. Before the value of water transfers as a management tool can be fully realized, these problems need to be addressed.

The Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and further development of a statewide water transfer market by addressing these problems. Because water transfers can impact third parties (those not directly involved in the transaction) and/or local groundwater, environmental, or other resource conditions, the framework also includes mechanisms to provide protection from such impacts.

Both the BDAC Water Transfer Work Group and the Transfer Agency Group were instrumental in identifying the issues which constrain the water transfer market. These were sorted into three broad categories to aid in developing resolution:

1. *Environmental, socio-economic, and water resource protections* - including:
 - Third party socio-economic impacts
 - Groundwater resource protection
 - Transfers to augment instream flow
 - Environmental protection in source areas

-
- Area of origin/watershed priorities
 - Rules/guidelines for environmental water transfers
2. *Technical, operational, and administrative rules* - including:
 - Transferrable water and the "no injury rule"
 - Saved or conserved water
 - Operating criteria and/or carriage water requirements
 - Reservoir refill criteria
 - Streamlining the transfer approval process
 3. *Wheeling and access to state/federal facilities (especially for cross-Delta transfers)* - including:
 - Predictability of access for transferred water in existing state and federal project facilities
 - Priority of transferred water in new facilities
 - Wheeling costs

Based on the recommendations of the BDAC Water Transfer Work Group, the Transfer Agency Group, and other stakeholders, CALFED will implement the following actions:

- **Develop a Strategic Plan.** Before adopting the Record of Decision, CALFED will develop a Strategic Plan for encouraging a robust water transfers market in California. In the early Spring of 1999, CALFED will convene a panel of legal, economic, hydrologic, and other relevant experts to assist in developing this Strategic Plan. Following the model of the ERP Strategic Plan, these experts should be selected with input from stakeholders, agencies, and the Legislature. The purpose of this panel will be to identify specific recommendations for the Strategic Plan to enhance the use of a water transfers market as a tool to achieve CALFED goals, consistent with the CALFED solution principles.

The Strategic Plan will provide direction and prioritization for implementation of CALFED's Water Transfers Program, and at a minimum will provide for the following:

- **An expedited process for CALFED agencies, in consultation with the stakeholders, to identify and develop interim rules, regulations or procedures necessary for an effective water transfer market pending long term resolution of definitional and procedural issues identified below.** This process should result in adoption of appropriate interim rules, regulations or procedures before the ROD.
- **An expedited process for CALFED agencies to work with the**

Legislature and stakeholders to determine whether additional legislation to protect water rights, including area of origin priorities, is necessary.

- **A prioritization and schedule for implementing the tasks discussed below, with identification of the appropriate agency or agencies to be involved.**

- **Based on the guidance in the Strategic Plan, establish a California Water Transfers Information Clearinghouse** to ensure that decisions regarding proposed water transfers can be made with all parties in possession of complete and accurate information and to provide information to facilitate assessment of potential third party impacts. The Clearinghouse would not function as a regulator, a market broker, or as a water bank. The Clearinghouse would:
 - Collect and disseminate data and information relating to water transfers and potential transfer impacts
 - Perform research using historic data to understand water transfer impacts

- **Based on the recommendations of the Strategic Plan, streamline the approval process for those categories of transfers that generally have not caused appreciable concerns.**
 - **Coordination among CALFED agencies to formulate policy**, under their existing authorities, for required water transfer analysis. This would require all transfer proposals which are subject to approval by the SWRCB or that depend on access to state/federal conveyance facilities to include information regarding potential socio-economic, groundwater, and cumulative impacts at the time of submission for approval by the respective CALFED agency. It is anticipated that the required analysis would differ according to the category of proposed transfer (short term/long term, in basin/out of basin, large/small, etc.). Information would be provided by the transfer proponents. This is for public information purposes and would be disclosed through the California Water Transfers Information Clearinghouse.

 - **Development by CALFED agencies of a standardized checklist and analysis procedure** to be followed for each proposed water transfer that undergoes review by the SWRCB, DWR or USBR. This would guide transfer proponents through a series of questions, requesting specific information regarding the proposed transfer. This checklist would allow the proponents to prepare all the necessary information prior to submitting

it to the SWRCB or other approving agency, greatly reducing the time spent trying to fill information gaps that often remain under the existing transfer approval process. This procedure should be consistent with an overall effort to streamline the transfer approval process, at least in those categories of transfers that generally have not caused appreciable concerns.

- **Based on the recommendations of the Strategic Plan, develop a process for CALFED agencies to work with the SWRCB and stakeholders to exercise the SWRCB's rulemaking authority to develop an expedited approval process.** This will include determining which categories of transfers have not caused appreciable concerns from the standpoint of protected legal interests (including the environment) and are thus eligible for expedited approvals, including categorical exemptions from CEQA. This also will include determining what type of hearing, if any, to conduct for these transfers, what kind of environmental documentation is required, what the protest opportunities will be, and how to allocate burdens of proof.
- **Based on the recommendations of the Strategic Plan, CALFED will work for institutional and legal changes to facilitate the conveyance and storage of transferred water and address related issues:**
 - **Forecast and disclosure by DWR and USBR of potential conveyance capacity** to provide transfer proponents more timely information regarding the potential availability of conveyance capacity for cross-Delta water transfers and probabilities of it being available. Forecasts would occur on a monthly basis (in conjunction with water supply forecasts). Forecasts would also be provided for other portions of project conveyance facilities, as needed. Forecasts would be based on the best information available to project operators, but could not guarantee that the capacity would be available because of the numerous operating variables, including but not limited to: hydrologic conditions, ESA requirements, Delta water quality standards, and physical capacity limitations.
 - **A process for CALFED agencies to work with stakeholder representatives to clarify and define what water is deemed transferrable under what conditions.** The objective of this process will be to develop a standardized set of rules on transferable water. Clarification of the CALFED agencies' criteria for quantifying transferrable water, including potential variations in the accepted criteria for time or location (i.e., one-year transfers versus multi-year and in-basin versus out-of-basin) is a key

outcome. The initial focus of this process would be technically based, resulting in a set of differing water transfer scenarios and accompanying definitions. Results of this effort may include formal rules adopted by the SWRCB during the initial years of CALFED's Stage 1 implementation. The details of this process, including the specific objectives, and the identification of stakeholder representatives, have not been determined.

- **A process for CALFED agencies to work with stakeholder representatives to resolve conflicts over reservoir refill and carriage water criteria.** This effort will focus on clarifying agency policies and rules governing water transfers that involve releases from stored water or the transport of water across the Delta. CALFED agencies may adopt a policy that requires proposed water transfers from storage to include a reservoir refill analysis identifying potential impacts to other legal users of water, and to identify appropriate mitigation measures. Carriage water is defined as the additional water that may be necessary to accompany a cross-Delta water transfer to maintain water quality or other standards imposed on Delta export operations. Clarifying carriage water criteria may be resolved with a longer term process that relates closely to other operational changes being proposed for Delta water management since they can impact the necessity for carriage water.

- **A process for CALFED agencies to work with stakeholder representatives to develop appropriate protection provisions for water transferred for instream uses.** This will include (1) developing methodology for monitoring instream transfers and associated tracking measures, (2) developing appropriate implementation procedures or regulations for California Water Code Section 1707 transfers, and (3) evaluation as to whether additional statutory or regulatory protection of water transfers for instream purposes is necessary. This process is designed to ensure that water transferred to the environment is available to meet its stated instream purpose throughout its designated reach. This process should provide mechanisms for assuring that water transferred for instream use be supplementary to water used to meet regulatory requirements, unless otherwise explicitly provided by the terms of the transfer. The intended provisions should also clarify the circumstances under which water transferred for instream use may be subsequently diverted for other purposes downstream.

- **A process for CALFED agencies to work with stakeholder representatives to develop potential procedures for transporting transferred water through existing water conveyance facilities.** The

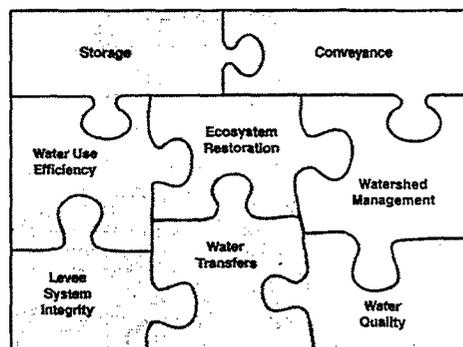
purpose is to develop criteria and procedures governing the determination of transport system availability. Such criteria and procedures would include how to process requests for use of a system, and how to calculate the unused capacity.

- **A process for CALFED agencies to work with stakeholder representatives to develop cost criteria associated with transporting transferred water through state or federal conveyance facilities.** This process will result in an agreed upon set of criteria governing the determination of transport costs such that transfer proponents can factor such costs into transfer proposals early in development phase of a potential water transfer. More specific actions and policies will likely be developed through this process prior to release of the final Programmatic EIR/EIS.
- **Based on the recommendations of the Strategic Plan, CALFED will work with CALFED agencies, stakeholders, the Legislature, and local agencies to identify appropriate assistance to enable local agencies to develop and implement groundwater management programs to protect groundwater basins in water transfer source areas.**

More information on the water transfer program will be included in the revised *Water Transfer Program Plan*.

Watershed Program

The two main components of the Watershed Program are to provide assistance - both financial and technical - to local watershed programs, and to aid in the coordination and integration of local watershed programs with the CALFED Program. The Watershed Program supports and encourages locally-led watershed activities that benefit the Bay-Delta system. Emphasis is placed on a "bottom up" approach rather than "top down," recognizing that local watershed approaches may vary and that community involvement and support are essential. The Watershed Program strives to strengthen the partnerships and relationships between the public, local watershed organizations, and governments at all levels. Like the CALFED Bay-Delta Program itself, watershed activities included in the Watershed Program should ensure that adaptive management processes can be applied at multiple scales and across ownerships.



In summary, the draft Watershed Program includes the following elements:

- **Support Local Watershed Activities**
- Implement watershed restoration, maintenance, and conservation activities that support the goals and objectives of CALFED.

WATERSHED PROGRAM GOAL

To help coordinate and integrate existing and future local watershed programs and to provide technical assistance and funding for watershed activities and protection relevant to achieving the goals and objectives of the CALFED Bay-Delta Program.

- **Coordination and Assistance** - Facilitate and improve coordination and assistance between government agencies, other organizations, and local watershed groups.
- **Watershed Monitoring Assessment** - Facilitate monitoring efforts that are consistent with CMARP's protocols and support watershed activities that ensure adaptive management processes can be applied.
- **Education and Outreach** - Support resource conservation education at the local watershed level and provide baseline support to watershed programs.
- **Watershed Processes and Relationships** - Identify the watershed functions and processes that are relevant to the CALFED goals and objectives, and provide examples of watershed activities that could improve these functions and processes.
- **Integration with Other Common Programs** - Improve the integration of the Common Programs, especially the efforts of the Watershed Program with the actions implemented under the Ecosystem Restoration and Water Quality programs.

Consistent with the emerging direction of the Watershed Program, CALFED's current ecosystem restoration program has provided funding to conduct numerous watershed based projects. The following funded watershed projects are good examples of the approach the Watershed Program will use to help meet the broad goals and objectives of the CALFED Bay-Delta Program:

- Alhambra Creek Coordinated Resource Management Plan
- American River Integrated Watershed Stewardship Strategy
- Sand & Salt Creeks Watershed Project
- Sacramento River "Headwaters to the Ocean, Public Information and Education

Program.”

Although the CALFED Watershed Program, as envisioned, can be implemented under existing State agency authorities, discussions with stakeholders and watershed groups have noted the merits of developing a state-wide statute encouraging watershed management efforts. Although all parties emphasize the need for watershed efforts to be driven at the local level, an umbrella statute providing broad guidance and targeting appropriate financial assistance may be desirable. CALFED will work with stakeholders and the Legislature to pursue this option.

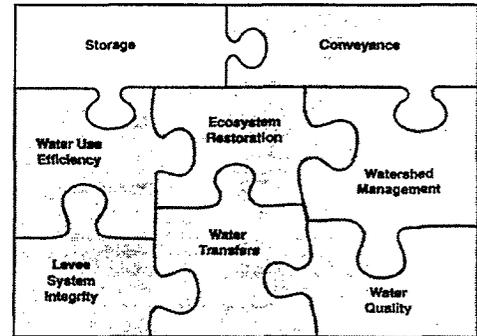
The following are examples of watershed activities that can make improvements in each of the four CALFED problem areas:

- **Ecosystem Quality** - Watershed activities that improve riparian habitat along streams, increase or improve fisheries habitat and passage, restore wetlands, or restore the natural stream morphology affecting downstream flows or species may benefit ecosystem quality.
- **Water Quality** - Watershed activities may benefit water quality in the Bay-Delta system by helping to identify and control non-point sources of pollution, and identify and implement methods to control or treat contaminants. Watershed activities which reduce the pollutant loads in streams, lakes, or reservoirs could measurably improve downstream water quality.
- **Water Supply Reliability** - As land use activities within a watershed intensify, the ability of that watershed to slow run off and allow water to percolate into aquifers tends to decrease. One result of this modified condition can be increased surface run off and higher peak flows during storms. This condition can make flood management more difficult, and reduce opportunities to capture runoff in downstream reservoirs. Activities designed to restore or enhance the ability of watersheds to absorb, store, and release water can reduce peak flows during storms and extend stream base flows through the dry season. The benefits of these activities include reduced flood risks, increased water supply reliability, and improved habitat conditions for fish and wildlife. Reoperation of small hydroelectric power reservoirs may also achieve these benefits.
- **Levee and Channel Integrity** - Attenuation of flood flows coming from the upper watershed can provide benefits far downstream in the system. Delta levees are most vulnerable during high winter flows; watershed activities which reduce these flows can help maintain the integrity of the levees.

More information on the watershed program will be included in the revised *Watershed Program Plan*.

Storage

Storage of water in surface reservoirs or groundwater basins can provide opportunities to improve the timing and availability of water for all uses. The benefits and impacts of surface and groundwater storage vary depending on the location, size, operational policies, and linkage to other program elements. By storing during times of high flow and low environmental impact, more water is available for release for environmental, consumptive, and water quality purposes during dry periods when conflicts over water supplies are critical. Storage which is properly managed and integrated with other water management tools can achieve improvement with regard to water management objectives: reduce conflicts, decrease drought impacts on all beneficial uses, increase supply availability, increase operational flexibility, and improve water quality.



The particular attributes of storage in a water management strategy vary by the type and location of a specific storage project. Water storage located upstream of the Delta functions differently than storage located south of the Delta in the export area. Generally, groundwater projects are viewed as having more benign on-site environmental and land use impacts than surface storage. Surface storage is more suited to rapidly discharging or receiving large volumes of water, a advantage in real-time management of high river flow periods or environmental storage releases. Off-stream surface storage projects are generally viewed as having significantly less environmental impacts than new on-stream projects. Both surface and groundwater storage projects may create additional environmental impacts, and inappropriate public investments in new storage may reduce incentives to invest in water conservation and other water management strategies.

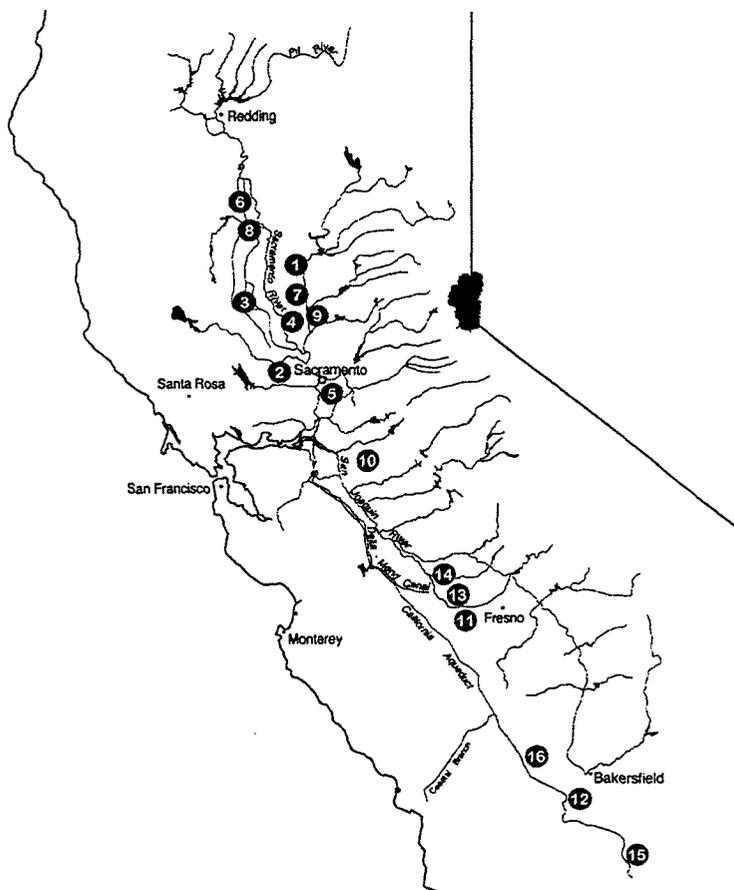
Considering the magnitude of conflicts over available water in California, CALFED believes that it must evaluate and implement a broad range of water management options to achieve the Program's objectives. Therefore, new storage will be developed and constructed, together with aggressive implementation of water conservation, recycling, and a protective water transfer market, as appropriate to meet CALFED Program goals. During Stage 1, CALFED will evaluate and determine the appropriate mix of surface water and groundwater storage, identify acceptable projects, and initiate permitting and construction if program linkages and conditions are satisfied.

Linkages and assurances are critical to the process of evaluating and constructing new storage in the CALFED Program. Before the final EIS/EIR and Record of Decision (ROD), CALFED will develop these linkages and assurances, including measures of success for the Program's water use efficiency and transfer programs, and lay out a process and schedule for defining and pursuing the appropriate mix of new storage in Stage 1. As part of the assurance package, these linkages will be reflected in a memorandum of agreement to be executed no later than the ROD,

articulating a Clean Water Act Section 404 compliance strategy and programmatic assurance on the need for storage facilities, based on the necessary technical and economic analyses.

Based on a programmatic evaluation of potential water supply benefits and practical consideration of acceptable levels of impacts and total costs, the range of total new storage considered for evaluation in Phase II was from zero up to about 6 MAF. This was considered a reasonable range for study purposes and impact analysis; more detailed study and significant interaction with stakeholders will be required before specific locations and sizes of new storage are proposed. However, most water supply benefits of Sacramento River off-stream surface storage are achieved with about 3 MAF of storage, while most water supply benefits of south of Delta off-aqueduct surface storage are attained with about 2 MAF of storage. Other types of surface storage considered in Phase II include San Joaquin River tributary storage and in-Delta storage. In addition, there may be significant opportunities for enhanced surface and groundwater storage within service areas dependent on Delta water for some or all of their supplies.

Groundwater banking and conjunctive use in the Sacramento and San Joaquin Valleys were also considered in Phase II. An initial inventory of potential groundwater storage opportunities was completed in 1997. Those opportunities are shown in the adjacent figure and the following table. The practical storage capacity available for groundwater storage in these areas will be determined only after detailed study of specific projects and full consideration of local concerns. For study purposes, groundwater storage volumes of 250 TAF in the Sacramento Valley and 500 TAF in the San Joaquin Valley were considered. During the first stage of the Program, the CALFED agencies intend to support the construction of at least two to three groundwater banking facilities with a target volume of 500,000 acre feet of storage. Any adverse environmental impacts will be mitigated.

