

# APPENDIX B

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## Alternatives Development

### Introduction

In 2001, the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation), California Department of Water Resources (DWR), and Contra Costa Water District (CCWD) began appraisal-level studies of the potential to expand Los Vaquero Reservoir to address regional water supply reliability and water quality needs. Expansion of Los Vaqueros was one of five potential surface water storage projects identified by the CALFED Bay-Delta Program (CALFED) as warranting further study. The appraisal-level studies indicated that expanding the reservoir by as much as 400,000 acre-feet was technically feasible and could provide water quality and water supply reliability to Bay Area water agencies in the region and also provide potential benefits to fisheries sensitive to water management operations in the Sacramento-San Joaquin Delta (Delta). Reclamation was directed by the Omnibus Appropriations Act of 2003 to conduct a feasibility-level investigation of the potential expansion of Los Vaqueros Reservoir.

This appendix contains a description of the comprehensive alternatives development process initiated after voters in the CCWD service area approved an advisory measure in 2004 to continue investigating the potential for expansion of Los Vaqueros Reservoir. The alternatives development process was based partly on the *Project Concept Report* (CCWD, 2002) and the *Final Draft Planning Report* (CCWD, 2004). The process resulted in the development of four action alternatives which are evaluated this Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The No Project/No Action Alternative is also discussed.

The alternatives development process consisted of the following three steps:

- Initial concepts
- Initial plans
- Alternatives development and refinement

This appendix also includes a summary of the evaluation of alternative sites for project components including intakes, pipelines, and conveyance facilities that are included in the action alternatives.

## Guidelines and Requirements

The following guidelines and requirements were used in the identification, development, and refinement of alternatives. Each is described briefly below.

- Project objectives, purpose, and need
- Planning constraints and guidelines
- Potential project participants and their interests
- Operational parameters including water right permit requirements

## Project Objectives, Purpose, and Need

The Los Vaqueros Reservoir Expansion Project objectives are to use an expanded Los Vaqueros Reservoir system to:

### **Primary Objectives:**

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.
- Increase water supply reliability for water providers within the San Francisco Bay Area to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

### **Secondary Objective:**

- Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

The primary project purpose is to use an expanded Los Vaqueros Reservoir system to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability for urban users in the San Francisco Bay Area (Bay Area).

The need for this project is driven by the following conditions:

- The Delta ecosystem is in a state of serious decline, with primary productivity very low and fish populations decreasing to record low levels, putting at least one species - the delta smelt (*Hypomesus transpacificus*) - on the brink of extinction.
- Insufficient quantities of water and lack of storage and flexibility in managing the timing and location of diversions for environmental and municipal water supplies are contributing to the ecosystem's decline.
- Ecosystem decline has put other beneficial uses of water supplies conveyed through the Delta at risk, leading to court-ordered limits on Delta pumping and greatly reducing water supply reliability for millions of people.

Improved storage and conveyance of environmental water supplies can help improve the Delta ecosystem conditions and reduce conflict among beneficial uses of Delta water supplies.

## Planning Constraints and Guidelines

In addition to physical conditions such as topography and hydrology, a number of planning constraints were considered in the identification, development, and refinement of alternatives, including the federal authorization for the reservoir expansion studies, laws, regulations, and policies, and the CCWD Board Principles. These are discussed below.

### Federal Authorization

The Omnibus Appropriations Act of 2003 authorized the Secretary of Interior, in carrying out CALFED-related activities, to undertake feasibility studies for enlarging Los Vaqueros Reservoir and prepare a Federal Feasibility Report. Congress again authorized the Secretary to conduct planning and feasibility studies for enlarging Los Vaqueros Reservoir in the Water Supply, Reliability, and Environmental Improvement Act of 2004. The federal feasibility study must be conducted according to federal planning principles and guidelines. Many of the planning principles are based on the *Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (federal P&Gs)* (U.S. Water Resources Council, 1983).

### Laws, Regulations, and Policies

Numerous laws, regulations, executive orders, and policies needed to be considered in developing the alternatives, including the National Environmental Policy Act (NEPA), Fish and Wildlife Coordination Act, Clean Air Act, Clean Water Act, federal and California Endangered Species Acts, California Environmental Quality Act (CEQA), Central Valley Project Improvement Act as well as the CALFED Record of Decision (ROD).

### NEPA/CEQA Requirements

Together, NEPA and CEQA require consideration of a range of alternatives to a proposed action that potentially could attain most of the basic project objectives and accomplish the project purpose and need while avoiding or minimizing environmental impacts. The purpose of including alternatives in an EIS/EIR is to offer a clear basis for choice by the decision-makers and the public as to whether and how to proceed with the proposed action. An EIS/EIR must also include a consideration of the No Action (NEPA) and No Project (CEQA) alternative.

### NEPA Requirements

According to the Council on Environmental Quality NEPA regulations (Title 40 Code of Federal Regulations (CFR) § 1502.14), the alternatives section of an EIS is required to contain a rigorous exploration and objective evaluation of all reasonable alternatives, including the No Action Alternative. The discussion of alternatives must include sufficient information for a reasoned choice of the alternatives in terms of environmental aspects to be made. For

alternatives that are not carried forward for detailed study, the EIS must include a brief discussion of the basis for this decision. NEPA requires substantial analysis of all the alternatives so that their merits can be compared (40 CFR 1502.14[b]).

### **CEQA Requirements**

CEQA requires that an EIR include a discussion of the alternatives to enable an evaluation of whether there are other means of achieving the project's goals and objectives while avoiding or reducing the environmental effects of the project. The following contains excerpts from the CEQA Guidelines that set forth the requirements for describing and evaluating alternatives in an EIR.

Section 15126.6(b) of the CEQA Guidelines states that:

*“...the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or could be more costly.”*

Pursuant to Section 15126.6(d) of the CEQA Guidelines, an EIR must describe and evaluate a reasonable range of alternatives that could potentially attain most of the basic project objectives and would avoid or substantially lessen any of the significant impacts of the Proposed Project. Section 15126.6(f) of the CEQA Guidelines provides guidance on the extent of the alternatives analysis required:

*The range of alternatives required in an EIR is governed by a “rule of reason” that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision-making.*

As described under Section 15126.6(d) of the CEQA Guidelines:

*The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed.*

Section 15126.6(e)(1) of the CEQA Guidelines also requires analysis of a “no project” alternative. The purpose of evaluating the No Project Alternative is to allow decision-makers to compare the potential consequences of the project with the consequences that would occur without implementation of the project.

### **CCWD Board Principles**

The CCWD Board of Director's 2003 Resolution No. 03-24 and Measure N, approved by the CCWD voters on March 2, 2004 (CCWD, 2003) were both considered in developing alternatives. The resolution and measure contain a description of the conditions that must be met for the CCWD Board of Directors to consider approval of the reservoir expansion project.

In Resolution No. 03-24 the CCWD Board determined that the District will not participate in or support the proposal for expansion of Los Vaqueros Reservoir unless the Board determines that the proposal meets the following conditions:

1. Improves drinking water quality for CCWD customers beyond that available from the existing Los Vaqueros Project;
2. Improves the reliability of water supplies for CCWD customers during droughts;
3. Enhances Delta habitat and protects endangered Delta fisheries and aquatic resources by installing state-of-the-art fish screens on all new intakes and creating an environmental asset through improved location and timing of Delta diversions and storage of water for environmental purposes;
4. Increases the protected land and managed habitat for terrestrial species in the Los Vaqueros Watershed and the surrounding region;
5. Improves and increases fishing, boating, hiking, and educational opportunities in the Los Vaqueros Watershed, consistent with the protection of water quality and the preservation of the watershed and the watershed's unique features;
6. CCWD continues as owner and manager of the Los Vaqueros Watershed;
7. CCWD maintains control over recreation in the Los Vaqueros Watershed;
8. CCWD continues as operator of the Los Vaqueros Reservoir system;
9. CCWD will be reimbursed for the value of the existing Los Vaqueros Project assets shared, replaced, rendered unusable or lost with the expansion project and said reimbursement will be used to purchase additional drought supply and water quality benefits or reduce debt on the existing Los Vaqueros Project;
10. Water rates for CCWD customers will not increase as a result of the expansion project.

### **Potential Project Participants and Interests**

CCWD and Reclamation have worked with DWR and other potential project beneficiaries to develop and refine alternatives that would meet the project objectives in a cost effective way. Alternatives development has been guided by the following interests:

**Federal** – The potential federal interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, including fisheries and wetland habitat, and the reliability of Bay Area CVP contract supplies. The type and extent of federal interest will be determined by the appropriate decision makers based on the separate Federal Feasibility Report and other pertinent information.

**State** – The potential state interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, and the reliability and quality of Bay Area SWP contract supplies. The type and extent of state interest will be determined by the appropriate decision makers based on the separate State Feasibility Report and other pertinent information.

**Regional and Local** – Should they choose to participate, the three South Bay water agencies' (Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), Alameda County Water District (ACWD), and Santa Clara Valley Water District (SCVWD)) interest in the reservoir expansion project includes the protection and restoration of Delta fisheries and the reliability and quality of South Bay water supplies. The greater Bay Area interest in the project includes the addition of local emergency storage.

**CCWD** – CCWD's interest in the reservoir expansion is to maintain and expand the water quality benefits of the reservoir for its customers, gain water supply reliability benefits, and coordinate reservoir operations with federal and/or state water operations to protect and restore Delta fisheries and provide other environmental benefits.

## Operational Parameters

Operational parameters drawn from CCWD's existing biological opinions and water rights permit also guided the alternatives development. The operational parameters, which are described below, were identified in order to contribute to the project objectives and meet the CCWD Board Principles for a reservoir expansion project while avoiding or minimizing impacts to other Delta water users including the CVP and SWP.

## Operations and Delta Diversion

(1) Filling of the expanded Los Vaqueros Reservoir would occur during periods of low salinity with either surplus flows under existing water rights or with CVP and/or SWP existing supplies. Operations would be coordinated with SWP and CVP operations to minimize adverse impacts and to provide the project benefits.

(2) No water would be diverted through the Los Vaqueros intake system from the Delta during a 30-day no-diversion period in the spring. It is assumed that other Delta operational restrictions would not affect reservoir filling and direct deliveries outside of the no-diversion period.

The analysis presented in Section 4.3 and Appendix C demonstrates that operations under these assumptions, in conjunction with the use of positive-barrier fish screens and water quality limits on reservoir filling, would not cause adverse impacts on sensitive fish species.

## Water Rights

None of the alternatives would involve diverting more water from the Delta than allowed under existing water rights or changing the ownership or priority of those water rights. The project would change the timing and location of diversions such that fish protection, environmental water management, and Bay Area water supply reliability would improve. In addition to its long-term contract with Reclamation, CCWD has separate water rights for the Los Vaqueros Reservoir. CCWD's separate Los Vaqueros water rights are subject to permit terms and conditions to ensure

that exercising those water rights does not adversely affect the CVP and SWP operations under the water rights permits held by Reclamation and DWR, respectively. Under all alternatives, the use of the collective water rights of the project participants would be coordinated to operate the existing and new facilities in a manner designed to accomplish the project objectives without adversely affecting CVP and SWP operation. This would be achieved through agreements among the parties and permit changes as necessary.

## Step 1: Initial Concepts

Initial concepts for achieving the project objectives were identified, evaluated, and screened during the first step of alternatives development. An initial concept was defined as any structural or non-structural action that would address one or more of the project objectives. The first step included the following:

- Develop a range of initial concepts, or resource management measures, that would potentially contribute to one or more of the project purposes.
- Develop initial screening criteria to identify whether a concept is likely to contribute to a project purpose and could be implemented, taking into consideration technical and legal constraints.
- Evaluate the concepts, using the initial screening criteria, to determine which concepts should be carried forward for further evaluation.

Additional factors in the selection of initial concepts were:

- The potential for a concept to address at least one project objective directly without adversely affecting other project objectives
- The potential for a concept to work in tandem with other concepts to address other project objectives
- Whether a concept had a geographic, operations, or physical relationship to problems and opportunities in the project study area.

The evaluation process of developing initial concepts is discussed in more detail in the *Initial Alternatives Information Report* (Reclamation, 2005), in which the initial concepts are referred to as resource management measures.