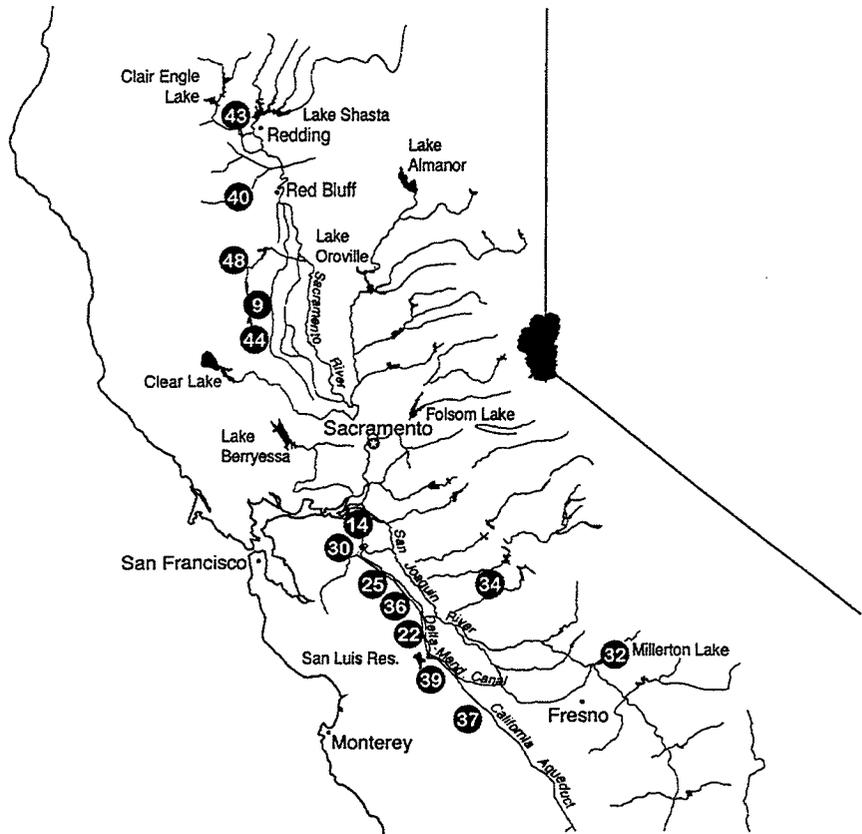


Groundwater Storage Preliminary Component Inventory

Component	Location	Map Location
Groundwater Storage North of Delta		
Butte Basin	Butte County	1
Cache Creek Fan	Yolo County	2
Colusa County	Arbuckle area	3
Eastern Sutter County	Sutter County east of Feather River	4
Sacramento County	Sacramento County south of American River	5
Stony Creek Fan	Glenn County Stony Creek	6
Sutter County	South of Sutter Buttes	7
Thomes Creek Fan	Tehama County Thomes Creek	8
Yuba County	Yuba County - south of the Yuba River	9
Groundwater Storage South of Delta		
Stockton East	San Joaquin County	10
James ID/Raisin City WD, Mid-Valley Canal Reaches 1-3	Central Fresno County	11
Kern River Fan	Kern County	12
Madera Ranch	Madera County	13
Mendota Pool - No. Branch Mid-Valley	Madera County	14
Mojave River Basins	San Bernardino	15
Semitropic WSD	Kern County	16

CALFED will focus on off-stream reservoir sites for new surface storage, but will consider expansion of existing on-stream reservoirs. CALFED will not pursue storage at new on-stream reservoir sites. Under the ecosystem restoration program element, some dams and stream obstructions will be removed to open additional areas of fishery habitat.

For the purposes of the programmatic Phase II evaluation, an inventory of fifty-two potential new surface storage projects was compiled. Those projects that appeared most feasible (see adjacent figure) were evaluated to provide representative information on costs and benefits. A more complete screening process for surface storage opportunities, taking into account engineering feasibility, potential environmental impacts, costs, and benefits, will proceed over the coming months and will be documented in a future report. While screening remains to be completed, CALFED has narrowed the number of potential sites for additional CALFED consideration to the fourteen in the following table. These include potential sites to provide benefits for water supply, flood control, water quality, ecosystem, and other multiple purposes.



**Reservoir Sites Retained for Additional CALFED Consideration
(Retained for Future Evaluation and Screening)**

Project	Location	Type	Gross Storage Capacity
Colusa Reservoir Complex (Site 9)	Colusa/Glenn Counties Funks Creek	Off-Stream Storage	3,300 TAF
Garzas Reservoir (Site 22)	Stanislaus County Garzas Creek	Off-Stream Storage	139 to 1,754 TAF
In-Delta Storage (Site 14)	Sacramento/San Joaquin Delta	Island Storage in the Delta	230 TAF
Ingram Canyon (Site 25)	Stanislaus County Ingram Creek	Off-Stream Storage	333 to 1,201 TAF
Los Vaqueros Enlargement (Site 30)	Contra Costa County Kellogg Creek	Off-Stream Storage	Additional 965 TAF
Millerton Lake Enlargement (Site 32)	Fresno County San Joaquin River	On-Stream Storage	Additional 720 TAF
Montgomery Reservoir (Site 34)	Stanislaus County Dry Creek	Off-Stream Storage	240 TAF
Orestimba Reservoir (Site 36)	Stanislaus County Orestimba Creek	Off-Stream Storage	380 to 1,140 TAF
Panoche Reservoir (Site 37)	Fresno County Silver Creek	Off-Stream Storage	160 to 3,100 TAF
Quinto Creek Reservoir (Site 39)	Merced/Stanislaus County Quinto Creek	Off-Stream Storage	332 to 381 TAF
Red Bank Project (Dippingvat-Schoenfield Project) (Site 40)	Tehama County S.F. Cottonwood Creek	Off-Stream Storage - Schoenfield Reservoir	Schoenfield-250 TAF
Shasta Lake Enlargement (6.5-foot raise of existing dam) (Site 43)	Shasta County Sacramento River	On-Stream Storage	Additional 290 TAF
Sites Reservoir (Site 44)	Colusa and Glenn Counties Funks & Stone Corral Cks	Off-Stream Storage	1,200 to 1,900 TAF
Thomes-Newville Reservoir (Site 48)	Glenn County Thomes & Stoney Creek	Off-Stream Storage	1,840 - 3,080 TAF

Of course, the relationship of water supply benefits to groundwater and surface storage volume is highly dependent on operating assumptions. Much more detailed information about specific locations of new storage, potential allocation of storage benefits, and operational goals and constraints would be necessary to determine an optimal volume of storage from a water supply perspective. In addition, long-term effective groundwater management throughout California will be essential to a range of CALFED Programs, including water transfers, groundwater

banking, watershed management, and water use efficiency programs.

A fundamental principle of the CALFED Program is that the costs of a program should be borne by those who benefit from the program. That principle is especially relevant in the decision about new storage facilities. CALFED will seek public financing for the planning and evaluation of storage projects to ensure a comprehensive and fair comparison of storage options. However, should a storage project proceed to construction, then the public funds used for planning and evaluation will be reimbursed by the project beneficiaries. This "user pays" principle is critical to the overall CALFED goal of increasing the efficiency of water use in California. CALFED is performing economic analyses evaluating new facilities and other approaches (such as conservation, recycling, and transfers) to identify cost-effective pathways to meeting CALFED objectives. These economic analyses will be especially useful in assisting all potential users of new storage to evaluate the relative costs and benefits of particular storage options, as well as other ways of addressing reliability.

The following linkages and conditions will guide development of groundwater/conjunctive use and new surface water storage. Agency and stakeholder input is needed to make the linkages and conditions for new storage more specific, and to develop appropriate "bundles" of actions so that all CALFED goals progress together.

- a. Completion of memorandum of agreement articulating a Clean Water Act Section 404 compliance strategy and programmatic assurance on the need for storage facilities
- b. Completion of all environmental documentation and permitting requirements
- c. Demonstrated commitment to finance by beneficiaries
- d. Demonstrated progress in meeting the Program's water use efficiency, water transfer program targets, and/or measures of success of other water management tools. These measures of success will be fully defined before the Final EIS/EIR and Record of Decision are issued.

In addition, groundwater/conjunctive use programs will be developed in tandem with the following actions:

- a. Groundwater monitoring, and modeling programs are established
- b. Full recognition is given to the rights of landowners under existing law
- c. Guidelines are in place to protect resources, address local concerns, and avoid potential impacts prior to and during implementation of a conjunctive management operation. The draft guidelines developed to date address the following:
 - Funding support for local assessment of groundwater resources.
 - Conjunctive management programs will be voluntary.
 - The needs of landowners and users of local groundwater are protected.

-
- Conjunctive management projects will be overseen by local agencies in partnership with other entities to assure that concerns are addressed through interest-based negotiation.
 - Groundwater withdrawals must be managed to avoid land subsidence, aquifer degradation, and ecosystem degradation.
 - Consistency with local groundwater plans (such as AB3030 Plans) and City and/or County Comprehensive General Plans

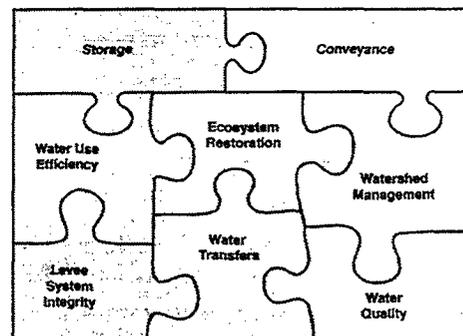
Recreation. CALFED seeks to plan for recreation enhancement and, if necessary, to mitigate impacts to Delta recreation resulting from CALFED activities designed to restore other Delta resources. Construction of new facilities will provide for appropriate on-site recreation development. The responsibilities and procedures for recreation development at new storage and other facilities is clearly addressed in current law. Federal and state laws and local laws and plans govern recreation developments associated with water development projects in and near the Delta. The Draft Programmatic EIS/EIR and accompanying technical reports address general impacts that CALFED Program implementation could have on recreational resources and on how the recreational resources could impact the other parts of the Program. The time line of such a process should be consistent with the Phase III documentation and implementation schedule, ensuring that recreation resources are appropriately considered as part of the Bay-Delta solution.

Hydropower. The CALFED Program has no specific objectives for hydropower generation. However, CALFED does seek to minimize negative impacts on resources, such as hydropower generation, during and after implementation. The Program may result in temporary or long-term changes in river and reservoir operations, which may affect the quantity, timing and value of hydropower produced within the Bay-Delta system. Also, additional pumping may increase the amount of Project Energy Use (power consumed by the CVP and the SWP to move water through the system). An increase in Project Energy Use can reduce the amount of surplus hydropower that might otherwise be available for sale from the CVP (necessary to repay Project debt), and may increase the amount of power that must be purchased from outside sources to meet SWP Project Energy Use. Replacement for reduced availability of renewable hydropower would likely come from fossil fuel or other thermal generation. CALFED is coordinating with the Western Area Power Administration to assure that issues are identified and properly framed, so consequences and options are clear to stakeholders, the public, and the CALFED decision-makers. In addition, hydroelectric power reservoirs present an opportunity for reoperation for multiple benefits, particularly when such reservoirs are up for sale. CALFED should assess the opportunities these present in conjunction with project owners.

Conveyance

Introduction

The Delta conveyance element of the Program describes the various configurations of Delta channels for moving water through the Delta and to the major export facilities in the southern Delta. While there are countless combinations of potential modifications to Delta channels, three primary categories of Delta configuration options, as described below, were studied in Phase II of the Program. These Delta conveyance options were the primary distinguishing features among the three broad categories of alternatives studied in Phase II.



Because of the potential impact on flow patterns and Delta water quality, the Delta conveyance configuration of an alternative can greatly affect the performance of other Bay-Delta program elements. The three primary Delta conveyance configurations evaluated in Phase II of the program are:

Existing System Conveyance. The Delta channels would be maintained essentially in their current configuration. One significant variation would include some selected channel improvements in the southern Delta together with flow and stage barriers (or their equivalent) at selected locations to allow for increasing the permitted pumping rate at the SWP export facility to full existing physical capacity of 10,300 cfs. These physical changes in the existing system include many of the features contained in the proposed Interim South Delta Program. Other variations that address the same needs are also being evaluated.

Modified Through-Delta Conveyance. Significant improvements to northern Delta channels would accompany the southern Delta improvements contemplated under the existing system conveyance alternative. Variations include a wide variety of channel configurations, designed to improve flow patterns to benefit fisheries throughout the Delta, provide flood control, and improve water quality in many parts of the Delta.

Dual Delta Conveyance. The dual Delta conveyance alternative is formed around a combination of modified Delta channels and a new canal or pipeline connecting the Sacramento River in the northern Delta to the SWP and CVP export facilities in the southern Delta. Capacities for this new isolated conveyance facility in the range of 5,000 cfs to 15,000 cfs were evaluated in Phase II of the Program. The new facility would siphon under all major waterways to minimize aquatic and flow impacts.

Strategy

The CALFED strategy regarding conveyance must consider fisheries and water quality for in-Delta uses and drinking water. These factors are critical to conveyance decisions both now and in the future as part of adaptive management. The existing Delta channels will be an integral part of any CALFED decision for Delta conveyance. The reliance on these channels provides a shared interest in restoring, maintaining, and protecting Delta resources, including water supplies, water quality, levees, channel capacities, natural habitat, and the common Delta Pool, which also protects in-Delta agricultural uses. Some modifications to these through-Delta channels can improve all of these Delta resources.

Because of the many complex interactions within the Bay-Delta system, successfully implementing a through-Delta strategy requires careful balancing of actions to address a wide range of concerns, including water quality, flood control, fisheries, water levels, circulation patterns, channel scour and sediment deposition. Actions which improve water quality and flow direction in one region of concern, for example, may in turn create adverse impacts elsewhere. Our understanding of these complex hydrodynamic, biological, and chemical interactions is still incomplete so it will be necessary to approach the optimization of the through-Delta strategy with a high degree of cooperation, rigorous monitoring, scientific analysis, and an open-minded approach to solution options. It will also be essential that the implementation of proposed solution actions be linked so that the appropriate balance of benefits and impacts is maintained throughout the implementation period.

CALFED's strategy is to develop a through-Delta conveyance alternative based on the existing Delta configuration with some modifications, evaluate its effectiveness, and add additional conveyance and/or other water management actions if necessary to achieve CALFED goals and objectives. The initial through-Delta conveyance will be continually monitored, analyzed, and improved to maximize the potential of the through-Delta approach meeting CALFED goals and objectives, consistent with its Solution Principles. If the through-Delta conveyance still fails to meet the CALFED goals and objectives, there will be a reassessment of the reasons and the need for additional Delta conveyance and/or water management actions.

If CALFED's goals and objectives cannot be accomplished by the through-Delta conveyance strategy, the preferred program alternative includes additional actions that may be taken toward these goals and objectives after thorough assessment of a variety of factors. For example, a decision to proceed with implementation of an isolated facility may occur if, in combination with vigorous implementation of relevant common program elements and improvements to through-Delta conveyance, and consideration of other water management options, an isolated conveyance facility is still deemed necessary. Such a facility would have to be demonstrated to be the most cost effective and least environmentally damaging alternative, and to be necessary for significantly advancing CALFED's commitment to seek continuous water quality improvement

(See the **Water Quality** section in this chapter).

An isolated conveyance facility also may be necessary if there is inability to achieve fishery recovery due to continuing impacts of diversions from the south Delta. A combination of these two factors also could result in a decision to proceed with implementation of an isolated facility and/or other additional water management actions to meet CALFED goals and objectives after assessment of the effectiveness of the initial through-Delta conveyance actions, and after a determination that such a facility and/or actions would be effective in resolving these problems. These factors will be continually reevaluated during Stage 1 as part of the adaptive management process, and will form the basis for a comprehensive set of additional improvements in Stage 2.

Details of the initial Delta conveyance improvements will be determined after detailed, project-level environmental analyses and technical studies are completed, but they are expected to include the following actions and considerations:

In the south Delta region--

- Evaluate the potential for, and if appropriate by the time of the ROD, permit interim modification of SWP operating rules to allow export pumping up to the current physical capacity of the SWP export facilities (approximately 8500 cfs) throughout the year, within the constraints of the 1995 Water Quality Control Plan. The Temporary Barriers Program would be concurrently extended (this requires a re-evaluation of the existing Biological Opinions and permits). The purpose of this proposed action would be to increase operational flexibility and provide balanced environmental and water supply reliability benefits.
- Construct a new screened intake at Clifton Court Forebay that allows diversion into the forebay throughout the tidal cycle sized to meet the full export capacity of 10,300 cfs with appropriately protective screening criteria. This facility would be sized to avoid the use of the existing unscreened radial gates at the forebay and would include new fish salvage facilities and other ancillary facilities.
- Construct either a new screened intake at the head of the channel leading to the CVP pumping plant at Tracy, or an expansion of the new diversion at Clifton Court Forebay with a new intertie to the Tracy Pumping Plant. This new (or expanded new) diversion would be sized to meet the full Tracy Pumping Plant export capacity of 4600 cfs with appropriately protective screening criteria and, if connected to CCFB, allow a variable rate of diversion throughout the tidal cycle.
- Implement the Joint Point of Diversion for SWP and CVP, which, if permitted by the SWRCB, would allow the SWP to pump CVP export flows and vice versa within the permitted export constraints of each. In addition, two potential

physical interties will be considered for implementation: One intertie would allow for up to 400 cfs of pumping from the CVP Delta Mendota Canal to the SWP California Aqueduct to overcome conveyance impediments downstream. The second would be an intertie connecting the Tracy Pumping Plant to Clifton Court Forebay. This intertie is similar to the one mentioned in the previous bullet but would be considered even if a new screen constructed for the intake to the Tracy Pumping Plant to provide additional operational flexibility for both facilities.

- Construct an operable barrier at the head of Old River to improve survival of downstream-migrating San Joaquin salmon in the spring and to improve water quality for salmon migrating up the San Joaquin River in the fall.
- Additional physical features and associated operational rules may be required to address problems related to SWP and CVP export operations, south Delta water levels, channel scour, fisheries, and water quality. Extensive evaluations conducted under the Interim South Delta Program over the past 12 years have led DWR and USBR to recommend the construction of three additional operable barriers (agricultural barriers) in south Delta channels and limited dredging in certain channels to alleviate these concerns. Substantial changes in the export operation of the CVP and SWP are now being considered. The magnitude and extent of these features will be re-evaluated in this context.

CALFED will further evaluate the need for, and appropriate alternatives to, the agricultural barriers and channel dredging based upon information presented in the Draft Interim South Delta Program EIR/EIS, draft Biological Opinions, the alternatives analysis required under Section 404 of the federal Clean Water Act, and other information which may be developed as part of CALFED's comprehensive planning process. CALFED will also explore the potential for developing operational criteria for the barriers and export facilities to provide assurance that the local water user, export, and fishery needs are met.

In the north Delta region--

- Develop operational criteria for the Delta Cross Channel that balances flood control, water quality, water supply reliability, and fisheries concerns.
- Evaluate whether a 2,000 cfs screened diversion from the Sacramento River at Hood to the Mokelumne River can be constructed to improve or maintain central Delta water quality, without compromising fish protection achieved by operation of the Delta Cross Channel or creating other adverse fishery impacts.
- Evaluate the implementation of setback levees and/or dredging along the

Mokelumne River from Interstate 5 downstream to the San Joaquin River to improve conveyance and resolve flood concerns in this region. These actions would be carefully coordinated with ecosystem restoration actions to create additional tidal wetlands and riparian habitat to assure that a balanced solution to local and regional concerns would be achieved.

- Based on the above evaluations, take appropriate action to provide a balanced solution to water quality, flood control, water supply reliability, and fisheries concerns.

Throughout the Delta region--

- Conduct localized channel dredging as needed to restore and maintain sufficient channel capacities to support balanced beneficial uses, including flood control, navigation, recreation, fisheries, water quality, water levels, and circulation.

In addition, the initial CALFED Program will include:

- San Joaquin River and Delta water quality improvement actions described in the Stage 1 action list and in more detail in the Water Quality Program Plan.
- Source control measures for drinking water quality, including along-aqueduct watershed management measures, as described in the Stage 1 action list and in more detail in the Water Quality Program Plan.
- Ecosystem Restoration measures for fishery improvement as described in the Stage 1 action list and in more detail in the Ecosystem Restoration Program Plan (including DEFT actions).