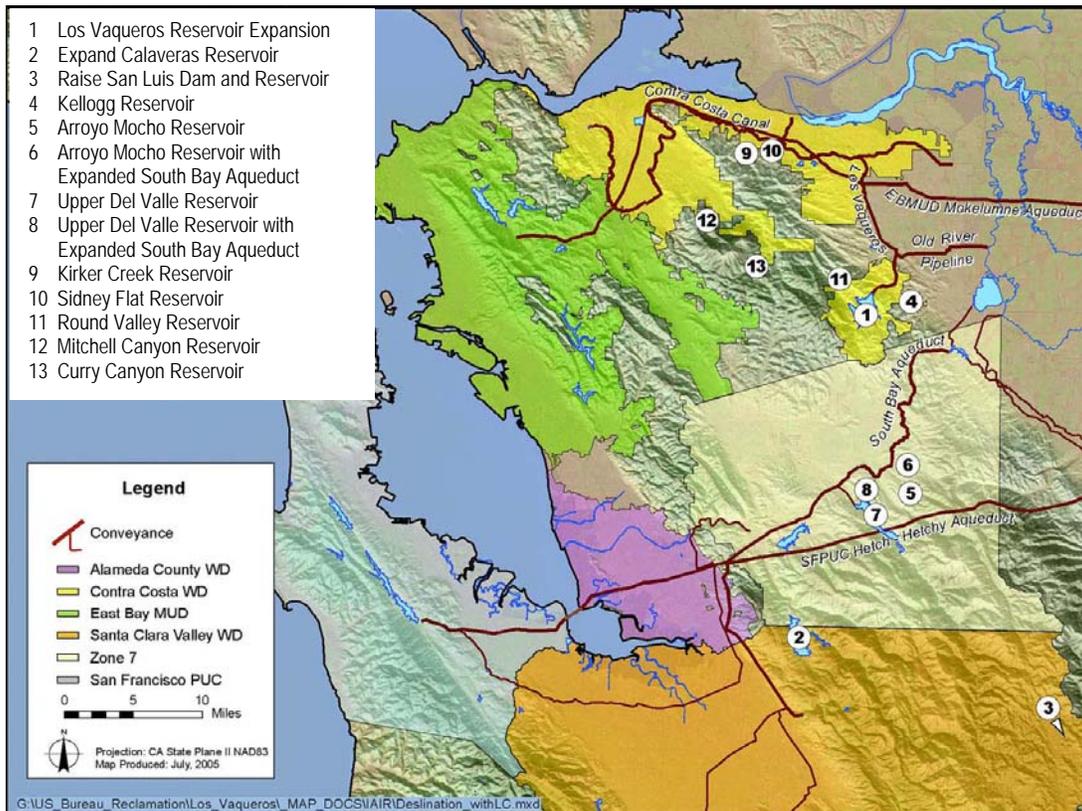
More than 30 initial concepts were identified as part of previous studies, programs, and projects, and through agency and consultant team meetings, field inspections, outreach, and environmental scoping activities. Throughout the alternatives development process, Reclamation and CCWD coordinated with local, state, and federal agencies through regular meetings of the Agency Coordination Work Group, which was established in 2002 after the Los Vaqueros Memorandum of Understanding was signed. Because the primary purpose of the reservoir expansion is to address problems and opportunities within the Delta and Bay Area regions, the geographic location of potential concepts was limited. Therefore, all concepts identified herein could be implemented within the project study area.

## Initial Concept Screening

Concepts were rated on a scale of high to low based on their relative ability to address the primary and secondary project objectives. Most of the concepts that were rated as moderately, or less than moderately, addressing a project objective were deleted from further consideration, while concepts rated higher were retained. This distinction was imposed primarily because concepts that could only marginally address a project objective were generally found to be inconsistent with the planning constraints or other principles and criteria described above. For example, many of the concepts that could improve water supply reliability for a limited number of Bay Area water agencies would not eliminate the need for expansion of Los Vaqueros Reservoir. These concepts are not *alternatives* to the proposed project. In the long-term, improvements in water supply reliability will need to come from multiple sources in order to fully address the conditions affecting Bay Area agencies. Other major factors and rationale in retaining or deleting a concept are included in the following descriptions of the individual concepts.

## Initial Concepts Addressing Water Supply Reliability

**Table B-1** lists the initial concepts related primarily to addressing the Bay Area water supply reliability objective (one of the primary objectives) and the results of the evaluation of these concepts. **Figure B-1** shows the location of reservoirs that are referred to in the various concepts listed in Table B-1.



**Figure B-1**  
Reservoir Storage Concepts Considered

**TABLE B-1  
INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY**

<b>Initial Concept</b>	<b>Potential to Address Project Objective</b>	<b>Status and Rationale</b>
<b>Surface Water Storage</b>		
Enlarge Los Vaqueros Reservoir to increase conservation storage space (300 to 500 TAF total storage)	<b>High</b> – Could provide up to 400 TAF of new local storage for water supply reliability, and has potential to contribute to other project planning objectives	<b>Retained</b> – Specifically authorized for study; could contribute to other project planning objectives
Raise Los Vaqueros Dam In-Place to increase conservation storage space (115 to 275 TAF total storage)	<b>Moderate to High</b> – Could provide up to 175 TAF of new local storage for water supply reliability; has potential to contribute to other project planning objectives	<b>Retained</b> – Raising in-place potentially less costly than new enlarged dam; smaller increment of storage; could contribute to other project planning objectives
Raise Calaveras Dam to increase conservation storage space	<b>Low</b> – Could provide up to 320 TAF of local storage but would benefit only agencies with existing SFPUC contracts (ACWD and SCVWD)	<b>Deleted</b> – Low potential to provide regional water supply reliability benefits in the Bay Area
Enlarge San Luis Reservoir to increase conservation storage space	<b>Low</b> – Could provide up to 200 TAF but would serve only one agency (SCVWD)	<b>Deleted</b> – High unit cost; low potential to contribute to increasing regional Bay Area water supply reliability
Raise Pacheco Dam to increase conservation storage space	<b>Low</b> – Could provide up to 120 TAF but would serve only one agency (SCVWD)	<b>Deleted</b> – High unit cost; low potential to contribute to increasing water supply reliability in the project study area; limited potential to support other objectives
Construct new conservation storage at Upper Lake Del Valle Dam site	<b>Low</b> – Could capture up to 15 TAF local runoff, but effectiveness would depend on expansion of the SBA by DWR	<b>Deleted</b> – Effectiveness would depend on actions by others; low potential to provide regional benefits; high unit cost compared with other concepts
Construct other local area storage facilities considered as alternatives to the original Los Vaqueros Project	<b>Moderate</b> – Various sites could provide small to moderate increase in local storage	<b>Deleted</b> – Major site acquisition issues; high likelihood of local opposition; high unit cost
Construct new conservation storage in Sacramento River/San Joaquin River watersheds	<b>Low</b> – Various sites could provide small to moderate storage outside the project study area	<b>Deleted</b> – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
Construct new conservation storage in the Sacramento-San Joaquin Delta	<b>Low</b> – Uncertainty regarding ability to provide water supply reliability benefits to the project study area	<b>Deleted</b> – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
<b>Reservoir System Reoperation</b>		
Increase effective conservation storage space in existing Lake Del Valle Reservoir	<b>Low</b> – Small potential to provide water supply reliability benefits to the project study area without affecting other reservoir functions	<b>Deleted</b> – Low potential to provide regional water supply reliability benefits; high unit cost compared with other concepts
Improve Delta export and conveyance capability through coordinated CVP and SWP operations	<b>Low</b> – Limited potential for additional reoperation benefits beyond current plans	<b>Deleted</b> – Joint Point of Diversion and other system efficiency improvement concepts are being actively pursued in other programs

**TABLE B-1 (Continued)**  
**INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY**

Initial Concept	Potential to Address Project Objective	Status and Rationale
<b>Groundwater Storage</b>		
Develop additional groundwater banking in San Joaquin River watershed	<b>Low</b> – Existing banks have sufficient capacity to store unused contract supplies; uncertainty regarding ability to secure additional supplies for banking and withdrawal limitations	<b>Deleted</b> – Existing Bay Area programs sufficient to store unused contract water; limited available capacity in current and planned banks
Develop additional groundwater banking in Sacramento River watershed	<b>Low</b> – Significant physical limitations to banking in Sacramento River watersheds	<b>Deleted</b> – Low likelihood of developing a reliable conjunctive-use program for Bay Area supplies in the Sacramento River basin due to significant physical, groundwater, and other related problems
<b>Conveyance/System Modifications</b>		
Increase Delta diversion capacity to Bay Area water agency facilities	<b>Moderate</b> – Increased export capacity could provide water supply reliability benefits, particularly in combination with storage	<b>Retained</b> – Additional Delta diversion capacity with enlarged capacity at existing site and/or new central Delta diversion likely to be effective when used in combination with reoperation and/or new storage
Construct intertie from SFPUC to the SBA	<b>Low</b> – Uncertainty regarding availability of Hetch Hetchy supplies and ability to provide regional benefits	<b>Deleted</b> – Low potential to contribute to overall water supply reliability conditions in the project study area; could be independently implemented; would have limited contribution to other project planning objectives
Expand use of Freeport Regional Water Project	<b>Low</b> – Little potential to improve water supply reliability because benefits would be limited to surplus project capacity during wet periods	<b>Deleted</b> – Very high capital and unit costs; benefits would be limited primarily to wet years
Increase Banks Pumping Plant capacity to greater than 8,500 cfs	<b>Low</b> – Limited potential to benefit water supply reliability in the project study area due to physical and regulatory constraints on increased exports	<b>Deleted</b> – Limited potential for increased water supply reliability in the project study area; limited potential to contribute to other project planning objectives
Construct an intertie from Los Vaqueros Reservoir to the SBA upstream from Dyer Canal	<b>Moderate</b> – Could provide water supply reliability benefits to South Bay water agencies with reoperation or expansion of Los Vaqueros	<b>Retained</b> – New conveyance from Los Vaqueros Reservoir to the SBA could be an important component of reservoir expansion action
Construct intertie from Los Vaqueros Reservoir to the SBA via Bethany Reservoir	<b>Low</b> – Although this measure could provide water supply reliability benefits to South Bay water agencies similar to the previously described Dyer Canal intertie, it would be much more costly because of increased pumping from Bethany Reservoir	<b>Deleted</b> – An SBA intertie at Bethany Reservoir was deleted as a measure for water supply reliability due to estimated high operations and maintenance costs;  <b>Retained</b> – As a measure for plans focused on developing water supplies for environmental water management
<b>Source Water Treatment Improvement</b>		
Implement treatment/supply of agricultural drainage water	<b>Low</b> – Uncertain ability to treat agricultural runoff to a quality standard acceptable to the public	<b>Deleted</b> – Very costly; low certainty of success; likely low acceptability by stakeholders and general public

**TABLE B-1 (Continued)**  
**INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY**

<b>Initial Concept</b>	<b>Potential to Address Project Objective</b>	<b>Status and Rationale</b>
<b>Source Water Treatment Improvement (cont.)</b>		
Construct desalination facility	<b>Moderate</b> – Potential to provide base water supply but would require storage to provide dry-year water supply reliability benefits	<b>Retained</b> – Limited application as a dry-year supply; high unit cost; potential environmental impacts from treatment byproducts; potential to provide benefits in combination with storage
Demineralize poor quality groundwater	<b>Low</b> – Limited groundwater resources in the project study area suitable for additional development; highly localized benefits	<b>Deleted</b> – High implementation costs; limited application and benefits; potential for adverse impacts to groundwater resources
<b>Water Use Efficiency</b>		
Implement additional wastewater reclamation	<b>Low</b> – Could provide localized water supply reliability benefits, limited by acceptable uses of recycled water	<b>Deleted</b> – Measure being actively pursued by other CALFED Programs and by individual agencies in the Bay Area
Implement additional demand management facilities	<b>Low</b> – Low potential to significantly address dry-year water supply reliability over and above existing/planned conservation programs	<b>Deleted</b> – Would not effectively address project planning objectives and constraints/criteria; features being actively pursued by other CALFED Programs and by individual agencies in the Bay Area <sup>1</sup>

ACWD = Alameda County Water District  
 Bay Area = San Francisco Bay Area  
 CALFED = CALFED Bay-Delta Program  
 cfs = cubic foot (feet) per second  
 CVP = Central Valley Project  
 DWR = Department of Water Resources

SBA = South Bay Aqueduct  
 SFPUC = San Francisco Public Utilities Commission  
 SCVWD = Santa Clara Valley Water District  
 SWP = State Water Project  
 TAF = thousand acre-feet

<sup>1</sup> Ongoing conservation programs in Bay Area are included in the No Project/No Action Alternative

## Initial Concepts Addressing Environmental Water Management

**Table B-2** lists the initial concepts related primarily to addressing the environmental water management objective (one of the primary objectives) and the results of the evaluation of these concepts.