CALFED will evaluate progress towards achieving its water quality and species recovery goals and objectives during Stage 1 with the advice and assistance of expert panels as described in the Water Quality and Ecosystem Restoration sections of this report. The deliberations of those panels will be part of the open, public decision making process CALFED will follow to determine if different conveyance and/or other water management actions are necessary in order to achieve water quality and species recovery goals and objectives.

CALFED will use the reports of the Delta Drinking Water Council and the ERP Science Review Panel to conduct program reviews in 2003 and 2007 with stakeholder involvement to assess whether Stage 1 actions to meet CALFED goals and objectives have been successful and determine whether modifications in conveyance and/or additional water management actions may be needed to simultaneously achieve species recovery, water quality improvement, levee system integrity, and water supply reliability. CALFED will present the results of these reviews

to the Legislature and Congress, along with its recommendations, if any, for legislative action.

To provide for the best adaptive management decision making in the future, aggressive monitoring and research, as well as thorough development and evaluation of alternatives must occur. These activities are identified in the program descriptions and Stage 1 actions for Water Quality, Ecosystem Restoration, and the Comprehensive Monitoring, Assessment and Research Programs.

For drinking water quality issues Stage 1 includes the following:

- Review and performance of public health effects studies to more specifically identify the potential health effects of bromide related disinfection byproducts.
- Investigation of alternative sources of high quality (low TOC, bromide, and total dissolved solids) water supply for municipal users of Delta water as a Stage 1 action.
- Investigation as needed of advanced treatment technologies for the removal of salt, bromide, total organic carbon, and pathogens in municipal water supplies and implement at affected sites to complement source water quality improvement actions.

For fishery issues, Stage 1 includes adequate monitoring and research to answer the following questions:

- What measures have been taken to restore fisheries?
- How adequate are the measures?
- How are the actions affecting target species, and are there any unexpected adverse effects on other species?

In the event of a finding that a through-Delta conveyance system is inadequate to achieve CALFED goals and objectives, additional actions, including an isolated facility, source water blending or substitution, and other actions will be intensively evaluated for their ability to solve these problems. If an isolated facility were ultimately found to be necessary for achieving CALFED's goals and objectives, it would be designed with **each** of the following assurances:

1. An agreement limiting the amount, or proportion, of water that can be exported (linked to water year types and flexible enough to allow additional exports when conditions allow) and needed assurances for compliance.
2. Commitment to continuous improvement of in-Delta water quality sufficient to protect existing beneficial uses (Delta standards or contracts including assurances for implementation, permits, financing, and O&M).

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3. Commitment to avoid potential seepage and flood impacts of an isolated facility along its alignment.
 4. Long-term funding for Delta levees (perhaps tied to quantity of water moved in the isolated facility or other institutional assurances) and commitment to provide at cost, suitable excess excavated material from facility construction for levee and habitat improvements.
 5. Reaffirm commitment to protect all area of origin water rights and to continue implementation of the 1959 Delta Protection Act.
 6. Completion of all environmental documentation and permitting requirements.
 7. Demonstrated commitment to finance by beneficiaries.
 8. Agreement on operating authority and operating criteria.
 9. A determination that the through-Delta conveyance with the other Program elements cannot meet CALFED goals and objectives, and that an isolated conveyance facility is the most cost-effective and least environmentally damaging measure to correct this deficiency in meeting the goals and objectives.
 10. A decision to proceed with implementation of the program will come through state and potentially federal legislative action. CALFED intends that this legislative action will not include legislative overrides or exemptions from state or federal environmental laws (including, but not limited to, the federal and state ESA, the Clean Water Act, NEPA or CEQA).

5. DRAFT IMPLEMENTATION PLAN

Phase II of the CALFED Bay-Delta Program will culminate with the federal Record of Decision and the State Certification of the Final Programmatic EIS/EIR (expected to be completed late 1999). At that time, Phase III of the CALFED Bay-Delta Program will begin implementation of the preferred program alternative. Phase III is expected to extend 30 years or more.

Program implementation during Phase III will be guided by the implementation plan. The plan focuses on the early years of implementation when needed actions are better known but also provides a long-term vision for continuing implementation over the next several decades.

The implementation plan cannot be completed until the final programmatic EIS/EIR is completed and the complete "decision" is defined. Therefore, this draft implementation plan, like other chapters of the *Revised Phase II Report*, is a work in progress. The draft implementation plan contains the following parts:

- **Stage 1 Actions** - A list of proposed actions for the first seven years of implementation following the Record of Decision and Certification of the EIS/EIR
- **Water Operations** - Draft water operations strategy for the first seven years of implementation
- **Assurances and Governance Plan** - Set of tools and mechanisms to assure that the Program will be implemented and operated as agreed
- **Financing Plan** - Plan for funding the implementation of the preferred alternative including financing principles, cost allocation and cost sharing considerations, and Program element cost estimates
- **Comprehensive Monitoring, Assessment and Research Program** - Plan for monitoring and research that provides the data and necessary information to evaluate the performance of completed actions for use in supporting the adaptive management of future actions
- **Adaptive Management** - Plan to constantly monitor the Bay-Delta system and adjust future implementation as we learn more about the system and how it responds to our efforts
- **Long-Term Implementation** - A general vision (subject to adaptive management and the conditional decisions) for the 30-year Program implementation
- **Draft Stage 1 Environmental Compliance Strategy** - Framework for efficient processing of information needed for conforming with the regulatory procedures of the different agencies and their protocols, guidelines and time lines

5.1 Stage 1 Actions

Stage 1 is defined as the seven year period commencing with the final decisions on the Programmatic EIS/EIR. Agreement on Stage 1 actions is only one part of the decision for a preferred program alternative but, it is important that these actions achieve balanced benefits and lay a solid foundation for successful implementation of the Program.

The following pages provide more detail on potential actions for Stage 1. To the extent that such actions require additional authorizing legislation, such authorization will be developed and pursued in cooperation with stakeholders.

Adaptive management is an essential part of the implementation strategy for every program element to allow necessary adjustments as conditions change in future stages of implementation and as more is learned about the system and how it responds to restoration efforts. Consistent with the concept of adaptive management, some actions may need to be refined within the time frame of Stage 1 to reflect changing conditions or new information.

The outcome of and certain sites for Stage 1 decisions will not be known until additional information, including need for mitigation, is available and until the options to carry out these Stage 1 proposals have undergone environmental review. Consequently, the outcome could be altered as a result of that second tier environmental review and mitigation measures imposed as a part of those actions. However, where the impacts from the actions in Stage 1 have been included in the Programmatic EIS/EIR, the subsequent environmental documents can tier off the Programmatic document for cumulative and long-range impacts of the Programmatic decision.

Each potential action in the following Stage 1 list includes an estimate (in parenthesis) of when the action may occur within Stage 1. For example, "(yr 1)" indicates the action is expected to occur in the first year following the final decisions on the Programmatic EIS/EIR.

CALFED will continue work between the Revised Draft EIS/EIR and the Final EIS/EIR on grouping the Stage 1 actions into a series of bundles (packages) which can provide additional assurances for balancing benefits. For example, a package of actions in the Delta could include levee work, habitat improvements, water quality work, and facilities and operations to improve water supply reliability. Packages for some actions may be geographical, based on timing, or other grouping. Linking the actions would help assure that they all move forward together. These may be linked within the same project EIS/EIRs, tied by contractual documents, dependent on the same funding, or other means.

Levees

The focus of the long-term levee protection element of the Program is to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees. Levee protection is an ongoing effort which builds on the successes of ongoing programs and consists of:

- *Base-level funding to participating local agencies*
- *Funding of special improvement projects for habitat and levee stabilization to augment the base-level funding*
- *Implementation of subsidence control measures to improve levee integrity*
- *Implementation of an emergency management and response plan to more effectively plan for and deal with potential levee disasters*
- *A risk assessment and risk management strategy*

The first stage continues the decades-long process to improve reliability of Delta levees.

1. Initiate the Levee Implementation Group (LIG). Develop and implement an outreach, coordination, and partnering program with local landowners including individuals, cities, counties, reclamation districts, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of levee projects (yr 1).
2. Obtain short-term federal and state funding authority as a bridge between the existing Delta Flood Protection Authority (AB360) and long-term levee funding (yr 1-5).
3. Obtain long-term federal and state funding authority (yr 1-7); e.g., the Corps of Engineers' current Delta Special Study could develop into a long-term Delta levee reconstruction program and the state would be the local cost-sharing partner.
4. Conduct project level environmental documentation and obtain appropriate permits for each bundle (package) of Stage 1 actions (yr 1-7).
5. Implement demonstration projects for levee designs, construction techniques, sources of material, and maintenance techniques that maximize ecosystem benefits while still protecting lands behind levees. Give priority to those levee projects which include both short (i.e. construction) and long-term (i.e. maintenance and design) ecosystem benefits, and which will provide increased information (yr 1-7).
6. Adaptively coordinate Delta levee improvements with ecosystem improvements by incorporating successful techniques for restoring, enhancing or protecting ecosystem values developed by levee habitat demonstration projects or ecosystem restoration projects into levee projects. Continue to develop techniques as major levee projects are implemented (Years 1-7).

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7. Fund levee improvements up to PL84-99 in first stage (yr 1-7); e.g., proportionally distribute available funds to entities making application for cost sharing of Delta levee improvements.
 8. Further improve levees which have significant statewide benefits in first stage (yr 1-7); e.g., statewide benefits to water quality, highways, etc.
 9. Coordinate Delta levee improvements with Stage 1 water conveyance, water quality improvements and with potential conveyance improvements in subsequent stages (yr 1-7).
 10. Enhance existing emergency response plans, approximately \$29 million in Stage 1 (yr 1-7); e.g., establish \$10 million revolving fund, refine command and control protocol, stockpile flood fighting supplies, establish standardized contracts for flood fighting and recovery operations, outline environmental considerations during emergencies.
 11. Implement current BMPs to correct subsidence effects on levees. Assist CMARP activities to quantify the effect and extent of inner-island subsidence and its linkages to all CALFED objectives (yr 1-7).
 12. Complete total risk assessment for Delta levees (yr 1-7) and develop and begin implementation of risk management options as appropriate to mitigate potential consequences. Available CALFED risk management options may include:
 - Improving emergency response capabilities
 - Developing storage south of the Delta
 - Reducing the fragility of the levees
 - Improving through-Delta conveyance
 - Releasing more water stored north of the Delta
 - Restoration of tidal wetlands
 - Controlling and reversing island subsidence
 - Curtailing Delta diversions
 - Continued monitoring and analysis of total risk
 - Constructing an isolated facility

Water Quality

The water quality program will consist of a wide variety of actions to provide good water quality for environmental, agricultural, drinking water, industrial, and recreational beneficial uses of water. The majority of current water quality actions rely on comprehensive monitoring, assessment, and research to improve understanding of effective water quality management and on the ultimate control of water quality problems at their sources. The Stage 1 water quality effort focuses on reducing constituents contributing toxicity to the ecosystem and affecting water users (including BOD) and on reducing total organic carbon loading, salinity, and pathogens that degrade drinking water quality. In addition, research and pilot studies are recommended to obtain information prior to implementation of some actions. CALFED is pursuing Stage 1

actions to continually improve public health through improvements in drinking water quality which include studies and investigations that will contribute to an assessment on the need for additional conveyance actions and/or other means of providing better quality source water.

1. Prepare project level environmental documentation and permitting as needed (yr 1-7).
2. Coordinate with other CALFED program elements to ensure that in-Delta modifications maximize potential for Delta water quality improvements (yr 1-7).
3. Continue to clarify use of and fine-tune water quality performance targets and goals (yr 1-7).
4. Conduct the following mercury evaluation and abatement work:
 - Cache Creek*
 - Risk appraisal and advisory for human health impacts of mercury (yr 1-5).
 - Support development and implementation of TMDL for mercury (yr 1-7).
 - Determine bioaccumulation effects in creek and delta (yr 1-4).
 - Source, transport, inventory, mapping and speciation of mercury (yr 1-7).
 - Information Management/Public Outreach (yr 5-7).
 - Participate in stage 1 remediation (drainage control) of mercury mines if federal Good Samaritan protection obtained (yr 3-5).
 - Investigate sources of high levels of bioavailable mercury (yr 4-7).
 - Sacramento River*
 - Investigate sources of high levels of bioavailable mercury, inventory, map, and refine other models (yr 3-7).
 - Participate in remedial activities (yr 7).
 - Delta*
 - Research methylation (part of bioaccumulation) process in Delta (yr 1-2).
 - Determine sediment mercury concentration in areas that would be dredged during levee maintenance or conveyance work (yr 3-7).
 - Determine potential impact of ecosystem restoration work on methyl mercury levels in lower and higher trophic level organisms (yr 3-5).
5. Conduct the following pesticide work:
 - Develop diazinon and chlorpyrifos hazard assessment criteria with DFG and the Department of Pesticide Regulations (yr 1).
 - Support development and implementation of a TMDL for diazinon (yr 1-7).
 - Develop BMPs for dormant spray and household uses (yr 1-3).
 - Study the ecological significance of pesticide discharges (using \$1.5 million of ERP funds) (yr-1-3).
 - Support implementation of BMPs (yr 2-7).
 - Monitor to determine effectiveness (yr 4-7).
6. Conduct the following heavy metals work:

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- Determine spatial and temporal extent of metal pollution (yr 3-7).
 - Determine ecological significance and extent of copper contamination (yr 1-3).
 - Review impacts of other metals such as cadmium, zinc, and chromium (yr 1).
 - Participate in Brake Pad consortium to reduce introduction of copper (yr 1-7).
 - Partner with municipalities on evaluation and implementation of stormwater control facilities (yr 2-5).
 - Participate in remediation of mine sites as part of local watershed restoration and delta restoration (yr 2-7).
7. Conduct the following salinity reduction work in coordination with the San Joaquin Valley Drainage Program:
- Develop and implement supply water quality management activities to improve supply quality (yr 1-7).
 - Develop and implement a management plan to reduce drainage and reduce total salt load to the San Joaquin valley (yr 1-7).
 - Encourage source reduction programs including tiered pricing, expansion of drainage recirculation systems, land management, and land retirement where other options are infeasible (yr 1-3).
 - Conduct pilot projects to evaluate the feasibility of water reuse, through agroforestry, of various concentrations of saline water (yr 4-6).
 - Study feasibility of desalination methods including reverse osmosis (yr 7).
 - Study cogeneration desalination (yr 7).
 - Implement real time management of salt discharges (yr 3-7).
8. Conduct the following selenium work:
- Conduct selenium research to fill data gaps in order to refine regulatory goals of source control actions; determine bioavailability of selenium under several scenarios (yr 1-5).
 - Research interactions of mercury and selenium (yr 2-3).
 - Refine and implement real-time management of selenium discharges (yr 1-7).
 - Expand and implement source control and reuse programs (yr 1-7).
 - Coordinate with other programs (yr 1-7); e.g., recommendations of San Joaquin Valley Drainage Implementation Program, CVPIA) for retirement of lands with drainage problems that are not subject to correction in other ways. (CVPIA alone will retire approximately 70,000 acres of land with selenium-caused water quality problems during time period of Stage 1.)
9. Conduct the following sediment reduction work/organochlorine pesticides:
- Participate in implementation of USDA sediment reduction program (yr 1-7).
 - Promote sediment reduction in construction arenas and urban SW, and

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- other specific sites (yr 1-7).
 - Implement stream restoration and revegetation work (yr 4-7).
 - Quantify and determine ecological impacts of sediments in target watersheds, implement corrective actions (yr 4-7).
 - Coordinate with ERP on sediment needs (yr 1-3).
10. Conduct the following nutrients work:
- Complete studies of causes for DO sag in San Joaquin River (yr 1-2).
 - Define and implement corrective measures for DO sag (yr 1-7).
 - Encourage regulatory activity to reduce nutrients discharged by unpermitted dischargers (yr 1-7).
 - Develop inter-substrate DO testing in conjunction with ERP (yr 2-4).
 - Study nutrient effects on beneficial uses (yr 4-7).
11. Conduct the following unknown toxicity work:
- Participate in identifying unknown toxicity and addressing as appropriate (yr 1-7).
12. Other actions specific to drinking water improvements:
- Control TOC contribution through control of algae, aquatic weeds, agricultural runoff, and watershed improvement (yr 1-7).
 - Study brominated and chlorinated disinfection byproduct operational controls at water treatment plants and implement incremental improvements as warranted (yr 1-7)
 - Control of pathogens through control of cattle, urban storm water, sewage, boat discharge, and possibly recreational swimming; includes various projects depending on area of impact (yr 3-7).
 - Study recreational swimming impacts, wild animal impacts (yr 4).
 - Relocate Barker slough intake (yr 7+).
 - MTBE reductions in various areas (yr 3-5).
 - Address water quality problems in terminal reservoirs (yr 3-5).
 - Perform public health effects studies, as needed, to more specifically identify the potential health effects of bromide related disinfection byproducts (yr 1-3).
 - Investigate alternative sources of and means of providing high quality water supply for urban users of Delta water (yr 1-7).
 - Investigate, as needed, advanced treatment technologies for the removal of salt, bromide, total organic carbon, and pathogens in urban water supplies (yr 1-7).
 - Investigate combinations of new supplies and technologies that can minimize salt content of urban water supplies and provide greater public health protection (yr 1-7).
 - Convene a Delta Drinking Water Council in a public forum to consider relevant technical data to inform the governing entity in its consideration of solutions to identified public health issues for urban users of Delta

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- water (yr 1-7).
 - Develop a plan sufficient to meet forthcoming EPA and Department of Health Services standards for brominated disinfection byproducts (by yr 7).
13. Conduct the following turbidity and sediment work:
- Implement protection actions in the upper watershed to reduce sedimentation of fish spawning habitat (yr 1-7).
 - Implement erosion control BMPs in the upper watershed (yr 1-7).
 - Construct sedimentation basins in urban and suburban areas (yr 1-7).
 - Evaluate use of a head control structure on lower Dominici Creek (yr 2-4).
 - Perform quantitative analysis of river sediment loads, budgets, and sources (yr 1-7).

Ecosystem Restoration

The CALFED ecosystem restoration program (ERP) is designed to maintain, improve, and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. A foundation of this program element is the restoration of ecological processes associated with streamflow, stream channels, watersheds, and floodplains. Implementation of the ERP over the 20 to 30 year implementation period will be guided through an ecosystem-based, adaptive management approach. ERP goals and objectives for ecosystem, habitat, and species rehabilitation are designed to produce measurable and progressive improvements to the Bay-Delta ecosystem that should result in a high level of ecosystem health and species recovery that exceeds existing regulatory requirements while improving water supply reliability and water quality of the Bay-Delta Ecosystem. The Stage 1 restoration efforts are structured to accomplish significant improvement in Bay-Delta ecological health through a large scale adaptive management approach in which the actions inform management decisions in later stages of implementation.

Success of ERP Stage 1 actions is also critically dependent on other program elements, including water quality improvement actions throughout the Bay-Delta watershed, levee system integrity actions, and integration with a watershed management strategy and a water transfers market. The general priorities for restoration activities will be first on existing public lands as appropriate, second to work with landowners in voluntary efforts to achieve habitat goals including the acquisition of easements, third a combination of fee and easement acquisition, and fourth on acquisition of fee title as necessary to achieve program objectives. Acquisition will be on a willing seller basis and with emphasis on local coordination and partnerships and include appropriate mitigation for agricultural resource impacts. The intent is to maximize habitat benefits while minimizing land use impacts.