**TABLE B-2  
INITIAL CONCEPTS ADDRESSING ENVIRONMENTAL WATER MANAGEMENT**

<b>Resource Management Measure</b>	<b>Potential to Address Project Objective</b>	<b>Status and Rationale</b>
Enlarge Los Vaqueros Reservoir to store environmental water supplies	<b>High</b> – Could store up to 400 TAF of surplus Delta flows or transfer water for environmental water management	<b>Retained</b> – High potential to provide water supplies for environmental water management
Raise Los Vaqueros Dam in-place to store environmental supplies	<b>High</b> – Could store up to 175 TAF of surplus Delta flows or transfer water for environmental uses	<b>Retained</b> – High potential to provide water supplies for environmental water management
Construct an intertie from Los Vaqueros Project to the SBA via Bethany Reservoir	<b>High</b> – Could be used to deliver replacement water supplies for the EWA or similar program. Most effective when combined with expanded storage in Los Vaqueros Reservoir and/or increased Delta intake capacity	<b>Retained</b> – Connection to the SBA could be an integral component in enlargement of Los Vaqueros for environmental water purposes; an intertie to Bethany Reservoir could also provide operational flexibility
Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	<b>Moderate to High</b> – Could be used to provide replacement supplies for the EWA or similar program, via delivery to the South Bay water agencies; most effective when combined with expanded storage at Los Vaqueros Reservoir	<b>Retained</b> – Connection to the SBA could be an integral component in enlargement of Los Vaqueros Reservoir; deliveries via this measure would be limited by the existing capacity of the SBA and demands of its users

Delta = Sacramento/San Joaquin River Delta  
 EWA = Environmental Water Account  
 SBA = South Bay Aqueduct  
 TAF = thousand acre-feet

## Initial Concepts Addressing Water Quality

**Table B-3** lists the initial concepts related primarily to the improving delivered water quality to the Bay Area (secondary objective). Of the five concepts that were identified, one was retained for possible inclusion in initial plans. Note that many of the initial concepts that address water supply reliability (Table B-1) also address improvements to water quality.

## Initial Concepts Retained for Further Development

The initial concepts that were carried forward to the next step—initial plan development—are listed in **Table B-4**.

**TABLE B-3  
INITIAL CONCEPTS ADDRESSING WATER QUALITY**

<b>Resource Management Measure</b>	<b>Potential to Address Project Objective</b>	<b>Status and Considerations</b>
Implement point-of-use water quality actions	<b>Low</b> – Difficult to implement over the entire project study area	<b>Deleted</b> – Likely very high costs to implement and maintain; marginal benefits
Rehabilitate Franks Tract for water quality improvement	<b>Moderate</b> – Some potential to improve water quality during certain periods at some existing Delta diversions	<b>Deleted</b> – Being pursued by others; unlikely to contribute to other project planning objectives
Cover open channel sections of the SBA	<b>Moderate</b> – Would benefit the South Bay water agencies during certain periods	<b>Deleted</b> – Low potential to contribute to other project planning objectives; could be pursued independently
Improve Bay Area water treatment plants	<b>High</b> – Potential to significantly improve treatment processes and delivered water quality	<b>Deleted</b> – Low potential to contribute to other project planning objectives; could be pursued independently by individual agencies
Reoperate an enlarged Los Vaqueros Reservoir or other project study area systems to improve water quality	<b>High</b> – Potential to improve water quality for CCWD and the South Bay water agencies, particularly combined with enlarged diversion and storage capacity	<b>Retained</b> – High potential to address area water quality conditions; could contribute to other project planning objectives

Bay Area = San Francisco Bay Area  
 CCWD = Contra Costa Water District  
 Delta = Sacramento-San Joaquin Delta  
 SBA = South Bay Aqueduct

## Bay Area Water Conservation

As described above, initial concepts related to water use efficiency, such as additional water conservation and recycled water use, were not carried forward beyond Step 1. In general, substantial programs are already in place at each Bay Area water agency to improve water use efficiency. Additional efforts in these concepts would not contribute to the two primary objectives defined for the project: environmental water management and water supply reliability. Further reducing Bay Area water agency demand for Delta water would result in a very small decrease in Delta diversions and the associated environmental water benefit. Additional water conservation without storage to hold water for dry years would provide little benefit in dry years and reduce the effectiveness of drought management (rationing) programs that most Bay Area water agencies would rely on to maintain deliveries through extended drought periods.

The Bay Area water agencies have extensive water conservation and efficiency programs in place that are considered part of the No Project/No Action Alternative. Even though the population of the Bay Area has increased nearly 17 percent since 1986, water use has actually decreased by 1.4 percent during the same period. During the drought period from 1987 to 1992, Bay Area conservation measures helped reduce water use by more than 20 percent. Despite continued growth since then, overall water use remains below pre-drought levels (BAWAC, 2003).

**TABLE B-4  
INITIAL CONCEPTS RETAINED**

Project Objectives	Resources Management Measure Retained	
Primary Objectives		
Bay Area Water Supply Reliability	Enlarge Los Vaqueros Reservoir	Increase conservation storage space in Los Vaqueros Reservoir by up to 400 TAF through removing and replacing the existing dam with a substantially larger facility
	Raise Los Vaqueros Dam in-place	Raise the height of the existing Los Vaqueros Dam to increase conservation storage space by up to 175 TAF
	Increase Delta diversion capacity	Increase the capacity of Delta diversion(s) to Bay Area water agencies
	Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	Construct new conveyance to deliver water from Los Vaqueros Reservoir to the SBA upstream from Dyer Canal
	Construct desalination plant	Develop desalination facility, drawing from Bay-Delta Estuary and associated conveyance facilities
Environmental Water Management	Enlarge Los Vaqueros Reservoir	Enlarge Los Vaqueros Reservoir by up to 400 TAF to store surplus Delta flows for environmental use
	Raise Los Vaqueros Dam In-Place	Raise the height of the existing Los Vaqueros Dam, increasing storage by up to 175 TAF, to store surplus Delta flows for environmental use
	Construct an intertie from Los Vaqueros Project to the SBA via Bethany Reservoir	Construct a new pipeline to deliver environmental supplies from the Los Vaqueros Project to Bethany Reservoir
	Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	Construct new conveyance to deliver water from Los Vaqueros Reservoir to SBA upstream from Dyer Canal
Secondary Objective		
Bay Area Water Quality	Reoperate reservoir/delivery	Reoperate an enlarged Los Vaqueros Reservoir and/or delivery system to improve delivered water quality

Bay Area = San Francisco Bay Area  
 Bay-Delta Estuary = San Francisco Bay/Sacramento-San Joaquin Delta Estuary  
 Delta = Sacramento-San Joaquin Delta  
 SBA = South Bay Aqueduct  
 TAF = thousand acre-feet

The Bay Area water agencies plan to continue conservation efforts into the future. The agencies plan to save 150 thousand acre-feet (TAF) per year from a variety of conservation measures, including plumbing retrofits, rebates for efficient toilets and appliances, and residential, commercial and industrial surveys and incentives. As the agencies implement these conservation measures, the flexibility to further reduce water use in dry periods is lost. For example, with a 5-gallon-per-flush toilet, users could install a displacement device in the toilet during dry years to reduce use. Today and in the future, with more 1.6-gallon-per-flush toilets installed, there is little ability to reduce water use for toilet flushing. Similarly, with more xeriscape plants and efficient landscape irrigation installed, the water savings in dry years from reduced landscape irrigation is less. (BAWAC, 2003).