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1. Develop and implement an outreach, coordination, and partnering program with local landowners and individuals, cities, counties, reclamation districts, the Delta Protection Commission, resource conservation districts, water authorities, irrigation districts, farm bureaus, other interest groups, and the general public to assure participation in planning design, implementation, and management of ERP projects.
 2. Conduct project level environmental documentation and permitting as needed for each bundle of Stage 1 actions(yr 1-7).
 3. Full coordination with other ongoing activities which address ecosystem restoration in the Bay-Delta system (yr 1-7); e.g., CVPIA, Four Pumps Agreement, Non-native Invasive Species Task Force, etc.
 4. Implement habitat restoration in the Delta, Suisun Bay and Marsh, and Yolo Bypass to improve ecological function, facilitate recovery of endangered species, and determine the feasibility and desirability of implementing larger scale habitat restoration in future stages (yr 1-7):
 - Restore major habitat corridors with a mosaic of habitat types along the Mokelumne and San Joaquin Rivers, within the Yolo Bypass, and along other major fish migration corridors as practicable (yr 1-7).
 - Implement tidal wetland restoration projects to test the effectiveness of larger scale restoration at various locations in the Delta.
 - Restore large expanses of shallow water habitat in open water areas of the Delta.
 5. Implement large-scale, restoration projects on select rivers (possibly Clear Creek, Deer Creek, and the Tuolumne River) that would include implementation of all long-term restoration measures in coordination with the watershed management common program and monitoring of subsequent ecosystem responses to learn information necessary for making decisions about implementing similar restorations in Stage 2 (yr 1-7).
 6. Develop an ecosystem water market (potentially \$20 million per year) and acquire at least 100,000 acre-feet of water for critical ecosystem and species recovery needs (yr 1-7).
 7. Complete targeted research and scientific evaluations needed to resolve the high priority issues and uncertainties (e.g., instream flow, exotic organisms, and Bay-Delta food web dynamics) to provide direction for implementing the adaptive management process and information necessary for making critical decisions in Stage 2 (yr 1-7).
 8. Establish partnerships with universities for focused research (yr 1-7).
 9. Complete the remaining 60% of the easements and/or acquisition for the Sacramento River meander corridor identified under the SB 1086 Program. Provide assurances for and participation by Sacramento River users and landowners that provides indemnification of affected parties against flooding impacts on neighboring landowners and impacts on water diverters (yr 1-7).

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10. Acquire flood plain easements, consistent with ecosystem and flood control needs along the San Joaquin River in coordination with the Corps of Engineers' Sacramento and San Joaquin River Basins Comprehensive Study (yr 4-7).
 11. Continue high priority actions that reduce stressors of direct mortality to fishes (yr 1-7):
 - Aggressively screen existing unscreened or poorly screened diversion on the Sacramento River, San Joaquin River, and tributary streams.
 - Remove select physical barriers to fish passage.
 12. Continue gravel management (yr 5-7); e.g., isolate gravel pits on San Joaquin River tributaries and relocate gravel operations on Sacramento River tributaries (most gravel work would be implemented in subsequent stages with designs and plans for ecosystem reclamation of gravel mining sites).
 13. Improve research, monitoring, detection, and control of exotic species (yr 1-7):
 - Implement invasive plant management program in Cache Creek.
 - Develop ballast water management program.
 - Develop early-response invasive organism control programs.
 - Evaluate CALFED implementation actions and how those actions may benefit non-native species to the detriment of native species or the Bay-Delta ecosystem.
 14. Explore ways to provide incremental improvements in ecosystem values throughout the Bay-Delta system in addition to habitat corridors described above (yr 1-7); e.g., pursue actions that are opportunity-based (willing sellers, funding, permitting, etc.), provide incremental improvements on private land through incentives, develop partnerships with farmers on "environmentally friendly" agricultural practices, etc.
 15. Incorporate ecosystem improvements with levee associated subsidence reversal plans (yr 1-7).
 16. Evaluate the feasibility of harvest management to protect weaker stocks (yr 1-7).
 17. Implement projects on selected streams to provide additional upstream fishery habitat by removing or modifying barriers (yr 1-7).

Water Use Efficiency

The CALFED water use efficiency element focuses on formulation of policies which support implementation of efficiency measures at the local and regional level. The CALFED Water Use Efficiency Program will: 1) establish measurable objectives; 2) offer support and incentives through expanded programs to provide planning, technical, and financial assistance; 3) monitor progress towards objectives; and, 4) if these objectives are not met, re-evaluate objectives and management options. CALFED agencies will also support institutional arrangements that give local water suppliers an opportunity to demonstrate that cost-effective efficiency measures are being implemented. The first stage implements the processes which will continue in subsequent

stages.

1. **Develop Reference Conditions** - Establish reference conditions in order to evaluate future progress. There will be an independent review conducted in conjunction with AWMC for this purpose (yr 1-3).

2. **Agricultural Financial Incentive Program** - Develop, in consultation with the Agricultural Water Management Council, a program of technical and financial incentives for the implementation of water use efficiency measures in agricultural sector. This program will consider several factors, including: (a) potential for reducing irrecoverable water losses; (b) potential for attaining environmental and/or water quality benefits from water use efficiency measures which result in reduced diversions; (c) regional variation in water management options and opportunities; (d) availability and cost of alternative water supplies; and (e) whether the recipient area experiences recurrent water shortages due to regulatory or hydrological restrictions. The financial incentives should generally take the form of loans for actions or activities that have been identified as cost-effective for the district in a water management plan approved by the Agricultural Water Management Council. The financial incentives should generally take the form of incentive grants for water use efficiency measures that are supplemental to measures that are cost-effective at the district level. The program will be coordinated with the action (Expand Existing State and Federal Conservation Programs) below and administered jointly by appropriate state and federal agencies. Funds will be provided by state and federal agencies from appropriations and/or bond measure proceeds pursuant to a cost-share agreement to be developed before the Record of Decision (yr 1-7).

- 3a. **Expand Existing State and Federal Agricultural Water Conservation Programs to Support On Farm and District Efforts** - Expand State and Federal programs (DWR, USBR, USFWS, DFG, DHS, NRCS, and SWRCB) to provide technical and planning assistance to local agencies in support of local and regional conservation and recycling programs. Develop and implement an agricultural water use efficiency program in cooperation with the NRCS, USBR, DWR, Resource Conservation Districts, and other appropriate entities. The purpose of the program would be to encourage utilization of cost-effective agricultural water management practices that accrue multiple benefits. The AWMC will be used to assist in soliciting and selecting individual projects to best meet the objectives developed through the Ecosystem Restoration and Water Quality Programs and to improve water supply reliability. Local entities will be encouraged to work collaborate on combined or regional proposed projects. Priority will be given to projects that are designed to achieve specific Delta-related benefits (e.g.,

improving water quality as opposed to general assistance or information dissemination). This action will be coordinated with the above action (Agricultural Financial Incentive Program) and will require increased funding above current levels (yr 1-7).

- 3b. **Expand Existing State and Federal Conservation Programs to Support Urban Water Purveyor Efforts** - Expand State and Federal programs (DWR, USBR, USFWS, DFG, DHS, and SWRCB) to provide technical and planning assistance in support of conservation and recycling programs.
4. **Create Public Advisory Committee** - Create public advisory committee to advise State and Federal agencies on structure and implementation of assistance programs, and to coordinate Federal, State, regional and local efforts for maximum effectiveness of program expenditures (yr 1).
5. **Develop Urban Water Management Plan Certification Process** - Select an agency to act as certifying entity, obtain legislative authority, carry out public process to prepare regulations, implement program beginning with plans submitted in 2005. Access to CALFED benefits will be contingent upon certification of suppliers' Urban Water Management Plan (yr 1-3).
6. **Implement Urban BMP Certification Process** - Implement a process for certification of water suppliers' compliance with terms of Urban MOU with respect to analysis and implementation of Best Management Practices for urban water conservation. Provide funding support for the entity selected to carry out this function. Access to CALFED benefits will be contingent upon certification of a supplier's compliance with the terms of the Urban MOU (yr 1-7).
7. **Statewide Urban Conservation Incentives** - Develop an incentive-based program to identify and implement urban water conservation measures that are supplemental to Best Management Practices in the Urban MOU process and are cost effective from a statewide perspective (yr 1-3).
8. **AWMC Evaluation of Agricultural Water Management Plans** - Utilize the AB3616 Agriculture Water Management Council (AWMC) to evaluate and endorse plans to implement cost-effective water management practices by agricultural districts. Identify and secure ongoing funding sources for AWMC and its members seeking to actively participate in the development, review, and implementation of these plans. Candidate activities include: administration, including staff, of the AWMC itself; implementation of approved practices; and participation by individual signatories. Access to CALFED benefits for a given agricultural district will be contingent upon AWMC's endorsement of the

adequacy of its water management plan and implementation. Prior to the ROD, the Focus Group recommends further deliberations to resolve several issues, including: 1) nature of review and form of action on such plans; 2) specific activities for which funding will be sought; 3) phasing in of certification over time (yr 1-7).

9. **Resolve Water Recycling Limitations** - Resolve legal, institutional, and funding limitations for agricultural and urban water recycling (yr 1-3). Secure loan and/or grant funding for water recycling capital improvement projects (\$500 million initial Stage 1 estimate).
10. **Refuge Water Management** - Finalize and implement the methodology for refuge water management which was described in the June 1998 "Interagency Coordinated Program for Wetland Water Use Plan, Central Valley, California" (yr 1-7). Consistent with requirements of urban and agricultural water users, access to new CALFED benefits will be contingent on implementation of this methodology.
11. **Research to Improve Water Use Efficiency Actions** - Encourage and support research to expand potential water use efficiency measures (yr 1-7).
12. **Assess the Need for Additional Water Rights Protections** - Before the Record of Decision (ROD) and after consultation with other CALFED agencies, the Legislature, and stakeholders, CALFED will evaluate the need for additional state regulations or legislation providing protection for water rights holders who have implemented water use efficiency measures and subsequently transferred water to other beneficial uses (yr 1-4).
13. **Water Measurement Program** - Develop, after consultation with CALFED agencies, the Legislature, and stakeholders, state legislation that requires appropriate measurement of water use for all water users in California (yr 1-3).
14. **Implement Recommendations Regarding Market Mechanisms** - Implement recommendations of strategic plan with regards to using market mechanisms to facilitate efficiency improvements (yr 1-7).

Water Transfer Framework

The water transfer framework is designed to facilitate and streamline the water transfer process while protecting water rights and legal users of water and addressing and avoiding or mitigating third-party socio-economic impacts and local groundwater or environmental impacts. This

would occur through a proposed framework of actions, policies and processes. The first stage implements the processes which will continue in subsequent stages. The prioritization of these and other water transfer actions will be further developed in the Water Transfers Strategic Plan being prepared before adopting the Record of Decision.

1. Establish the California Water Transfers Information Clearinghouse to collect and disseminate data and information relating to water transfers and potential transfer impacts, perform research using historic data to understand water transfer impacts, and provide a forum for discussion and comment on proposed transfers (yr 1).
2. Coordinate with CALFED agencies to formulate policy, under their existing authorities, for required water transfer analysis (yr 1).
3. Begin forecast and disclosure process (DWR and USBR) of potential conveyance capacity in existing export facilities. This would be an on-going activity, occurring in conjunction with hydrologic forecasts (yr 1).
4. Develop a standardized checklist and analysis procedure (SWRCB, DWR, and USBR) to be followed by transfer proponents for proposed transfers (yr 1-2).
5. CALFED agencies work with stakeholder representatives to reduce the conflict between transfer proponents and the SWRCB, DWR, or USBR regarding what water is deemed transferrable under what conditions (yr 1-3).
6. CALFED agencies continue work with stakeholder representatives to resolve conflicts over reservoir refill and carriage water criteria (yr 1-3).
7. Develop a process for expedited approval of short-term and other appropriate transfers (DWR, USBR, and SWRCB) (yr 1-3).
8. CALFED agencies will work with stakeholders to develop and issue appropriate rules, regulations, or procedures to make these environmental water transfers effective (yr 4-7).
9. CALFED agencies will work with stakeholders to develop an agreed upon set of criteria and procedures governing the determination of transport system availability and costs, including the procedures to determine the fair reimbursement to the water conveyance facility operator (yr 1-3).
10. CALFED agencies work with the Legislature and stakeholders to determine whether additional legislation to protect water rights, including area of origin priorities, is necessary (yr 1-2).
11. CALFED agencies will work with stakeholders, the Legislature, and local agencies to identify appropriate assistance to enable local agencies to develop and implement groundwater management programs to protect groundwater basins in water transfer source areas (yr 1-2).
12. CALFED agencies identify, arrange, fund, and carry out a specific number of targeted water transfers for instream environmental purposes, with a goal of using these transfers to evaluate the effectiveness of California Water Code Section 1707 procedures (yr 1-3).

Watershed Program

The Watershed Program will be coordinated and integrated with existing and future local watershed programs and provide technical assistance and funding for watershed activities that support the goals and objectives of the CALFED Bay-Delta Program. The actions during Stage 1 are a mix of watershed coordination, restoration, maintenance, and conservation activities, as well as demonstration projects designed to show benefits to the Bay-Delta system while also benefitting existing watershed resources.

1. Fund and implement watershed restoration, maintenance, conservation, and monitoring activities that support the goals and objectives of the CALFED Bay-Delta Program and that are locally controlled efforts (years 1-7).
2. Identify priority locations and implement watershed restoration activities which benefit restoration in the Bay-Delta system (years 1-7).
3. Assist local watershed groups and government agencies to address common issues, including roles and responsibilities, funding support, technical assistance, information exchange, and to ensure effective communication and implementation among government agencies and stakeholder groups (years 1-7).
4. Develop and implement a funding process and provide watershed stewardship funds to build the capacity of locally controlled watershed groups that ensure participation of local landowner groups (years 1-7).
5. Improve the use and usefulness of existing or future watershed clearinghouse functions to assist watershed groups with obtaining information on funding opportunities, technical assistance, and data storage and retrieval (years 1-7).
6. Ensure the completion of project level environmental documentation and permitting; assist with documentation and permitting processes as appropriate (years 1-7).
7. Evaluate the benefits (including economics) that accrue from watershed plans and projects designed to achieve CALFED goals and objectives (yr 1-7).
8. Establish, fund, and maintain watershed restoration and maintenance assistance to aide local watershed groups and private landowners in project concept, design, and implementation (years 1-7).
9. Coordinate with other CALFED and non-CALFED programs on watershed related activities (years 1-7).
10. Work with stakeholders and the Legislature to develop a state-wide umbrella watershed management act (yr 1-3).
11. With the consent of project owners/operators, perform reoperation analysis for existing hydroelectric power reservoirs under 500,000 acre-feet capacity (except SWP, CVP, and Corps of Engineers reservoirs) to benefit local and downstream water users, water quality, and the environment. With consent of project owners/operators, implement changes in operations, including funding of acquisitions, where appropriate (yr 1-7).

Storage

New storage will be included in the preferred program alternative as necessary to meet CALFED's goals and provided conditions and linkages for implementation are satisfied.

Groundwater Banking and Conjunctive Use - *This first stage includes a coordination effort with local implementing entities and landowners in both the north of Delta and south of Delta areas, and includes construction of several south of Delta projects. Additional south of Delta and north of Delta projects, if feasible, could be constructed in later stages.*

1. Develop and implement a framework for groundwater banking and conjunctive use projects (yr 1).
2. Include provision to protect overlying and other landowners' water rights (yr 1-7).
3. Provide funding assistance to local governments and special districts for groundwater plan development (yr 1-7).
4. Identify potential projects and local cooperating entities and define CALFED role (yr 1-3).
5. Conduct baseline monitoring and modeling (yr 1-7).
6. Initiate field studies (yr 2-7).
7. Project environmental documentation and permitting (yr 1-3).
8. Project design (yr 2-4).
9. In partnership with local entities, construct two to three groundwater banking facilities with target volume of 500,000 acre-feet storage (yr 1-7); e.g., potential options include Madera Ranch, Stockton East, expanded Kern Water Bank, and others.
10. Study additional project sites (yr 2-7).

Surface Storage - *New offstream storage and/or expansion of existing onstream reservoirs could add up to several million acre-feet of new surface storage. A description of three to five possible sites will be available at the start of Stage 1. The first stage will consist of feasibility studies, evaluations, and permitting compliance procedures to determine the appropriate mix of surface water and groundwater storage, identify acceptable projects, and initiate construction if program linkages and conditions are satisfied.*

1. Identify initial local partners and other cooperating entities for projects and CALFED role (yr 1-3).
2. Develop environmental documentation (yr 1-5).
3. Perform feasibility studies and economic analyses (yr 1-5).
4. Perform field studies (yr 1-5).

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5. Finalize CALFED evaluation process and 404(b)(1) analysis to determine the appropriate mix of groundwater and surface water storage projects to meet the program goals and objectives (yr 1-5).
 6. Site selection (yr 4-5).
 7. Evaluate improvements to potential conveyance to storage (yr 1-5).
 8. Obtain permits, negotiate operating agreements, and seek site specific authorization and reimbursable state or federal funding for land acquisition, site preparation, and construction if conditions and linkages are satisfied (yr 5-7).
 9. Identify beneficiaries and negotiate cost sharing agreements (yr 5-7).
 10. Begin construction if conditions and linkages are satisfied (yr 6-7).

Conveyance

CALFED's basic strategy is to develop a through-Delta conveyance alternative based on existing Delta configuration with some modifications. Some construction of improvements in the south and north Delta should occur within the first stage to improve conditions for ecosystem and water management reliability. Part of the first stage consists of studies and evaluations of the major conveyance features. This will allow conveyance projects to be ready for permitting and construction in later stages should the projects be necessary to meet Program objectives.

South Delta Improvements - *South Delta improvements consist of methods to control flow, stage and circulation, improve fish passage, fish screen and salvage facilities, and provide SWP/CVP interties upstream and downstream of the export pumps. South Delta conveyance improvements included in Stage 1 would function with the basic conveyance strategy or potential modifications.*

1. Complete various environmental documentation and permitting (including 404(b)(1) analysis) requirements for the various actions included in items 4 -11, below (yr. 1-4).
2. Design various south Delta improvements described in items 4,5, 7- 10, below (yr. 1-5, depending upon improvements).
3. Construct a new screened intake at Clifton Court Forebay that allows diversion into the forebay throughout the tidal cycle sized to meet the full export capacity of 10,300 cfs with appropriately protective screening criteria (yr 4-6).
4. Construct either a new screened intake at the head of the channel leading to the CVP pumping plant at Tracy, or an expansion of the new diversion at Clifton Court Forebay with a new intertie to the Tracy Pumping Plant. This new (or expanded new) diversion would be sized to meet the full Tracy Pumping Plant export capacity of 4600 cfs with appropriately protective screening criteria and, if connected to CCFB, allow a variable rate of diversion throughout the tidal cycle (yr. 1-4).

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5. Implement the Joint Point of Diversion for SWC and CVP, which, if permitted by the SWRCB, would allow the SWP to pump CVP export flows and vice versa within the permitted export constraints of each (yr. 1-7).
 6. If appropriate, construct an intertie with up to 400 cfs of pumping from the CVP Delta Mendota Canal to the SWP California Aqueduct to overcome conveyance impediments downstream (yr. 5-7).
 7. Evaluate, and if appropriate, construct an intertie connecting the Tracy Pumping Plant to Clifton Court Forebay. The forebay intertie would be considered even if a new screened intake is constructed for the intake to the Tracy Pumping Plant to provide additional operational flexibility for both facilities (yr 5-7+).
 8. Construct an operable barrier at the head of Old River (yr 2-4).
 9. Implement additional physical features and associated operational rules required to address problems related to SWP and CVP export operations including south Delta water levels, channel scour, fisheries, and water quality in the south Delta or some other method to address the concerns (yr 2-4).
 10. Evaluate benefits and impacts of recirculation of a portion of Delta Mendota Canal flows through the Newman Wasteway to the San Joaquin River for water quality and ecosystem enhancements (yr 1-4).