## Step 2: Initial Plans

In Step 2, the initial concepts retained from Step 1 were used in combination to develop the initial plans, which were then evaluated per the project objectives, purpose, need, principals, and guidelines described above. Because a large array of potential concept combinations and sizes existed, the approach was not to develop an exhaustive list of all possible plans or to optimize outputs. Rather, the purpose was (1) to explore different strategies to address the planning objectives, constraints, principles, and criteria, and (2) to identify initial plans that may warrant further development into comprehensive alternatives.

The plans described in this chapter represent a range of potential actions to address the project objectives. The initial plans focused on a single primary objective, either the environmental water management or Bay Area water supply reliability. A third set of plans included a mixture of concepts to address all of the planning objectives, referred to as “combined objective plans.”

## Overview of Initial Plans

The retained initial concepts were packaged into eight initial plans formulated to facilitate comparison of a broad range of potential actions. The initial plans were not complete alternatives but represented fundamentally different ways of combining the retained initial concepts to address specific objectives. The initial plans are shown in **Table B-5**, organized by the objective(s) the plan is designed to meet.

## Facilities Associated with Enlarging Los Vaqueros Reservoir

Three major components were associated with enlarging Los Vaqueros Reservoir for the purpose of either increasing Bay Area water supply reliability or providing environmental water supplies:

- Constructing new and modifying existing Delta intake(s), pumping, and conveyance facilities to the reservoir, and constructing a small balancing reservoir
- Raising Los Vaqueros Dam and increasing the size of Los Vaqueros Reservoir
- Constructing pumping and transmission facilities from Los Vaqueros Reservoir to the SBA or Bethany Reservoir

During this step, a variety of potential reservoir sizes was considered and represented increases in the current capacity of 25 TAF to 400 TAF. The 25-TAF increase corresponded to a dam raise of about 15 feet, the estimated maximum height the existing structure could be raised without major reconstruction. It was projected that larger dam raises would require removal of the existing dam and construction of a new dam a short distance from the existing facility.

**TABLE B-5  
SUMMARY OF INITIAL PLAN FEATURES**

Initial Plans	Initial Concepts						
	Raise Los Vaqueros Dam in place	Enlarge Los Vaqueros Reservoir	Enlarge Delta Pumping/Conveyance	Los Vaqueros with Dyer Canal Intertie	Los Vaqueros-Bethany Res. Intertie	Desalination Plant	Water Quality Reoperation
<b>Bay Area Water Supply Reliability Focus</b>							
1. Raise Los Vaqueros Dam In-Place	✓		✓	✓			
2. Enlarge Los Vaqueros Reservoir		✓	✓	✓			
3. Desalination with Storage (Enlarge Los Vaqueros Reservoir)		✓	✓	✓		✓	
<b>Environmental Water Management Focus</b>							
4. Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie		✓	✓	✓			
5. Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie		✓	✓		✓		
<b>Combined Objective Focus</b>							
6. Water Supply Reliability/Improved Environmental Water Management Combination with Dyer Canal Intertie		✓	✓	✓			
7. Water Supply Reliability/Improved Environmental Water Management Combination with Bethany Reservoir Intertie		✓	✓		✓		
8. Water Supply Reliability/Improved Environmental Water Management Combination with Water Quality Improvements		✓	✓	✓			✓

**Initial Plans Focused on Bay Area Water Supply Reliability**

Three initial plans focus on improving water supply reliability for Bay Area water agencies. These initial plans represent three fundamentally different strategies to address the water supply reliability objective using various combinations of the retained concepts: a small dam raise strategy, a major reservoir expansion strategy, and a regional desalination strategy. Because the plans that focus on Bay Area water supply reliability also include diverting water from the Delta during surplus flow conditions, when water quality is typically good, the plans also would provide water quality benefits.

### ***1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability***

The focus of this initial plan is on increasing water supply reliability through a small raise of the existing Los Vaqueros Dam. Initial studies indicate that the existing dam could be raised by as much as 15 feet, without major reconstruction, to create up to 25 TAF of additional storage. Diversion and conveyance capacity from the Delta to the enlarged reservoir would be increased by maintaining the existing pumping capacity at Old River of 250 cubic feet per second (cfs) and constructing an additional diversion and pumping facility in the central Delta of about 500 cfs. Total Delta diversion capacity under this initial plan would be about 750 cfs. Conveyance facilities including a pump station near the outlet of the expanded reservoir and a pipeline to the SBA near the Dyer Canal Back Surge Pool would be constructed.

The additional storage would improve dry-year water supply reliability for Bay Area water agencies, including CCWD and the South Bay water agencies. The increase in Delta diversion capacity identified for this initial plan was selected because it appeared to result in the lowest cost per unit of increased water yield of the diversion capacities considered.

### ***2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability***

This initial plan includes an expansion of Los Vaqueros Reservoir to 500 TAF. It would require demolishing the existing dam and constructing a larger dam capable of storing as much as 400 TAF in addition to the existing 100-TAF Los Vaqueros Reservoir (total storage of 500 TAF). Similar to Initial Plan 1, surplus Delta flows would be conveyed to the expanded reservoir, and water would be delivered to SBA through a new pump station, pipeline, and intertie to the Dyer Canal. This plan would improve dry-year water supply reliability for CCWD and the South Bay water agencies. The facility sizes selected for this initial plan were shown in preliminary operations modeling to more efficiently contribute to the primary objective of water supply reliability than other sizes evaluated.

### ***3 – Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability***

The focus of this initial plan is on increasing water supply reliability through construction of a new regional water desalination facility in the Bay Area in combination with new storage and delivery facilities. For purposes of this initial plan, the plant was assumed to be a single brackish water desalination plant located at, or near, the Mirant Pittsburgh site identified by the Bay Area Regional Desalination Project. New conveyance facilities would include transmission facilities from the desalination plant to the existing CCWD Neroly Blending Facility and a pumping station and pipeline from that location to Los Vaqueros Reservoir.

Los Vaqueros Dam would be reconstructed and enlarged to store as much as 500 TAF and the diversion and conveyance capacity from the Delta to Los Vaqueros Reservoir would be increased from 250 cfs (existing at Old River) to 750 cfs (total capacity). Similar to previous plans, deliveries would be made from Los Vaqueros Reservoir to the SBA via a new pump station, pipeline, and intertie to the Dyer Canal.

## **Initial Plans Focused on Environmental Water Management**

Two initial plans were formulated to address the primary project objective of developing water supplies for environmental water management. Each includes diverting surplus flows from the Delta to an expanded Los Vaqueros Reservoir and constructing delivery facilities to CVP and SWP water users affected by environmental water pumping curtailments. The facilities associated with these plans would generally be similar to those described for Initial Plan 2. In both of the environmental water-focused initial plans, deliveries would be made to the SBA from the expanded reservoir facilities; the resulting pumping reductions at the CVP and SWP Delta pumping plants then could be used either to deliver environmental water supplies south of the Delta or to directly accommodate environmental fish actions (pumping curtailments) at the export facilities. At this stage of alternatives development, environmental benefits were primarily seen as resulting from using the enlarged Los Vaqueros Reservoir and related facilities in conjunction with the CALFED Environmental Water Account (EWA) Program, or a similar program that provided water for environmental uses while keeping municipal, industrial and agricultural water users whole. As the alternatives development process progressed, and the long-term status of the EWA became uncertain, the alternatives were refined to provide a broader base of environmental water management benefits that are described in Chapter 3 and Sections 4.2 and 4.3 of the Draft EIS/EIR. The evaluation of alternatives at the Initial Plan step included comparisons of how effectively an alternative provides EWA or EWA-like benefits as shown in Table B-2 Initial Concepts Addressing Environmental Water Management and Table B-6 Summary Comparison of Initial Plans.

Initial Plans 4 and 5, described below, are similar; however, the first delivers water from Los Vaqueros Reservoir to the SBA near the Dyer Canal Back Surge Pool, and the second delivers water to Bethany Reservoir.

### ***4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management***

This plan is focused on providing water supply for environmental water management through expanding the existing Los Vaqueros Reservoir by as much as 400 TAF (to 500 TAF total) and constructing an intertie between the expanded reservoir and the SBA at the Dyer Canal. Delta diversion and conveyance facilities would be enlarged to fill the expanded reservoir during periods of surplus Delta flow; these supplies would be delivered to the SBA in lieu of CVP and SWP deliveries that could then be used for environmental purposes. The pump station would lift water from the expanded reservoir through a pipeline to the Dyer Canal segment of the SBA.

### ***5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management***

This initial plan is similar to Initial Plan 4 except that water would be delivered either from the expanded reservoir or directly from enlarging Delta pumping and conveyance facilities to the SWP Bethany Reservoir. Supplies delivered to Bethany from the expanded reservoir via a gravity intertie then would be pumped to the SBA via the existing South Bay Pumping Plant or through the California Aqueduct for other environmental water purposes (such as storage in San

Luis Reservoir). A flow separation structure could prevent higher quality Los Vaqueros supplies delivered to the SBA from mixing with lower quality Bethany Reservoir supplies. Unlike Initial Plan 4, the capacity and demands of the SBA would not restrict environmental water deliveries under this initial plan; additional environmental water supplies could be conveyed south via the California Aqueduct.

## **Initial Plans Focused on Combined Objectives**

Three initial plans were formulated from the retained concepts to address multiple project objectives. The three initial plans provide both water supply reliability and environmental water management benefits. The third plan was also formulated to provide additional water quality benefits. The initial plans all consist of enlarging/reconstructing Los Vaqueros Reservoir to 500 TAF, enlarging associated Delta diversion and conveyance facilities primarily for the purposes of increasing water supply reliability, and developing environmental water supplies.

### ***6 – Water Supply Reliability / Improved Environmental Water Management Combination with Dyer Canal Intertie***

This initial plan would provide water supply reliability benefits and improve environmental water management through enlarging the existing Los Vaqueros Reservoir by as much as 400 TAF (to 500 TAF) in combination with a new intertie to the Dyer Canal segment of the SBA. Delta diversion and conveyance capacity would be increased to supply the enlarged reservoir with surplus Delta flows. A portion of the additional storage space would be dedicated to improving dry period water supply reliability for CCWD and the South Bay water agencies, and the remainder would be dedicated to environmental purposes.

### ***7 – Water Supply Reliability / Improved Environmental Water Management Combination with Bethany Reservoir Intertie***

Similar to Initial Plan 6, this plan would provide water supply reliability benefits and improve environmental water management. A new intertie would connect the expanded reservoir with Bethany Reservoir. Existing facilities would be used to deliver water supplies from Bethany to CVP and SWP users on the SBA. Unlike Initial Plan 6, the capacity of demands of the SBA would not limit the amount of environmental water supplies that could be developed under this plan.

### ***8 – Water Supply Reliability / Improved Environmental Water Management Combination with Water Quality Improvements***

This initial plan would focus on providing water supply reliability and water quality improvements and improved environmental water management. Facilities would be similar to the combined objective Initial Plan 6, including increased Delta diversion and conveyance capacity to the expanded reservoir and an intertie to the Dyer Canal segment of the SBA. Portions of the new storage space in Los Vaqueros Reservoir would be dedicated to Bay Area water supply reliability and environmental water management purposes similar to the previous plans. However, unlike

Initial Plan 6, the reservoir would be operated to provide additional water quality benefits for Bay Area water agencies.

## Evaluation of Initial Plans

### Federal Economic and Environmental Principles and Guidelines

To help focus the plan formulation process and develop the most appropriate detailed plans to be considered for implementation, the eight initial plans were compared using four general criteria - completeness, effectiveness, efficiency, and acceptability - based on the federal P&Gs as described above.

**Completeness.** Completeness is a determination of the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of planned effects. Each alternative is given a completeness ranking ranging from low to high, depending primarily on the degree of uncertainty (or reliability) of achieving the intended objectives and adequately mitigating significant adverse impacts.

**Effectiveness.** Effectiveness is the extent to which an alternative plan would alleviate problems and achieve objectives. For example, in the case of water supply reliability or water quality objectives, effectiveness may be considered in terms of a measured increase in water supply reliability or the ability to achieve a specific water quality goal, respectively.

**Efficiency.** Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating specified problems and realizing specified opportunities, consistent with protecting the nation's environment. Some potential ways to evaluate efficiency include comparing dollars per unit of economic benefit, least-cost of attaining a given objective, and lower opportunity cost relative to the accomplishment of other alternatives.

**Acceptability.** Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public, and compatibility with existing laws, regulations, and public policies. Acceptability may be evaluated according to a plan's ability to be implemented within existing laws and policies; consistency with stated project principles; or the potential for broad-spectrum acceptance or support.

Costs, implementation costs, and annual costs of the initial plans were also evaluated. The facility sizes represented in the initial plans were selected to provide a level basis for comparing the plans while also considering apparent trends in the cost effectiveness of various facility combinations.