North Delta Improvements - *North Delta Improvements consist of methods to address flood control, water quality, fisheries, and water supply reliability concerns. Actions include modification of the Delta Cross Channel operational criteria and creation of additional floodplain, wildlife, and fisheries habitat. A screened diversion at Hood and channel dredging and setback levees in the Mokelumne River will be evaluated and may be implemented if necessary.*

1. Prepare project environmental documentation (yr 1-5).
2. Conduct feasibility studies for screened diversion and fish passage facilities, channel modifications, and habitat improvements (yr 1-5).
3. Conduct field studies (yr 1-5).
4. Prepare environmental documentation for land acquisition for various purposes including habitat and flood protection (yr 2-3).
5. Acquire land and convert land use for habitat and flood protection improvements (yr 4-6).
6. Obtain permits and operating agreements (yr 4-6).
7. Design selected improvements (yr 4-6).
8. Develop operational criteria for the Delta Cross Channel that balances flood control, water quality, water supply reliability, and fisheries concerns.
9. Evaluate whether a 2,000 cfs screened diversion from the Sacramento River at Hood to the Mokelumne River can be constructed to improve or maintain central Delta water quality, without compromising fish protection achieved by operation

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- of the Delta Cross Channel or creating other adverse fishery impacts.
 10. Evaluate the implementation of setback levees and/or dredging along the Mokelumne River from Interstate 5 downstream to the San Joaquin River to improve conveyance and resolve flood concerns in this region. These actions would be carefully coordinated with ecosystem restoration actions to create additional tidal wetlands and riparian habitat to assure that a balanced solution to local and regional concerns would be achieved.
 11. Based on the above evaluations, take appropriate action to provide a balanced solution to water quality, flood control, water supply reliability, and fisheries concerns.
 12. Conduct pilot studies for dredged material reuse for Delta levee improvements and habitat creation (yr. 1-7).

Isolated Facility - *The isolated facility (a new canal or pipeline connecting the Sacramento River in the northern Delta to the SWP and CVP export facilities in the southern Delta) will only be built when it is determined that the through-Delta conveyance actions coupled with other CALFED actions cannot meet CALFED goals and objectives. The following Stage 1 actions provide progress on initial studies in case the isolated facility is found necessary to meet CALFED objectives. Stage 1 studies relating to continuously improving public health through improved drinking water quality (see **Water Quality** section and **CMARP** section in this chapter) will be considered in determining whether those goals and objectives have been achieved without an isolated facility and/or other means of providing better quality source water. Stage 1 studies relating to actual fishery recovery, the entrainment effects of the south Delta export facilities, and the benefits and negative impacts of relocating the diversion point will also be assessed.*

1. Model potential operation scenarios for an isolated facility tied to modeling of water quality and fisheries to help in overall assessment of the need for an isolated facility and/or other means of providing better quality source water (yr 1-7).
2. Conduct the following actions if there is a decision to proceed with an isolated facility:
 - Prepare project environmental documentation (yr 4-or after).
 - Conduct feasibility studies (yr 4-or after).
 - Conduct field studies (yr 4-or after).
 - Assess right-of-way issues that could impact CALFED's ability to maintain a viable option for a potential future habitat and facility corridor (yr 4-or after).

Assurances & Institutional Arrangements

An assurances package is a set of actions and mechanisms to assure that the Program will be implemented and operated as agreed. The assurances package will include items to be adopted immediately as well as a contingency process to address situations where apart of the plan cannot be implemented as agreed. While the principles for the assurances package will be substantially complete before beginning Stage 1, many details remain to be finalized early in Stage 1 after the federal ROD and the State Certification.

1. Finalize coordination among agencies or new entity (yr 1-3); e.g., provide for ecosystem restoration authority within the individual CALFED agencies or in a new organization with responsibility for ecosystem restoration.
2. Expand on the conservation strategy (yr 1-3); next steps will implement mechanisms that will provide regulatory certainty for specific projects or bundled projects whose actions were identified in the ROD for completion during Stage 1.
3. Recommend legislation, if necessary, to implement new institutional arrangements or facilitate program implementation (yr 2-3). Legislation could serve to create a new entity or modify water transfer law and statutes to facilitate an appropriately protective water transfer framework recognizing law that may exist at that time. For any legislation to implement new institutional arrangements that would facilitate increased water transfers out of the Delta, include reaffirmation and enhancement of existing laws such as the Delta Protection Act, the Feigenbaum Act, the Watershed Protection Act, and the Protected Areas Act (Water Code §§1215, 1222, 1216, and 1217 [a]).
4. Incorporate the final State Board's water rights decision for allocation of responsibility to meet flow requirements for Water Quality Control Plan 95-6 (May 1995) in water transfer and operational rules.
5. Implement a CALFED environmental documentation, mitigation, and permit coordination process (yr 1-7).
6. Implement and revise contingency response as needed (yr 1-7).
7. Develop guidelines and support legislation for federal Good Samaritan protections for mine remediation (yr 1-2).

Finance

The financial package will seek to finance the preferred program (total Program costs for improvements, mitigation, and ongoing annual operating and maintenance costs) through a combination of federal, state, and user funds. This financing will be needed over several decades as the various parts of the preferred program alternative are implemented, operated, and maintained. An agreement on the financial principles including the benefits-based

approach, guidelines for public/user cost split, provisions for crediting for other parallel efforts, provision for repayment of federal/state costs where appropriate, and cost allocation methodology or strategy will be included in an implementation agreement prior to Stage 1. These principles will recognize public and private benefits derived from water quality, environmental protection, flood control, recreation, and a reliable water supply. Stage 1 establishes the financial package for use in all stages.

1. Establish reliable short-term and long-term funding for each program element and for each package of Stage 1 actions complete as necessary (1-7):
 - Refine cost estimates (yr 1)
 - Finalize beneficiary pays principle (yr 1)
 - Finalize details surrounding repayment or crediting (yr 1)
 - Finalize cost-share agreements (yr 1).
 - Finalize appropriate user fees linked to long-term assurances (yr 1-7).
 - Seek federal authorization/appropriation and seek authority to sell state bonds (yr 1-7).

Monitoring, Research, and Adaptive Management

Establish monitoring for all program elements that focuses on obtaining data on a timely basis, providing interpretation of data, and maintaining data in an accessible and useful form. The monitoring, assessment of data, and resultant need for adaptive management are required throughout the CALFED Bay-Delta Program. The first stage refines the monitoring system and procedures which will continue in subsequent stages.

1. Periodic review and refinement of the monitoring plan (CMARP) including all elements of the Program (yr 1-7).
2. Define conceptual model of Delta watershed as it relates to fish survival and other indicators of ecosystem health. Include model variables for all significant stressors, such as diversion effects, commercial fishing, exotic species, hatchery impacts, and fish barriers on tributaries (yr 1).
3. Refine monitoring program based on conceptual model to acquire data needed to test model elements and guide investment strategy (yr 1).
4. Define, review, and refine the adaptive management process for making adjustments as better information becomes available, including who makes future decisions, for all elements of the Program (yr 1-7); e.g., define triggers and time periods necessary for deciding need for change in management direction.
5. Implement baseline monitoring plan under direction of a single umbrella entity as defined in CMARP with linkage to adaptive management process and provision for stakeholder input but provide for responsible agencies to conduct additional

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- monitoring to meet their obligations in the event that needs cannot be met by baseline monitoring plan (yr 1-7).
6. Review the progress toward achieving CALFED goals and objectives and refine adaptive management and monitoring programs as needed to accommodate the information needed for that assessment process (yr 1).
 7. Complete monitoring studies identified by diversion effects on fisheries team to provide feedback on actual diversion effects of south Delta pumps (yr 2-7) *[includes long-term, system wide, baseline monitoring with focused research to increase understanding of ecological process and ways to reduce uncertainty; definition of needed studies is currently under development, following are examples]*
 - Conduct focused research on Delta hydrodynamics and linkage to food web including relation to location of diversion point.
 - Study population trends of fish using the Delta, including fish salvage at south Delta export facilities, with emphasis on San Joaquin River fall run chinook salmon, delta smelt, and Mokelumne River fall run chinook salmon and steelhead trout.
 - Expand real-time monitoring for enhanced fish protections and flexible operations for water suppliers.
 8. Provide available data on need to reduce bromides, total dissolved solids, total organic carbon, pesticides and heavy metals (yr 5).
 9. Provide available data on water quality in south Delta and lower San Joaquin River (yr 1-7).
 10. Monitor and assess the impacts of water use efficiency measures on water demands and available supplies, and develop better information for water balances in the Bay-Delta system (yr 1-7).
 11. Prepare annual reports on status/progress and need for adjustments (yr 1-7).
 12. Analyze status and need for adjustments of actions for stage 2 (yr 5-7).
 13. Monitor and report land use changes, such as agricultural land conversion, resulting from CALFED actions (yr 2-7).

5.2 Water Project Operations for Stage 1

The Stage 1 actions in the previous section provide a major step in implementing CALFED's long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. While Stage 1 includes a wide variety of new facilities, habitats, policies, and other management actions, carefully crafted operating criteria for the State and Federal water projects remain critical. New operating criteria, together with the other Stage 1 actions, will minimize the ongoing conflict between fisheries and water diversions (see **Bay-Delta Problems/Objectives** in Chapter 2). As a first step toward specific water operations

criteria, CALFED is developing a water operations strategy for Stage 1.

This proposed strategy would combine the certainty of prescriptive standards with the flexibility of active and adaptive management provided by an **environmental water account (EWA)** as described below. Prescriptive standards provide general ecosystem benefits. CALFED has investigated additional potential prescriptive criteria that could improve ecosystem benefits. Active management, wherein decisions are based on real-time data, permits flexible responses to species whose needs are likely to shift greatly from year to year. Adaptive management promotes improved understanding of species whose sensitivity to entrainment is not well understood. An EWA could provide the flexibility of both active and adaptive management. CALFED will continue to refine prescriptive criteria, the EWA concept, and develop operating criteria in 1999, through the remainder of Phase II. The final operations strategy will likely involve some combination of these elements.

The Environmental Water Account (EWA)

The EWA concept is based upon the notion that flexible management of water operations could achieve fishery and ecosystem benefits more efficiently than a completely prescriptive regulatory approach. Regulations place specific limitations on project operations. In general, these limitations are based upon hydrological, seasonal, and biological criteria. For example, under the current export-inflow regulations, the projects are limited to diverting 35 percent of Delta inflow during February through June of most years. An EWA is not a substitute for regulation, but is a supplement to regulation. CALFED's intent is to provide flexibility to achieve environmental benefits and to provide certainty (ESA and other regulatory assurances) to water users. The intent of operations using this account also is to achieve substantial fish recovery while providing for continuous improvement in water supply reliability and water quality benefits.

There are a variety of potential approaches to defining and operating an EWA, all of which could provide for flexible management of water resources. For example, an EWA could be defined in terms of export restriction "credits" or strictly in terms of dollars for market acquisitions. In its preliminary evaluation of the EWA concept, CALFED considered a proposal for an EWA that treats the EWA much like a water contractor. Under this proposal, an EWA would consist of a portfolio of assets including: water; entitlement to capacity in water diversion facilities, aqueducts, storage; and money. In addition, an EWA could use transfers, options and acquisitions to obtain water. Water could be pumped to refill its storage facilities using those rights and purchases. Water could be acquired by paying for water use efficiency or recycling projects. Variances in export standards could be granted in the interest of generating additional EWA water. Funding would be available to make use of these assets. The fishery agencies would jointly manage an EWA.

Fisheries agencies could then draw on the account to provide additional species protection. The

fisheries agencies would work with the project operators in using an EWA to modify project operations in real-time. For example, if fish were detected in the vicinity of the export pumps, reductions in export pumping to protect the fish could be required. In return, the water projects could be compensated out of EWA assets, so that reduced project pumping would not result in reduced water deliveries to the State and Federal water contractors. Examples of how an EWA may be operated over the course of several years are presented below:

If the EWA managers decided to extend the export reductions called for within VAMP for an extra month to protect salmon and delta smelt, the result for the State and Federal projects would be reduced storage within San Luis Reservoir. The EWA would commit to providing supplies, if necessary, out of its water assets -- a combination of surface and groundwater storage, production from conservation or recycling projects, and market purchases.

If the State and Federal projects were unable to move water out of storage north of the Delta to fill San Luis, then the EWA would probably be required to fill some or all of the storage deficit in San Luis by the end of the growing season or carry over the debt to the following year. The EWA would do so using water it controlled.

Alternatively, if the EWA managers felt that a temporary change in the export-inflow ratio would have minimal fisheries impacts, it could allow the projects to pump water out of the Delta above the specified export-inflow ratio for some period in order to enhance EWA assets.

If the State and Federal projects could replenish San Luis storage by moving water from upstream storage later in the summer, then the risk of repaying the debt would be moved upstream. If the following winter is wet and the upstream reservoirs spill, then the debt owed by the EWA to the projects would be eliminated. However, if the reservoirs do not spill, then the EWA would be required to provide compensation using its assets the following year.

Of course, real operations would be much more complicated, with the EWA managers spending assets to protect fish part of the year; diverting water to rebuild assets over other parts of the year; shifting water between surface storage and groundwater storage, and trying to anticipate and accommodate biological needs. Clearly, high-quality fisheries monitoring through the CMARP is essential for the ultimate success of the EWA approach.

Water quality concerns must also be considered in management of an EWA. Operational changes to enhance the protection of aquatic resources and export supplies have the potential to affect water quality. Management of the EWA must be coordinated with operation of the State and Federal water projects and the CALFED Water Quality Program to provide water quality improvements for all users (see **Water Quality** section in Chapter 4).

Potential Attributes of An EWA

For a given quantity of environmental water dedicated to environmental protection, an appropriately sized EWA with the appropriate combination of assets could be more protective than traditional standards. Potential attributes of the EWA include:

1. **Increased Flexibility** - The flexibility to provide the greatest level of environmental protection at a time when fish are most threatened may be difficult to craft as a fixed standard. EWA operations could be a more flexible and efficient tool for providing protections for certain species.
2. **Increased Protection for Species From Entrainment Even During Favorable Hydrological Conditions** - As an example, delta smelt adults following a dry year are believed to be particularly vulnerable. Entrainment of such fish in January or February could be a problem, despite apparently beneficial hydrologic conditions.
3. **Focused Protection** - It is difficult to predict which species will be at greatest risk at a given time in the future. An EWA could provide the ability to tailor operations to protect those species most at risk in a given time and situation.
4. **More Efficient Use of Water** - Because of the wide range of hydrologic and environmental conditions that can be encountered in the Delta, it is difficult to craft a standard that efficiently protects species under all circumstances. The EWA could allow operations to be tailored to the specific circumstances at hand.
5. **Greater Opportunities to Experiment and Learn From Previous Operations** - Opportunities to conduct experimental manipulations may be enhanced because an account could be used to address potential impacts to other beneficial uses. An EWA will also allow rapid translation of new scientific insights into improved operations. The information provided by CMARP will be critical to successful adaptive management.
6. **More Incentives for Efficiency** - The incentive for getting maximum benefit from a given resource comes from having finite resources. An EWA would encourage efficient use of its assets.
7. **Better Coordination of Maximum Benefits** - An EWA could provide opportunity to coordinate with actions of others (ERP habitat restoration, CVPIA, etc). EWA decisions can take into account diverse events taking place at the same time, such as hatchery releases, large natural production of juveniles, unexpected toxicity events, etc.

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8. **Potential for Reduced Conflict Between the Environment and Water Users -**
The EWA managers and water users would have a common interest in improving system infrastructure, system flexibility, biological monitoring and scientific analysis in order to obtain water benefits for both. With a properly sized EWA, there would be an adequate amount of water to provide the necessary species protection and reliable water supplies, thereby minimizing conflict.

Problems Associated with An EWA

Even though an EWA could provide more environmental protection at a lower water cost than regulatory standards, there are a number of institutional and operational problems that may not be easily solved. These problems include but are not limited to:

1. How to insure that an account has sufficient assets to insure environmental restoration.
2. How to insure that the manager of the account makes environmentally appropriate decisions.
3. How to account for the water owed to the environment.
4. How to establish an initial baseline of assets for the environmental account.

These issues must be fully addressed before CALFED makes a decision about whether or how to establish an EWA.

Initial Evaluation of An EWA

To gain insight into how and whether an EWA could provide adequate fish protection while not adversely affecting water quality or water supply benefits, a group including CALFED Agency staff and stakeholders walked through a month-by-month simulation of one EWA operations scenario over four water years. The simulation was conducted using a base operation study as a default for State and Federal water project operations in the absence of an EWA. Changes in operations were simulated considering a set of assumed assets of the EWA and historic fish salvage records.

For this scenario, the EWA was assumed to consist of several hundred thousand acre-feet of water, primarily in the export areas, including surface and groundwater storage, water option contracts, production from an urban efficiency program, and water that might be generated by adjusting the export-inflow ratio standard. Moreover, in this scenario, an expanded SWP diversion capacity (up to 8,500 cfs) was assumed to generate additional water.

The four years simulated included a variable hydrologic sequence of alternating wet years and dry years. The simulation was conducted only once, assuming no foresight as to hydrological or biological conditions.

This simulation exercise yielded the following insights and findings:

1. With the proper mix of assets, both fisheries protection and water supply benefits can be achieved with implementation of an EWA.
2. Experience in managing the simulated EWA would allow more efficient use of EWA assets.
3. Monitoring data provided through CMARP would help guide EWA decision-making. CMARP would have to be closely linked to operation of the EWA to help anticipate and avoid or reduce impacts of project operation.
4. Surface storage facilities allow more flexibility than groundwater storage. Groundwater recharge rates limit opportunities to refill the account, while groundwater extraction rates limit use of the account.
5. In-Delta storage would also provide flexibility.
6. There are benefits to holding options on water north as well as south of the Delta, just as there are benefits to having access to storage north and south of the Delta. The EWA assets considered in this exercise limit the ability to fill local storage deficits at key times both north and south of the Delta.
7. Additional option contracts with south of Delta exporters would be helpful.
8. A better mix of tools is needed to provide assurances.
9. Consideration must be given to how managing the EWA could affect attraction flows needed for upstream migrant salmon.
10. While flows and exports were managed in this simulation to benefit fisheries, the exercise did not allow for directly evaluating potential biological benefits or impacts of actions taken.

General Conclusions

Based on this simulated EWA evaluation and on the related discussions, CALFED can make some preliminary conclusions about how an EWA can be structured and operated. These include:

1. An EWA approach holds significant promise in achieving both fisheries protection and water supply benefits
2. Ultimate authority for decisions on how the EWA is used will rest with the DFG, USFWS, and NMFS. These agencies will establish an open process for EWA decision-making that provides for coordination with the operation of the SWP and CVP and the meaningful involvement of the affected stakeholders and other

-
- agencies.
 3. An EWA could be used to achieve flexible operation of additional environmental protections.
 4. Water must be available from the account for environmental use at the beginning of Stage 1
 5. Funding must be assured through time and must be adequate to secure water needed through Stage 1.
 6. To the extent that operation of the EWA involves purchase of water, those purchases must be feasible and timely.
 7. Decisions on the use of EWA water will require monitoring and research.
 8. Management of the EWA must be coordinated with operation of the State and Federal water projects and the CALFED Water Quality Program to provide water quality improvements for all users (see **Water Quality** section in Chapter 4.)

Issues to be Addressed in 1999

Although an EWA has significant potential, a number of major issues and details will need to be evaluated and resolved before this approach can be fully implemented. These include:

1. Determine which environmental protections would be provided through prescriptive standards and which would be provided through an EWA.
2. Investigate various approaches for implementing an EWA.
3. Determine how much (1) existing surface and groundwater storage; (2) water purchase contract water; and (3) water generated from co-funding efficiency or reclamation projects will be needed by an EWA as of the first day of EWA operations.
4. Determine how the EWA assets will shift and grow during Stage 1.
5. Determine sharing methods of initial water export improvements (e.g., South Delta improvements).
6. Determine sharing methods of additional Stage 1 water export improvements.
7. Determine EWA rights to use existing and future storage and conveyance facilities.
8. Develop accounting methodologies.
9. Assure that water quality impacts of operational changes to protect fish are adequately dealt with within the CALFED water quality program.
10. Secure adequate, assured funding to support EWA operations at defined levels.
11. Allocate costs of this program.
12. Define institutional control of EWA, including governance, public participation, linkages to CMARP, and decision making process.
13. Determine existing and reliability of existing legal mechanisms to assure intended use of EWA water released for instream purposes.

CALFED EWA Proposal

CALFED believes that the EWA concept should be further evaluated and developed as soon as possible. To that end, CALFED proposes:

1. A pilot-project EWA should be developed and implemented during the 1998-99 water year.
2. If all the operational, institutional, and assurance issues identified above and others identified during the pilot-project are satisfactorily resolved, CALFED proposes developing and implementing a long-term EWA as soon as possible.

5.3 Assurances and Governance

Overview

CALFED is developing an assurances package which will consist of a set of tools and mechanisms to ensure that the Program will be implemented as agreed. In addition to ensuring that the ERP and other CALFED programs are fully implemented, the intent of this package is to provide regulatory certainty to participants in the CALFED Program throughout the Bay-Delta system.

CALFED recognizes that a number of existing and ongoing programs, especially ecosystem protection and restoration measures being implemented by in-Delta and upstream water users, make significant contributions to meeting CALFED's goals. It is CALFED's intent that those efforts receive similar assurances as similar projects implemented by CALFED. CALFED is evaluating mechanisms an/or processes under which such assurances can be granted.

The assurances package includes mechanisms to be applied early in Stage 1, such as financing and governance, as well as components for the long term, such as the contingency response process. Over the long term, assurances will also be provided through the Conservation Strategy and the Comprehensive Monitoring Plan, both discussed elsewhere in this *Revised Phase II Report*.

The assurances package is an integral part of the implementation plan being developed, and includes mechanisms which are program-wide and element-specific, internal and external, long term and short term. Internal assurances are those mechanisms which are integral to program actions, such as staging, linking and bundling (grouping) of actions together so they progress together. External assurances are those tools which may be applied to the program, including legislation, regulations, or contractual arrangements. Eventually, the assurances package will

consist of several related components:

- A programmatic implementation plan or agreement
- Program wide assurances, including a Program oversight and management structure
- Specific assurances for Program elements and actions
- Contingency response process

A package of assurances will be completed before issuance of the Record of Decision (ROD). While the principles of a longer-term assurances package for the remainder of the program will be substantially complete before beginning Stage 1, the details of some components will remain to be finalized during Stage 1.

1999 (Pre-ROD) Actions

Not all of the assurance components will be fully developed prior to beginning Stage 1 implementation. Therefore, CALFED and stakeholders will need to continue work in Stage 1 to complete the long term Assurances Package. However, prior to Stage 1 the following steps will be taken to further develop the assurances package:

1. **Complete a decision on an overall CALFED management structure.** This decision will reflect the manner in which the overall CALFED program is managed and coordinated. It will also assign responsibilities for each of the program's elements to a new entity, existing entity, or combination of entities. Recommendations for required legislation will be made, if necessary.
2. **Complete a decision on an ERP entity.** Over the past two years, stakeholders and CALFED have done considerable work on the concept for a separate entity to carry out the ERP. A high degree of consensus among stakeholders has been reached on the need for a new organization to carry out the many new ERP tasks. The nature and specifics of an ERP entity will be decided, and legislative recommendations made if necessary.
3. **Complete the Conservation Strategy.** The Strategy will include goals and actions for species recovery, and will provide the framework for authorizing incidental take associated with Stage 1 actions.
4. **Complete strategic plans for each program element.** Each of the program's elements will complete a plan detailing: 1) Measurable performance goals; 2) Stage 1 actions; 3) Financing; 4) Recommended governance; and 5) Key milestones and decision points. The plans will give stakeholders, agencies and

the public a more complete picture of what can be expected from each part of the program.

5. **Complete the Agricultural Water Use Efficiency Strategic Plan.**
6. **Develop an operational plan for water allocation.** The plan will utilize the State Board's water rights decision for allocation of responsibility to meet flow requirements for Water Quality Control Plan 95-6, and will be consistent with all regulatory requirements including state and federal ESA and including requirements related to the Trinity River.
7. **Identify the first group of Stage 1 projects, and implement an environmental documentation and permit coordination process.** Certain Stage 1 projects which are high priority for Stage 1 and could move forward quickly need to be identified in 1999. To enable these projects to move forward efficiently, a process to coordinate and consolidate permitting and CEQA/NEPA requirements will be implemented. Examples of pre-ROD actions include analysis and environmental review for establishment of an Environmental Water Purchase program, and completion of environmental review for Interim South Delta projects.
8. **Complete a Programmatic Section 404 Assurance Package.** This programmatic document will present a clearly-defined 404 process with appropriate decision criteria. (See **Clean Water Act Section 404** in Chapter 6)
9. **Complete a recommendation on an Urban Conservation Certification entity, and recommend legislation, if necessary.** A decision will be made on what existing or new entity will certify urban water conservation plans for adequacy.
10. **Define a process to provide linkages between program actions.** A process on which to base program ties will be developed, taking into account types of measures, timing and ways to bundle projects (see discussion below).

Stage 1 Assurances

Assurances in Stage 1 may be included in many ways. For example, assurances will be provided through:

- Conservation strategy
- Clean Water Act 404 process
- Governance structure
- The actions selected and proposed for implementation
- Linkage between Stage 1 actions

- Financing

The concept of linkage and bundling provides that actions in different program areas are bundled to provide additional assurances that benefits will be balanced across the Program. Several means of linking or bundling projects have been discussed. They include grouping projects that may be completed within a similar time period; tying projects of interest through a shared CEQA/NEPA process; projects oriented around permitting needs like Clean Water Act Section 404; and grouping projects that are geographically related.

Additionally, since in Stage 1 the program is dealing with short-term implementation efforts there will be frequent and periodic checkpoints at which parties can determine whether the program is meeting their needs and expectations. Effectively, the commitment of all interested parties will not have to be any longer than Stage 1. This reduces the need to develop long term assurances prior to the beginning of Stage 1.

Program Management and Governance

Implementation of the CALFED Program will require some type of general program structure to provide coordinated oversight and policy guidance. A major oversight function will be determining when program implementation milestones or performance indicators have – or have not – been achieved, and then making the necessary reports or findings so that the Program can move forward to the next stage of implementation. Other oversight functions will include development of program budgets, project prioritization, and interagency coordination. Also, CALFED will need to make the necessary decisions and program adjustments due to unforeseen or uncontrollable events, as described in the contingency response process.

The nature of the existing CALFED Bay-Delta Program, however, does not provide the formal structure necessitated for implementing the large-scale program now envisioned. Indeed, the existing structure was not intended to implement the entire Program. The federal and state governments created CALFED's cooperative structure to develop a long-term plan, not to administer a multi-billion dollar program. CALFED therefore was given no independent administrative authorities. As CALFED moves toward implementation, however, the issues of management and governance of that implementation arise.

To date, CALFED has focused on two questions related to program management and governance. First, how will the Program as a whole be implemented, managed and governed? Second, how will the ERP portion of the Program be managed and governed? Efforts are underway currently to convene a panel of experts and practitioners in interagency programs to evaluate the CALFED Program's overall management needs, hold a public symposium, and prepare a report to the CALFED agencies, stakeholders, the Legislature and the Congress.

In addition, the CALFED BDAC Assurances Workgroup has completed a large amount of work studying the need for a separate Ecosystem entity. The Assurances Workgroup has collected and evaluated information on similar multi-agency ecosystem projects from around the country, and has reached a number of conclusions. From this work, the stakeholders have developed a consensus that the ERP needs a new entity for implementation. The Assurances Workgroup also concluded that this new entity should: 1) take responsibility for meeting the ERP's performance goals; 2) restore the ecosystem in a proactive manner; 3) use an adaptive management approach; and 4) retain a high degree of independence. Conclusions and data from past and upcoming efforts will be used in 1999 to prepare a recommendation from the expert panel to CALFED management, the Legislature and the Congress.

The need for resolving the management/governance issue has become increasingly apparent as CALFED approaches implementation. Effective CALFED implementation demands both timely decisions and efficient actions to carry out those decisions. Making those decisions and carrying out those actions requires an organization that reflects the unique nature of CALFED. Creating such an organization will require substantial time and effort, but the importance of such an effort cannot be underestimated.

Implementation Decisions - Given the range and scope of the decisions that CALFED implementers will face, the decision-making protocol over time is key. Much of the CALFED Program is based on staged decision-making and adaptive management. These decisions will affect the Program's achievement of continuous improvement in all program areas. Timely decision-making remains critical to the success of the entire program.

The decisions needed to ensure the Program's success include:

- Evaluation of water quality and fishery impacts from conveyance, using expert advice, to determine the need for an isolated conveyance and/or other water management options.
- Adaptive management decisions related to ecosystem restoration. The success of the entire ERP depends on adaptive management, allowing future decisions based on results of actions that CALFED takes.
- Maintenance of proper balance among all the water management tools to achieve the Program's water supply reliability objectives and to comply with Clean Water Act Section 404 for storage.

These decisions cannot be deferred. Someone – or some entity – must make them. The decision maker may be a slightly modified CALFED Policy Group, a new governmental entity, or a joint powers authority. Typically, responsibility for such high-level decision rests with the highest departmental officials. It must consider the best scientific information from advisory or other formal scientific bodies.

Implementation Actions - Once critical decisions are made, the CALFED Program will need to implement the decision. Some entity will need to implement each program element (i.e. Levees, Ecosystem Restoration, Water Quality, Conveyance, Storage, Watershed Programs, Water Use Efficiency, Water Transfers, and an overall program management function). This "entity" may be an existing state or federal agency, or a new CALFED organization. Given the breadth of the CALFED program, it will be necessary to evaluate each separate program element to determine the best fit between element and implementing entity. Success of each element depends on taking multiple actions, which may include one or more of the following:

- **Program Coordination.** The linkages between program elements demand coordination among elements, actions and agencies. For example, building setback levees must be coordinated with ecosystem restoration, and levee agencies must coordinate their actions with fish and wildlife agencies.
- **Budget Management.** Implementation requires allocation of resources, prioritizing action funding, and tracking action expenditures.
- **Assignment of Responsibilities and Corrective Actions.** Determining who does what when is fundamental to program implementation. CALFED will face this question as it prepares the Record of Decision. Then, when a contractor or assigned agency does not perform adequately, corrective action will be required.
- **Stakeholder Participation.** Maintaining clear and open lines of communication with stakeholders is a necessity. Some stakeholders have asked for a formal role in making implementation decisions.
- **Legislative Coordination and Program Responsibility.** Both Congress and the Legislature will need to rely on some entity to take ultimate responsibility for CALFED's success or failure. Appropriating CALFED funding to one entity would simplify appropriation review and debate. Because legislative bodies will review much of the CALFED Program progress, coordinated responses to legislative concerns will provide clearer lines of communication.
- **Project Implementation.** CALFED encompasses a huge array of project actions, from building a levee to adding a fish screen. In many cases, implementation of these pieces of the CALFED Program will be done by an entity with responsibility for a program element rather than the broad CALFED oversight structure.
- **Environmental Review.** Given the number of actions included in the proposed CALFED Bay-Delta Program, there will be a large and continuing need to satisfy environmental permitting, CEQA, and NEPA requirements. This activity could

be categorized under Program Coordination or Project Implementation, but its scope and criticality need emphasis here.

- **Project Management and Ownership.** Once a project (such as habitat development) has been completed, the project will require on-going operation and maintenance. The O&M responsibility may or may not fall to the agency who completed the project. Other agencies or private organizations may take such responsibility. The costly nature of O&M over the long term requires that this item be considered carefully.

Given the breadth of the CALFED Bay-Delta Program, implementation will require a structure with a scope broad enough to consider the inter-related effects of all the projects throughout the Delta and nimble enough to respond timely to new information. While creating such a structure may not be achievable in a year, CALFED is committed to setting the direction for creating such a structure by the time of the ROD.

Contingency Response Process

The contingency response process is to be used when elements of the solution cannot be implemented or operated as agreed. It can provide an accountable process that promotes appropriate actions by program managers when contingencies or potentially damaging circumstances affect program functions. It would be designed to minimize program disruption, while at the same time keeping agreed upon linkages and conditions in place. A graded response process is proposed, with corrective actions for minor contingencies, significant disruptions, and catastrophes. These responses are summarized in the following table.

Category	Effects/Outcomes	Response Process
Minor	<p>Has negligible effect on Program implementation or operation and/or</p> <p>Confined to single program element with low risk of affecting others and/or</p> <p>Requires only minor and/or temporary changes in implementation or operation of affected element</p>	<p>Delegated to lowest appropriate decision maker. Immediate response and resolution as deemed appropriate by decision maker. Notification to other Program managers as appropriate.</p>
Significant	<p>Will prevent achieving element objectives and/or</p> <p>May immediately affect more than one element or has potential to affect more than one element if not resolved and/or</p> <p>May immediately or eventually affect Program implementation or operation and/or</p> <p>Requires significant changes in implementation or operations on either temporary or permanent basis</p>	<p>If one element affected, delegated to highest appropriate decision maker in charge of implementing that element. If more than one element is affected, oversight entity will resolve. Notice to all Program managers and other affected parties. Written notice of resolution of outcome to all managers, Program administration and affected parties.</p>
Catastrophic	<p>Immediately halts Program implementation or operations and/or</p> <p>Requires changes in Program policies in order for Program to go forward</p>	<p>Formal process Early public notice Public meetings Stakeholder involvement Written findings</p>
Emergency	<p>Sudden, unexpected occurrences that pose imminent loss or damage to life, health, safety, property or essential public services and/or</p> <p>Requires immediate suspension of Program operations</p>	<p>Immediate notification of appropriate emergency management organizations. Delegated responsibility within Program to coordinate with emergency mgmt. organizations</p>

5.4 Financing Plan

Financing the CALFED Program

Significant effort will be necessary by CALFED agencies and stakeholders on financing the CALFED Program to ensure successful funding throughout Stage 1. Federal, State, and User funding will be necessary, and in order to succeed in funding the Program, the details on exactly how to obtain and bring funds to bear will need to be worked out prior to the Record of Decision. The following actions represent the priority for 1999 for financing the Program.

- **Refine cost estimates** - The cost estimates included in this report for Stage 1 are a first-cut attempt. During 1999, these numbers will need to be refined as more detail is obtained about the specific projects that will take place during Stage 1. In addition, cost estimates will need to be developed for operation & maintenance and included in the cost table.
- **Coordination Plan** - Determine the availability of existing funding sources and coordinate the CALFED Financing Plan with these sources of funding.
- **Beneficiary Pays** - The fundamental philosophy is that costs will be paid by the beneficiaries of the actions. The benefits for each program area need to be defined. CALFED will work with stakeholders and legislature to develop an explicit mechanism by which beneficiaries will be identified and costs will be allocated.
- **Crediting** - An interim policy granting credit for cash contributed to the Category III Program has been approved by CALFED. The details surrounding repayment or crediting against user fees will need to be worked out. This includes determining who will receive credit for payments contributed to the CALFED Program after the signing of the Accord.
- **Seek Federal Authorization/Appropriation** - This will be an ongoing process throughout Stage 1, but the focus in 1999 should be on the FY 2000 Budget.
- **Private Investment** - Assess the potential for private capital as a funding source for the CALFED Program. Evaluate the investment models developed in the study *Quantitative Analysis of Finance Options for California's Future Water Supply* to assess the potential of new water resource investments to attract private investment capital.
- **Finalize Cost Share Agreements** - Cost sharing agreements between the state

government, federal government, and beneficiaries will need to be completed during 1999. This will involve a decision surrounding the cost allocation methodology that is selected, and the role that this will take in cost sharing for the Program. Other related issues include refined cost estimates, the definition and identification of benefits, and the extent to which user fees and private investment will complement public funding and user investment in the Program.

- **User Fees** - Prior to the Record of Decision, CALFED will evaluate the need for fees to fund the Stage 1 actions. Such evaluation will include consideration of existing funding sources, including state and federal authorizations and appropriations, bonds, current fees, and water user charges. It will also be necessary to determine legal authorities and develop legislative support, as appropriate, to support the creation of fees for this purpose.

Program Element Funding/Cost Estimates

Subsequent to release of the draft Programmatic EIS/EIR in March 1998, Program staff developed preliminary cost estimates and conceptual cost sharing tables to stimulate further discussion and to advance the consensus process. This first-cut attempt at estimating the costs of the program for Stage 1 (first 7 years) is included here, but it is a rough estimate of costs, not a detailed or final report on costs. The cost estimates in the following table do not yet include interest, inflation, O&M, individual State and Federal agency costs, and CALFED (or other coordinated entity) management/ overhead costs.

ESTIMATED CALFED STAGE 1 PROGRAM AND CAPITAL COSTS IN MILLIONS¹

PROGRAM AREA²	TOTAL
Ecosystem Restoration ³	965
Conservation	800
Recycling	1,000
Watershed Management	270
Water Quality	250
Delta Levees ⁴	250
Storage (off-stream, on-stream & conjunctive use)	230 ⁵
Conveyance	675 ⁶
TOTAL	4,440⁷

1 Preliminary; based on staff estimates.

2 Includes all CALFED program areas except Water Transfers which has no anticipated capital costs.

3 This includes Prop. 204 (State), Federal Bay-Delta appropriation and CVPIA water and energy funds (Federal), and CVPIA Restoration Fund (User) for seven years. Expanded user fees may also be needed to fund the program elements, including future ecosystem restoration and watershed management.

4 The Delta Levees cost share is consistent with the Water Resources Development Act of 1996 (PL 104-303, Sect. 202), the pre-existing federal cost share for flood control.

5 Includes South of Delta groundwater (145), North of Delta groundwater (15), surface storage pre-permitting and EIR/EIS compliance work (70).

6 Includes South Delta Improvements (433), North Delta Improvements (220), conveyance studies (22).

7 CALFED (or other coordination entity) management/overhead costs and other State and Federal agency costs are not included. O&M and interest are also not included.

5.5 Comprehensive Monitoring, Assessment and Research Program (CMARP)

Introduction

The CALFED Bay/Delta Program is organized around the concept of adaptive management because there is incomplete knowledge of how the ecosystem functions and the effects of individual project actions on populations and processes. Monitoring key system functions (or indicators), completing focused research to obtain better understanding, and staging implementation based on information gained are all central to the adaptive management process. The process necessarily includes numerous assessment and feedback loops so that management decisions are based on the best and most current information. This process entails an institutional framework to ensure that the correct questions are identified for monitoring and research actions, that monitoring and research are conducted appropriately, that the data collected and obtained are stored properly and available to those with an interest, and that relevant information is developed from the data obtained to further the incremental process of adaptive management. The Comprehensive Monitoring, Assessment and Research Program (CMARP) has been charged with developing recommendations to meet these needs.

A substantial monitoring effort in the Bay and Delta has been carried out for several years under the auspices of the Interagency Ecological Program (IEP). The purpose of the CMARP is to build on the work of IEP to assure that information and evaluation necessary to the success of the CALFED Program is developed and carried out.

Scope

The scope of CMARP includes all of the CALFED Bay/Delta common program elements (i.e., ecosystem restoration, water quality, watershed management, levee stability, water transfers and water use efficiency), as well as other CALFED programs including restoration coordination and the Conservation Strategy. The CMARP scope also includes the monitoring assessment and research needs of CALFED member agencies. The recommended CMARP will include organizational options to ensure that monitoring, assessment, and research needs are:

- Identified
- Coordinated to provide comprehensive system-wide coverage
- Performed by the most appropriate party
- Completed in a comparable manner by all parties
- Accomplished with minimum redundancy and optimum efficiency and effectiveness

The CMARP must also ensure that results from the monitoring are:

- Interpreted
- Made readily available to all interested parties in a timely manner
- Incorporated as feedback to facilitate adaptive management

The scope of CMARP includes both institutional and environmental considerations. It seeks to balance specific knowledge needs of water managers and the public versus an understanding of ecosystem processes and what can actually be obtained and measured from the field. For example, CALFED agencies presently monitor the abundance of several key species and environmental attributes such as streamflow at the State and federal diversion facilities in the Delta to understand better what is entrained, when, how many, during what life stage and under what kind of environmental conditions. Although much of this monitoring is designed to address institutional needs, limits on knowledge obtained are based on limitations of monitoring design which in turn are limited by the physical system to be monitored. Thus, the programmatic scope of a monitoring and research program must consider both institutional needs and environmental considerations and should maintain sufficient flexibility to respond to both as they change over time.

CALFED has determined that monitoring, assessment, and applied research efforts are a critical component of the adaptive management process, and should be integral to all program elements. The application of CMARP will be very different for individual CALFED programs. However, each program element has similar needs that include gathering and assessing data. In addition, the CMARP must also address the monitoring and assessment needs of the CALFED Conservation Strategy, as well as any mitigation required as a result of CALFED program actions.

Restoration coordination projects require special consideration. A requirement for restoration coordination funding is that project proposals contain monitoring elements to determine if stated objectives have been met and to provide guidance for assessing future rehabilitation needs. CMARP will include recommendations to ensure that monitoring data from all these projects are technically sound, broadly usable, and provide meaningful information to guide future actions.

From a CALFED agency perspective, the comprehensive program includes such disparate activities as real-time monitoring of fish distribution, compliance water quality monitoring, the Vernalis Adaptive Management Program, levee integrity evaluation, and a number of special monitoring and research projects related to each agency's mission.

The CMARP Plan will take into consideration the broad variety of factors that can affect the environment, its physical structure, chemical makeup and biotic communities. The recommended program will necessarily be limited to monitoring only a small fraction of the

possible physical chemical, and biological, attributes of the environment. Conceptual modeling will play a key role in helping decide which attributes to monitor.

Objectives

Objectives have been established for CMARP's monitoring and assessment and research functions that are consistent with the primary CMARP goal of supporting the general CALFED structure, and in particular the adaptive management strategy adopted by CALFED.

Monitoring and Assessment Program Objectives

1. Provide information necessary to management necessary to evaluate the effectiveness of program actions and to support ongoing adaptive management actions
2. Describe conditions in the Bay-Delta and its watershed on appropriate temporal and spatial scales
3. Evaluate trends in the measures of environmental conditions
4. Identify the major factors that may explain the observed trends
5. Analyze data and report results to stakeholders and agencies on a timely basis

Research Program Objectives

1. Build an understanding of physical, chemical and biological processes in the Bay-Delta and its watershed that are relevant to CALFED program actions
2. Provide information useful in evaluating the effectiveness of existing monitoring protocols and the appropriateness of environmental attributes
3. Test causal relationships among environmental variables identified in conceptual models
4. Reduce areas of scientific uncertainty regarding management actions
5. Incorporate relevant new information from all sources
6. Revise conceptual models as understanding of the system increases

Program Activities

The CMARP development process involves the completion of several specific tasks involving activities shown below. Accountability and efficiency are critical components of the overall program.

1. **Identify the goals, objectives and needs of CALFED Common Programs,**

Related Programs, and Agency Major Program Goals and Objectives.

2. **Develop a conceptual framework** that focuses on development of explicit conceptual models for use in designing monitoring and research programs. (This task is being accomplished in coordination with monitoring and research programs from Puget Sound, Chesapeake Bay and South Florida).
3. **Monitoring program design**
 - Inventory existing monitoring programs
 - Develop monitoring elements (There are 6 elements and 13 sub-elements)
 - Develop a process for data management
 - Develop a process for data analysis and monitoring
 - Restoration coordination monitoring institutional process
4. **Design a CALFED focused research program** to investigate causes and trends, reduce areas of scientific uncertainty, and corroborate relationships in conceptual models.
5. **Develop an institutional structure for monitoring, assessment and research** to focus on identifying institutional functions, recommend how a monitoring and research program should operate, determine funding, establish accountability, and identify its relationship to CALFED.

CALFED recognizes the need for reducing uncertainties about the factors affecting the resources of the Bay-Delta system. Although a traditional monitoring, assessment and research program will meet this need over a period of decades, CALFED needs to reduce key uncertainties at a more rapid rate to meet program goals. Therefore, CALFED will undertake an active program of adaptive resource management. Such a program will require a partnership between resources managers and scientists in which effects of key factors are better defined by informed management experiments. Resource managers will thereby increase chances of avoiding catastrophes and responding successfully to unexpected events. Informed adaptive experiments require policy-level recognition and acceptance of some risks to the resources.

Implementation of CMARP

CMARP will be implemented in concert with the evolving CALFED program. Implementation will provide assurances that information is being obtained and knowledge learned from specific CALFED actions to promote adaptive management.

In 1999, specific projects will be initiated that are critical for continued CALFED program development, implementation of Accord and CVPIA actions, and documentation of results from

approved Category III projects. These projects include:

- Diversion effects on fish - Assessment of fish entrained at the SWP and CVP facilities in concert with real-time monitoring results to better define flexibility of project operations and use of an environmental water account.
- Fish screen evaluation - Establish a team or teams to develop information needed to evaluate the major proposed Stage 1 fish screens and provide information to help decide whether to expand or modify these screens.
- Municipal source water quality - Establish a team of agency and stakeholder personnel to reach consensus on questions and priorities identified by the Bromide Panel to reduce source water concentrations during Stage 1 implementation. The intent is to develop a proposal package of monitoring and research priorities for solicitation by spring 1999.
- Marking hatchery salmon - Develop a constant fractional marking program at Central Valley Chinook salmon hatcheries to help evaluate hatchery contribution to spawning escapement and ocean and inland recreational fisheries. The goal is to have the program implemented by fall of 2000.
- Factors affecting salmon - Through the IEP's Central Valley Salmonid Project Work Team and its satellite teams, develop proposals to refine understanding of factors affecting survival of juvenile chinook salmon living in and traveling through the Delta.
- Factors affecting delta smelt - Assemble an interdisciplinary agency/stakeholder team to prioritize and if possible start additional research on delta smelt in support of CALFED goals and adaptive management. The prioritized list and subsequent proposals will be peer-reviewed.
- Fish/X2 relationships - In concert with external peer review panel recommendations, select and begin studies to document physical and biological mechanisms involved in the fish/X2 relationships.
- Documenting and assessing effects of aquatic species introductions - By review and synthesis of existing data and by initiation of new projects, document non-indigenous species introductions and determine effects of these introductions. These efforts will be closely coordinated with other efforts in the IEP, CALFED, SFEI and the Coastal Committee of the Western Regional Panel of the National Aquatic Nuisance Species Task Force.
- Delta topography and bathymetry - Assemble an agency/stakeholder team to direct a short-term (3-month) study on the feasibility of using LIDAR (Light Detection and Ranging) for topography and shallow-water bathymetry and multi-beam sonar for deeper bathymetry.
- Review existing streamflow network - Review the existing streamflow gage network in the Bay-Delta watershed used to evaluate water transfers, water availability, water use efficiency, water quality and other aspects of the CALFED program. Develop a proposal for augmentation of gages where determined

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- necessary.
 - Category III Program effectiveness - Continue the review and oversight of monitoring activities for projects being implemented through the Category III program, to determine effectiveness of projects and to provide an assessment of information being developed.
 - Relational Database Management System - Continue development and implementation of a Relational Database Management System that allows individual data providers to manage their own data locally while contributing to a larger comprehensive database.

5.6 Adaptive Management

No long term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts or foresee events such as earthquakes, climate change, or the introduction of new species to the system. Adaptive management, as an essential Program concept, acknowledges that there is a need to constantly monitor the system and adapt the actions that are taken to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as more is learned about the system and how it responds. The Program's objectives will remain fixed over time, but the actions may be adjusted to assure that the solution is durable.

The concept of adaptive management is an essential part of every CALFED Program element, as well. The concept of adaptive management can be illustrated as applied to the Ecosystem Restoration Program element as shown in the following section.

Because the Bay-Delta ecosystem is large, complex, diverse and variable, it is impossible to know with certainty how it will respond to implementation of the ERP and other Program components. And although much is known about how the Bay-Delta functions, there are still significant information gaps that hamper the ability to sufficiently define problems and design restoration actions to address them. To account for this uncertainty, the ERP strategic plan outlines an adaptive management approach to restoring and managing the Bay-Delta ecosystem. An adaptive management approach acknowledges the uncertainty inherent in restoring and managing a natural system as large and complex as the Bay-Delta by designing and monitoring restoration actions so that they improve the understanding of the system while simultaneously restoring it. This approach allows revised restoration activities or better designed future restoration actions based upon the information learned from projects implemented earlier. It also provides the flexibility required to respond to changing Bay-Delta conditions and to identify and address resource conflicts and trade-offs. The Strategic Plan outlines the following steps as part of the adaptive management approach:

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1. **Define the problem or set of problems to be addressed.** In order to design effective restoration actions, the geographic, temporal, and ecological parameters of the problem must clearly be defined. Decades of scientific study have already identified many of the problems affecting the health of the Bay-Delta ecosystem. However, for certain components of the Bay-Delta ecosystem, existing knowledge is insufficient to adequately define problems, so targeted research will be necessary to provide the information that allows the problems to be defined with greater detail.
 2. **Define goals and objectives for resolving identified problems.** It is important to establish the expectations of the overall restoration program and for individual restoration actions by articulating clear restoration goals. It is also important to establish the criteria that can be used to measure success in achieving goals by defining measurable objectives. Clear goals and measurable objectives help focus and direct ecosystem restoration, they help facilitate the design of restoration actions, and they help resource managers track incremental progress toward restoration objectives.
 3. **Develop conceptual models.** It is impossible to account for all of the variables that compose and animate an ecosystem as large and complex as the Bay-Delta; therefore, it is necessary to distill the most important ecosystem attributes and relationships into simplified models that can guide resource restoration and management. Conceptual models articulate hypotheses about what attributes and relationships are most important in an ecosystem. By articulating hypotheses about causal relationships in the ecosystem, conceptual models can suggest potential restoration actions or identify critical information gaps that help target additional research.
 4. **Develop and design alternative restoration or management actions.** Conceptual models will provide an assessment of the confidence we can place in potential restoration actions. For those actions about which there is confidence in how the ecosystem will respond, full-scale implementation can begin. If conceptual models suggest multiple viable restoration alternatives, pilot or demonstration projects to test the alternative hypotheses could be implemented. The resulting information will improve understanding of the ecosystem and help suggest which restoration actions are most effective in achieving restoration goals. Conceptual models can also help identify information gaps and needed targeted research.
 5. **Implement restoration actions.** Restoration actions selected for implementation must address the more serious environmental problems, must be linked to conceptual models, and must provide an opportunity to enrich our knowledge of

how the ecosystem operates.

6. **Monitor the ecosystem.** It is important to monitor the ecosystem to gauge how it responds to the restoration or management action. Monitoring provides the information necessary for assessing the effectiveness of a given restoration action. It also provides the data that will help improve understanding of the Bay-Delta ecosystem.
7. **Update restoration and management actions.** The information derived from monitoring data allows resource managers to evaluate restoration actions and revise or update them to be more effective in achieving restoration goals and objectives. Monitoring data can also indicate when there is a need to refine the definition of a problem or the goals and objectives.

Similar models of these seven steps can be used to develop adaptive management approaches for the other program elements.

6. OTHER CONTINUING/FUTURE WORK EFFORTS

6.1 Summary of Regulatory Compliance

The March Draft Programmatic EIS/EIR described how the CALFED Bay-Delta Program proposes to achieve programmatic compliance with several federal and state laws. Specifically, the CALFED Program proposes specific actions to comply with the programmatic requirements of the National Historic Preservation Act; the Memorandum on Farmland Preservation and the Farmland Protection Policy Act; the Federal Agricultural Improvement and Reform Act of 1996 and the 1985 Food Security Act; Executive Orders 11988 (Floodplain Management), 11990 (Protection of Wetlands), and 12898 (Environmental Justice); the Federal Clean Air Act; and the Federal Climate Change consideration under NEPA. Chapter 11 of the Main Document of the March Draft Programmatic EIS/EIR contains additional information regarding compliance with applicable laws and regulations.

Chapter 11 outlined programmatic compliance actions that still need to be initiated before the Final Programmatic EIS/EIR is completed. This section indicates how the CALFED Bay-Delta Program plans to comply with the federal/state Endangered Species Acts; Fish and Wildlife Coordination Act; 404(b)(1) Guidelines (Clean Water Act); and the Coastal Zone Management Act. Further compliance steps will be taken by agencies carrying out specific projects in Phase III.

Federal/State Endangered Species Acts

The CALFED Conservation Strategy (Strategy) is a comprehensive species and habitats conservation program that addresses the multiple species and habitat needs and the maintenance of ecological functions within the CALFED Program area. The Strategy addresses species and habitats at the ecosystem level and provides for the integration of species specific conservation strategies at both the site-specific and landscape level.

The Strategy document is in preparation and addresses, at a programmatic level, all of CALFED's actions and provides a framework for site- and action-specific compliance with the Federal and State Endangered Species Acts. An action specific analysis will be conducted in an Action Specific Conservation Strategy addressing the impact and mitigation for specific actions (e.g. Ecosystem Restoration Program actions, levee protection projects, etc.) which in combination with the Strategy, will form the basis for obtaining authorization to incidentally take species (take authorizations) pursuant to Federal Endangered Species Act, the California Natural

Community Conservation Planning Act and/or the State Endangered Species Act.

The Strategy includes an evaluation of CALFED actions on 204 species (evaluation species). The list of evaluation species includes all Federally and California listed, proposed and candidate species that may be affected by the CALFED Program and for which adequate information is available. The evaluation species list also includes other species identified by CALFED that may be affected by the CALFED Program for which there is adequate information and for which take authorization may be requested. The Strategy's evaluation species list includes species which occur in the Ecosystem Restoration Program's 14 Ecological Zones. Information is being compiled for each of the species, including life history, current population status, distribution and habitat requirements, and where available, identified goals/actions for species recovery. Species identified in the Strategy are the evaluation species which are conserved at a level which meets the Strategy's species' goals and which also meet take authorization issuance criteria as set forth in the Acts.

The Strategy includes:

- Identification of how various components of the CALFED Program (e.g. Ecosystem Restoration; Comprehensive Monitoring, Assessment and Research Program; Adaptive Management; etc.) interrelate in regard to achieving and maintaining the identified conservation goals for species and habitats
- Identification of species specific conservation goals
- Identification of habitat conservation goals
- Identification of important ecological processes affected by the CALFED Program which need to be maintained and/or improved to achieve the conservation goals for each species
- A framework for the preparation of action specific analysis for future CALFED projects which facilitate issuance of take authorization for the action
- Identification of actions which, as implemented over time, will achieve the identified species and habitat conservation goals
- Identification of the funding for implementation of the Strategy (including monitoring, research and adaptive management) and for addressing unforeseen, and in some cases, changed circumstances

The Strategy analyzes the effects of the CALFED programmatic actions (beneficial, detrimental and neutral) on the evaluation species and identifies measures which maximize the beneficial

effects to species, minimize the adverse effects to species, and identifies the measures necessary to compensate or minimize unavoidable adverse effects.

The Strategy will not in an of itself provide "take" authorization. Rather, as appropriate for the authority under which take is being authorized, the document will be used as the:

- Biological assessment for ESA Section 7 consultations
- Basis for preparing a conservation plan pursuant to requirements for ESA Section 10 (a)(1)(B) permit(s)
- Natural Community Conservation Plan pursuant to requirements for California Fish and Game Code Section 2835 authorization to take species
- Mitigation plan pursuant to requirements for issuance of Fish and Game Code Section 2081 incidental take permit(s)

The Strategy identifies mitigation and minimization measures which will be incorporated into Action Specific Conservation Strategies for specific types of future actions. The identified mitigation measures or range of mitigation measures is intended to set appropriate and approximate mitigation sideboards for actions addressed in future Action Specific Conservation Strategies. Incorporation of identified mitigation measures into a Action Specific Conservation Strategy is intended to expedite the review and approval of the take authorizations for a specific project. An example of this type of mitigation measure might be a specific habitat replacement ratio or a standard buffer requirement for an upland habitat of a covered species affected by levee protection actions.

Action Specific Conservation Strategies for Stage 1 actions are being developed concurrently with the programmatic strategy and will tier to it. Other future projects will be evaluated in the context of the Strategy and their Action Specific Conservation Strategies will be developed to be consistent with and to tier off the programmatic strategy. The programmatic Strategy also identifies the process that will be used to obtain take authorizations for future CALFED actions. The process for obtaining the take authorization for an action will vary based on , among other things, the level of detail in the Strategy regarding the action, the level of benefits/impacts of the action, and the type of action proposed.

Fish and Wildlife Coordination Act

Under subsection 2(a) of the Fish and Wildlife Coordination Act (FWCA), federal agencies are responsible for consulting with the USFWS and the Department of Fish and Game for the purpose of conservation of wildlife resources by preventing loss and damage as well as providing

for their development and improvement in connection with water-resource projects. Also within subsection 2(b) of the FWCA, the USFWS is required to report its recommendations for wildlife conservation and development and the results expected, and to describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages.

For the programmatic FWCA report, the USFWS will provide the public with their overall assessment of the effects of the CALFED Program and alternatives on fish and wildlife resources, providing recommendations for mitigation of adverse effects (where appropriate), and providing recommendations for implementing future (Phase III and beyond) CALFED Program actions.

The USFWS, as a member agency of the CALFED program, has provided technical assistance to the Program throughout the development of the preferred program alternative. The USFWS will complete this programmatic FWCA analysis and report its findings and recommendations prior to completion of a Final Programmatic EIS/EIR for the CALFED Program. That report will become a part of the Final Programmatic EIS/EIR.

The USFWS will continue to provide technical assistance during Program implementation. Analyses of effects on fish and wildlife will also be provided for applicable Program actions as they are being planned.

Clean Water Act Section 404

The CALFED Bay-Delta Program was established to develop a comprehensive solution to problems facing the Bay-Delta system, in the areas of ecosystem quality, water quality, water supply reliability, and levee and channel integrity. The Program has crafted programmatic alternatives that will address these multiple concerns over an implementation period of 30 years or more. The preferred programmatic solution will likely include hundreds of individual actions combined with a carefully crafted monitoring program to guide implementation based on adaptive management. Many of these actions will involve potential impacts to wetlands and waters of the United States and will therefore require Department of the Army Permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act (Section 404 Permits for short). The actions potentially range from major, highly controversial projects such as construction of new surface storage facilities to creation of new or enhanced wetlands habitat by contouring land and changing local hydrology. It is critical to the success of the Program that an effective strategy for addressing the Section 404 Permits process for this diverse range of potential actions be developed and agreed to prior to the Record of Decision for the Program.

Many stakeholders are urging that the U.S. Environmental Protection Agency and the Army Corps of Engineers issue a "programmatic" 404 permit that would assure that the CALFED

solution actions would be permissible under a clearly defined process with appropriate decision criteria. The Corps and USEPA have determined that the level of detail in the programmatic EIS/EIR for the CALFED preferred alternative will not establish a sufficient basis for a final determination of compliance with Section 404 as to any specific projects at the time of the Record of Decision, prior to the beginning of Stage 1. Although no site specific Section 404 permits will be available at the time of the Record of Decision, the Corps of Engineers, USEPA, the State of California, and CALFED staff are developing a plan to facilitate Section 404 permitting during Program implementation. The preliminary proposal includes:

- An early permitting process for those projects included in the initial CALFED actions during Stage 1 of Program implementation.
- Developing programmatic assurances regarding a process by which the surface storage facilities in the CALFED Program will be evaluated under Section 404. Establishing and defining this process will allow for a more expedited and limited Section 404 permit evaluation when CALFED Program elements need site specific permits.

Establishing these assurances would take place no later than the completion of the Record of Decision, and would include a Memorandum of Agreement between the Corps, USEPA, and appropriate CALFED agencies, establishing the Section 404 compliance strategy. This MOA would include the following elements that would need to be satisfied to qualify specific water supply benefit projects for the programmatic assurances:

- Performance criteria for alternatives to surface storage, which would represent the limit of practicability for the purposes of Section 404(b)(1) Alternatives Analyses. Input for this element of the Section 404 compliance strategy is currently being developed as the result of several concurrent processes involving agency staffs and stakeholders for water use efficiency and water transfer actions.
- Commitment by all appropriate parties assuring full implementation of the performance criteria.
- Establishment of a framework by which Program implementation projects would be evaluated for permits during the Program's implementation phase. This would define, to the extent feasible, the scope of project level analysis that would be needed to adequately supplement the programmatic analysis completed in Phase II.
- Establish and define all other procedures needed to comply with the Section 404 permitting process on a wide range of potential implementation actions.

The MOA would describe a similar compliance strategy for projects having specific project purposes of water quality and/or fisheries benefits.

In addition to the MOA, the USACE and USEPA would work with CALFED in bringing to completion the Rough Screening Process for potential surface storage sites, resulting in a short list of sites which would undergo detailed evaluation during the Program's implementation.

Under Section 401 of the Clean Water Act, the State Water Resources Control Board certifies federally-licensed or funded projects as being consistent with maintenance or attainment of water quality standards. Before the ROD, the SWRCB and other appropriate CALFED agencies will develop a Memorandum of Agreement establishing a process for determining Section 401 certification for CALFED projects requiring such certification.

The Coastal Zone Management Act

Under the Coastal Zone Management Act of 1972, coastal states are required to develop coastal zone management programs, and federal agencies are required to certify that any proposed activities within or affecting the coastal zone are consistent with the state's program. In California, the San Francisco Bay Conservation and Development Commission (BCDC) oversees the San Francisco Bay segment of California's coastal zone management program. Among other areas, BCDC also has permit jurisdiction over projects within certain waterways up to, but not including, the legally-defined Sacramento-San Joaquin Delta (east of Chipps Island) that empty into the Bay and within specific saltponds and managed wetlands.

For Phase II, the Program will prepare a Programmatic Coastal Zone Management Act Consistency Determination which will document the possible effects of the Preferred Program Alternative on coastal resources. The Consistency Determination will also document the actions that the Program will take to ensure that implementation of the Preferred Alternative is carried out in a manner consistent, to the maximum extent practicable, with CZMA and the Coastal Act. Since the March 1998 Draft Programmatic EIS/EIR did not contain a Preferred Program Alternative, the Programmatic Coastal Zone Management Act Consistency Determination for the CALFED Bay-Delta Program was not submitted to BCDC. This document will be presented to BCDC and be part of the Final Programmatic EIS/EIR.

Clean Water Act Section 303

Section 303 of the Clean Water Act requires all states to conduct triennial reviews to evaluate and, where necessary to protect the designated uses for the state's waters, revise water quality standards. In California, the State Board is the recognized entity responsible for implementing

the triennial review process.

The triennial review process of Section 303 is particularly well-suited to the adaptive management approach to ecosystem protection being proposed in the CALFED Program. CALFED intends to work with the State and Regional Boards and the USEPA to assure that the implementation of the Ecosystem Restoration Program and other CALFED programs is consistent with and, where appropriate, incorporated into the ongoing regulatory programs based on Section 303.

6.2 Restoration Coordination

On December 15, 1994, the Bay-Delta Accord included a commitment by the agency and stakeholder signatories to develop and fund non-flow related ecosystem restoration actions to improve the health of the Bay-Delta ecosystem. This commitment is commonly referred to as *Category III*. Some of the specific non-flow factors identified to be addressed as part of the Category III commitment include unscreened water diversions, waste discharges, water pollution prevention, fishery impacts due to harvest and poaching, land derived salts, exotic species, fish barriers, channel alternations, loss of riparian wetlands, and other causes of estuarine habitat degradation.

Category III actions can be beneficial to the long term program regardless of the final configuration of the preferred program alternative. The Category III actions must be consistent with any alternative configuration and provide early implementation benefits. This implementation will also provide valuable information for use in adaptively managing the system in later years of the program. Category III projects must have appropriate environmental documentation, have no significant adverse cumulative impacts, and must not limit the choice of a reasonable range of alternatives.

Funding sources for near-term restoration activities include \$60 million from state Proposition 204 funds (Bay-Delta Agreement Program) and stakeholder contributions of \$31.75 million. In addition, Congress authorized \$430 million for fiscal years 1998, 1999, and 2000 to fund the Federal share of Category III and initial implementation of the ERP. In Federal fiscal year 1998, \$85 million was appropriated and in Federal fiscal year 1999, \$75 million was appropriated for Bay-Delta ecosystem restoration, a portion of which is considered Category III funding. Proposition 204 also includes \$390 million for implementation of the ERP.

Projects have been selected through a 1997 Request for Proposals which resulted in the selection of 71 projects totaling more than \$85 million, through selection of twelve directed programs targeted at specific issues to be addressed by individual CALFED agencies, and through a 1998 Proposal Solicitation Package which resulted in the selection of 64 projects totaling over \$25

million. Competition has been fierce for these funds and the number of applications regularly exceeds the available funding by 10 to 1.

About three-fourths of the money was devoted to projects that restore rivers, riparian forests, wetlands, and marshes. The remainder has gone to projects such as installing fish screens to keep endangered fish from being pumped out of rivers; preventing the introduction of exotic species; and researching key questions that must be answered to implement adaptive management. Many of the ecosystem projects also provide benefits to other CALFED objectives such as water supply reliability, levee system integrity, and water quality.

As the CALFED long-term program has become more developed, the priorities and the project selection process have been revised to ensure that expenditures are consistent with the overall direction of the program and efficiently targeted at restoring the ecosystem through adaptive management.

6.3 Phase III Site-Specific Environmental Documentation

During Phase III of the CALFED Program, second-tier site-specific environmental documents will be prepared for the individual actions or site-specific projects chosen for implementation during the current Phase II process. Second-tier documents will be prepared after certification of the Programmatic EIS/EIR to concentrate on issues specific to the individual parts of the program elements being implemented or the site chosen for the action. The second-tier documents will summarize and incorporate by reference the issues discussed in the broader program-oriented EIS/EIR and focus on the issues specific to the part of the overall program being implemented. Information presented in the second-tier EIS/EIRs will be specific to a smaller area within the CALFED Bay-Delta study area and will focus on impacts within the smaller area and individual action-level mitigation performance criteria.

6.4 Coordination

Central Valley Project Improvement Act

Under the Central Valley Project Improvement Act (CVPIA), the U.S. Fish and Wildlife Service and the U.S. Bureau of Reclamation are jointly responsible for implementing the CVPIA. The Act includes provisions intended to restore anadromous fish populations, improve and facilitate water transfers, implement water conservation actions, provide water for wildlife refuges in the Central Valley, and improve flows on the Trinity River for anadromous fish.

Many of the provisions of the CVPIA parallel elements of the CALFED Program. CALFED's

ecosystem restoration program, water transfers program, water conservation program, and water project operations for Stage 1 will be complementary to programs with similar goals being implemented under the CVPIA. Over the last year, Congress and stakeholders have identified coordination of similar elements of the CALFED and CVPIA programs as necessary priority to ensure that the common elements of both the CVPIA and CALFED are implemented in the most efficient way.

The USFWS and the USBOR, as member agencies of CALFED, have provided assistance to the Program throughout development of the preferred program alternative. The USFWS and the USBOR will continue to provide assistance to CALFED to ensure that implementation of CVPIA provisions are supported by the CALFED Program and coordinated with various CALFED program elements through the continued involvement of USFWS and USBOR staff. Specific examples include coordination of CVPIA's AFRP and Trinity actions with CALFED's water project operations for Stage 1.

7. GLOSSARY OF TERMS

AF Abbreviation for acre feet; the volume of water that would cover one acre to a depth of one foot, or 325,851 gallons of water. On average, could supply 1-2 households with water for a year. A flow of 1 cubic foot per second for a day is approximately 2 AF.

Alternative A collection of actions or action categories assembled to provide a comprehensive solution to problems in the Bay-Delta system.

AFRP Anadromous Fish Restoration Program, part of the Central Valley Project Improvement Act. The AFRP identified instream and Delta flows needed for recovery of anadromous fish.

Action A structure, operating criteria, program, regulation, policy, or restoration activity that is intended to address a problem or resolve a conflict in the Bay-Delta system.

Anadromous Fish Fish that spend a part of their life cycle in the sea and return to freshwater streams to spawn.

B(2) Water Statutory mandate to manage the water dedicated to fish and wildlife purposes pursuant to Section 3406(b)(2) of the Central Valley Project Improvement Act.

Banks Pumping Plant The State Water Project (SWP) export pumping plant in the south Delta. The plant is located downstream of Clifton Court Forebay.

BDAC The Bay-Delta Advisory Council, a 34-member federally chartered citizens' advisory committee. BDAC provides formal comment and advice to the CALFED agencies during regularly scheduled meetings.

Best Management Practices (BMP) An urban water conservation measure that the California Urban Water Conservation Council agrees to implement among member agencies. The term is also used in reference to water quality standards, watershed management activities, and others.

Carriage Water Additional flows released during export periods to ensure maintenance of water quality standards and assist with maintaining natural outflow patterns in Delta channels. For instance, a portion of transfer water released from upstream of the Delta intended for export from south Delta would be used for Delta outflow.

Central Valley Project (CVP) Federally operated water management and conveyance system that provides water to agricultural, urban, and industrial users in California. The CVP was originally authorized by legislation in 1937.

Central Valley Project Improvement Act (CVPIA) This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the federal Central Valley Project. The CVPIA puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower users.

CFS Cubic feet per second.

Channel Islands Natural, unleveed land masses within Delta channels. Typically good sources of habitat.

Clifton Court Forebay The in-Delta storage used to regulate flows to the Banks Pumping Plant.

Common Delta Pool Delta provides a common resource, including fresh water supply for all Delta water users, and all those whose actions have an impact on the Delta environment share in the obligation to restore, maintain and protect Delta resources, including water supplies, water quality, and natural habitat.

Conjunctive Use The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use in place of or to supplement surface supplies. Water is stored by intentionally recharging the basin during years of above-average water supply.

Conveyance A pipeline, canal, natural channel or other similar facility that transports water from one location to another.

CZMA Coastal Zone Management Act

Delta Cross Channel Existing gated structure and channel connecting the Sacramento River at Walnut Grove to the North Fork Mokelumne River. The facility was constructed as part of the CVP to control movement of Sacramento River water into the central Delta and to the south Delta export pumps. Operating criteria currently requires the gates to be closed for specific periods to keep downstream migrating fish in the Sacramento River and to prevent flooding of the central Delta.

Delta Inflow The combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other tributaries.

Delta Islands Islands in the Sacramento-San Joaquin Delta protected by levees. Delta Islands provide space for numerous functions including agriculture, communities, and important infrastructure such as transmission lines, pipelines, and roadways.

Delta Outflow The net amount of water (not including tidal flows) at a given time flowing out of

the Delta towards the San Francisco Bay. The Delta outflow equals Delta inflow minus the water used within the Delta and the exports from the Delta.

Demand Management Programs that seek to reduce demand for water through conservation, rate incentives, drought rationing, and other activities.

Direct Mortality The direct loss of fish associated with facilities (forebay, fish screens, and salvage facilities) for the south Delta export pumps. This direct mortality is a portion of the total fish mortality resulting from operation of the export pumps (see indirect mortality).

Diversions The action of taking water out of a river system or changing the flow of water in a system for use in another location.

Drought Conditions A time when rainfall and runoff are much less than average. One method to categorize annual rainfall is as follows, with the last two categories being drought conditions: wet, above normal, below normal, dry critical.

Dual Conveyance A means of improving conveyance across the Bay-Delta by both improving through-Delta conveyance and isolating a portion of conveyance from Delta channels.

Ecosystem A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.

Ecosystem Manager (Trustee) An entity responsible for environmental improvements in the Bay-Delta system with the financial means, legal rights, authorities, and discretion needed to carry out the Ecosystem Restoration Program (ERP).

Entrainment The process of drawing fish into diversions along with water, resulting in the loss of such fish.

Environmental Water Account A method of accounting for the water and financial assets that can be managed to provide additional protections for fishery resources.

ESA (Endangered Species Act) Federal (FESA) and State (CESA) legislation that provides protection for species that are in danger of extinction.

Export Water diversion from the Delta used for purposes outside the Delta.

Export-Inflow Ratio (E-I Ratio) This requirement presently limits Delta exports by the State and federal water projects to a percentage of Delta inflow. In July through January, 65% of inflow can be exported. During February through June, months most critical to fisheries, the allowable E-I ratio is reduced to 35% to help diminish reverse flows and the resulting

entrainment of fish caused by south Delta export operations.

Fish Entrainment The incidental capture and loss of fish during water diversion.

Fish Migration Barriers Physical structures or behavioral barriers that keep fish within their migration route and prevent them from entering waters that are not desirable for them or their migration pattern.

Fish Salvage The process of screening fish at the south Delta export facilities and physically transporting them by truck to release in other parts of the Delta. This generally results in higher fish mortality than a more conventional fish screen where screened fish simply return to the river and continue downstream. Fish salvage is required at the export facilities since there is no flow continuing downstream to carry the fish away.

Fish Screens Physical structures placed at water diversion facilities to keep fish from getting pulled into the facility and dying there.

Flexible Operations Operation of the south Delta export pumps that would allow reducing export pumping at times critical to fish and increasing export pumping at other times. Flexible operations would allow higher or lower export rates and export-inflow ratios than prescribed by the 1995 *Water Quality Control Plan*. Pumping could deviate from currently permitted rates seasonally and on a real-time basis in response to Delta flows and fish distributions.

Groundwater Banking Storing water in the ground for use to meet demand during dry years. In-lieu Groundwater Banking replaces groundwater used by users with surface water to build up and save underground water supply for use during drought conditions.

Hood A location on the Sacramento River in the northern Delta above the major tidal influence. It has been identified as one potential location for a new diversion, if it is determined to be needed, from the Sacramento River. A new intake at this point could move more water into the central Delta or be the beginning for an isolated facility. Sacramento River water is much fresher at this location than at the export facilities and a diversion at this point may have substantially fewer impacts on some species of fish than the current diversions at the export pumps.

Hydrograph A chart or graph showing the change in flow over time for a particular stream or river.

In-Delta Storage Water storage within the Delta by converting an existing island to a reservoir. The storage can help facilitate flexible operations of the export pumps by allowing export of stored water when critical fish species are present in the south Delta.

Indirect Mortality The indirect fish losses from operating the Delta Cross Channel and south

Delta export pumps. For example, fish diverted from the Sacramento River into the central and south Delta experience higher mortality through increased stress, small agricultural water diversions, predation, reduced shallow water habitat for fry, higher water temperatures, and higher residence times. This indirect mortality is a portion of the total fish mortality resulting from operation of the export pumps (see direct mortality).

Isolated Conveyance Facility A canal or pipeline that transports water between two different locations while keeping it separate from Delta water.

Land Following/Retirement Allowing previously irrigated agricultural land to temporarily lie idle (fallowing) or purchasing such land and allowing it to remain out of production for a variety of purposes for a long period of time.

MAF An abbreviation for million acre feet, as in 2 MAF or 2,000,000 AF.; 10,000 cfs flowing for a year is about 7 MAF.

Mine Drainage Remediation Controlling or treating polluted drainage from abandoned mines.

Meander Belt Protecting and preserving land in the vicinity of a river channel in order to allow the river to meander. Meander belts are a way to allow the development of natural habitat around a river.

Non-native Species Also called introduced species or exotic species; refers to plants and animals that originate elsewhere and are brought into a new area, where they may dominate the local species or in some way negatively impact the environment for native species.

Program Element The program elements for the Phase II Alternatives include an element for Delta conveyance, a element for storage, and the six common program elements (Water Use Efficiency, Water Quality, Levee System Integrity, Ecosystem Restoration, Water Transfers, and Watershed Management).

Old River A natural channel in the southern Delta. The channel merges with many other channels in the south Delta, passes by the south Delta export facilities and connects with the San Joaquin River at its upstream end. Much of the water approaching the export facilities flows up Old River from the central Delta. Potential improvements to the channel include a fish barrier at its upstream end to keep migrating fish in the San Joaquin River and dredging north of Clifton Court Forebay to allow more efficient flow to the export facilities.

Overdraft The condition, over the long-term, when more water is withdrawn from a groundwater basin than is recharged.

QWEST A broad indication of the net direction and quantity of flow in the San Joaquin River at

Jersey Point. This is only an indicator since there is considerable tidal exchange at this point. A positive QWEST indicates the net flow is generally in the downstream direction towards the San Francisco Bay. A negative number indicates that the net flow is generally in the upstream direction to the east. Generally, a positive QWEST is desirable for Delta flow circulation, water quality, and fisheries.

Real-Time Monitoring and Operations Continuous observation in multiple locations of biological conditions on site in order to improve management to protect fish species and allow optimal operation of the water supply system. This is an essential feature to allow flexible operations of the export pumps.

Riparian The strip of land adjacent to a natural water course such as a river or stream. Often supports vegetation that provides the important fish habitat values when growing large enough to overhang the bank.

Riverine Habitat within or alongside a river or channel.

Setback Levee A constructed embankment to prevent flooding that is positioned some distance from the edge of the river or channel. Setback levees allow wildlife habitat to develop between the levee and the river or stream.

Shallow Water Water with just enough depth to allow for sunlight penetration, plant growth, and the development of small organisms that function as fish food. Serve as spawning areas for delta smelt.

Smolt A young salmon that has assumed the silvery color of the adult and is ready to migrate to the sea.

Solution Principles Fundamental principles that guide the development and evaluation of Program alternatives. They provide an overall measure of acceptability of the alternatives.

South of Delta Storage Water storage supplied with water exported south from the Delta.

State Water Project (SWP) A California state water conveyance system that pumps water from the Delta for agricultural, urban domestic, and industrial purposes. The SWP was authorized by legislation in 1951.

TAF Thousand acre feet, as in 125 TAF equals 125,000 AF.

Take Limit The numbers of fish allowed to be lost or entrained at a water management facility before it must limit or cease operations. The numbers are set for different species by regulations.

Tracy Pumping Plant The CVP export pumping plant in the south Delta.

Terrestrial Species Types of species of animals and plants that live on or grow from the land.

Through-Delta Conveyance A means of improving conveyance across the Bay-Delta by a variety of modifications to Delta channels.

Upstream Storage Any water storage upstream of the Delta supplied by the Sacramento or San Joaquin Rivers or their tributaries.

Water Conservation Those practices that encourage consumers to reduce the use of water. The extent to which these practices actually create a savings in water depends on the total or basin-wide use of water.

Water Reclamation Practices that treat and reuse water. The waste water is treated to meet health and safety standards depending on its intended use.

Water Transfers Voluntary water transactions conducted under state law and in keeping with federal regulations.

Watershed An area that drains to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

X2 The location (measured in kilometers upstream from the Golden Gate Bridge) of 2 parts per thousand total dissolved solids. The length of time X2 must be positioned at set locations in the estuary in each month is determined by a formula that considers the previous month's inflow to the Delta and a "Level of Development" factor, denoted by a particular year. X2 is currently used as the primary indicator in managing Delta outflows. The X2 indicator is also used to reflect a variety of biological consequences related to the magnitude of fresh water flowing downstream through the estuary and the upstream flow of salt water in the lower portion of the estuary. The outflow that determines the location of X2 also affects both the downstream transport of some organisms and the upstream movement of others and affects the overall water operations of the CVP and SWP.