**Table B-6** shows the results of the evaluation of the initial plans.

**TABLE B-6  
SUMMARY COMPARISON OF INITIAL PLANS**

Initial Plans	Comparison Criteria				Further Development Status and Overall Ranking
	Completeness	Effectiveness	Efficiency	Acceptability	
<b>Bay Area Water Supply Reliability Focus</b>					
1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability	Could be physically implemented with minimal impacts; would not require future elements; would be consistent with study authorization; and would address water supply reliability objective.	Potential to provide nearly 30 percent of the 2020 drought period shortages for Bay Area water agencies.	Lowest implementation cost but lower drought period yield. Low cost per unit of output compared with other plans focused on water supply reliability.	Consistent with goals of CALFED.	Although lower yield, <b>retained</b> for further development because of very low implementation cost.
	<i>High</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Moderate</i>
2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address water supply reliability objective.	Potential to provide almost 65 percent of the 2020 drought period shortages for Bay Area water agencies.	Moderate yield but higher cost per unit of output for water supply reliability than Initial Plan 1.	Consistent with goals of CALFED.	<b>Retained</b> for further development because of potential to significantly address water supply reliability for Bay Area.
	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>	<i>High</i>	<i>Moderate-High</i>
3 – Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability	Could be physically implemented; would be consistent with study authorization; and would address water supply reliability objective. Increased uncertainty relating to reliability and efficiency to implement and maintain desalination facilities and mitigate for brine disposal impacts.	Potential to provide about 75 percent of the 2020 drought period shortages for Bay Area water agencies.	Highest yield but also the highest cost per unit of output for water supply reliability.	Consistent with goals of CALFED; may be difficult to mitigate byproducts (brine) to a level acceptable to other Bay Area water resources interests.	<b>Deleted</b> from further development as a stand-alone alternative primarily because of highest cost per unit of water supply developed of any plan considered and because of inability to further other project objectives.
	<i>Moderate</i>	<i>Moderate</i>	<i>Low - Moderate</i>	<i>Moderate</i>	<i>Low-Moderate</i>
<b>Environmental Water Management Focus</b>					
4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address the environmental water management objective.	Potential to replace more than 60 percent of average annual EWA water acquisition target.	Moderately high cost per unit of output for relatively low environmental water supply.	Consistent with goals of CALFED; potential for federal interest in the environmental water management objective.	<b>Retained</b> for further development, although at this time, does not appear to be as efficient as Initial Plan 5 (with intertie to Bethany Reservoir).
	<i>High</i>	<i>Low-Moderate</i>	<i>Moderate</i>	<i>Moderate-High</i>	<i>Moderate</i>
5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address the environmental water management objective.	Potential to replace about 85 percent of average annual EWA water acquisition target.	Moderate cost per unit of output for environmental water supply and highest yield of the initial plans.	Similar to Initial Plan 4.	<b>Retained</b> for further development primarily because it would result in the largest potential environmental water supply.
	<i>High</i>	<i>Moderate-High</i>	<i>Moderate</i>	<i>Moderate-High</i>	<i>Moderate-High</i>

**TABLE B-6 (Continued)  
SUMMARY COMPARISON OF INITIAL PLANS**

Initial Plans	Comparison Criteria				Further Development Status and Overall Ranking
	Completeness	Effectiveness	Efficiency	Acceptability	
<b>Combined Objectives Focus</b>					
6 – Water Supply Reliability/Improved Environmental Water Management Combination with Dyer Canal Intertie	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address primary objectives.	Potential to provide more than 20 percent of the 2020 drought period shortages for Bay Area water agencies and replace more than 60 percent of average annual EWA water acquisition target.	Relatively low drought period yield and EWA replacement supplies with low to moderate cost per unit of output for both water supply reliability and EWA.	Consistent with goals of CALFED; potential for federal interest in environmental water management objective.	Although relatively low yields, <b>retained</b> for further development because of low to moderate costs per unit of output for both supply reliability and environmental water supply.
	<i>High</i>	<i>Moderate</i>	<i>Moderate-High</i>	<i>High</i>	<i>High</i>
7 – Water Supply Reliability/Improved Environmental Water Management Combination with Bethany Reservoir Intertie	Could be physically implemented; would not require future elements; could be consistent with study authorization; and would address primary objectives.	Potential to provide about 15 percent of the 2020 drought period shortages for Bay Area water agencies and replace nearly 80 percent of average annual EWA water acquisition target.	Similar to Initial Plan 6.	Similar to Initial Plan 6.	<b>Retained</b> for further development primarily because it would result in the lowest cost for environmental water supply, and high potential for federal interest.
	<i>High</i>	<i>Moderate-High</i>	<i>Moderate-High</i>	<i>High</i>	<i>High</i>
8 – Water Supply Reliability/Improved Environmental Water Management Combination with Water Quality Improvements	Could be physically implemented; would not require future elements; reduced certainty of improving water quality conditions under all circumstances; would be consistent with study authorization; and would address all objectives.	Potential to provide nearly 30 percent of the 2020 drought period shortages for Bay Area water agencies and replace about 40 percent of average annual EWA water acquisition target. Also would provide a significant improvement in SBA water quality.	Overall highest cost per unit of water supply reliability and EWA replacement output of combination plans considered.	Consistent with plan in CALFED ROD; potential for federal interest.	<b>Retained</b> for further development primarily because it would be consistent with the plan in the CALFED ROD and balance project objectives.
	<i>High</i>	<i>Moderate</i>	<i>Low-Moderate</i>	<i>High</i>	<i>Moderate-High</i>

KEY: Bay Area = San Francisco Bay Area  
 CALFED = CALFED Bay-Delta Program  
 EWA = Environmental Water Account  
 ROD = Record of Decision  
 SBA = South Bay Aqueduct

## Initial Plans Selected

After evaluating each initial plan per the planning criteria and analyses described above, seven plans were selected for further investigation. Initial Plan 3 (Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability) was not selected for further development as a stand-alone alternative due primarily to higher construction and operations costs. Energy costs for operating a desalination facility are highly variable and sensitive to market changes. Additionally, desalinated water stored in the reservoir for later use would require a re-treatment process before being delivered to Bay Area water agencies. The environmental impacts of a desalination facility were also somewhat prohibitive because of the large quantity of brine waste and increased water temperature, which would be introduced into the Delta environment, resulting in biological impacts. As outlined in the Other Initial Plan Analyses section below, desalination without new storage was considered but not moved forward for various reasons.

The seven initial plans (plus No Project/No Action) that were selected for more detailed evaluation are:

- **No Project/No Action.** No further action would be taken by Reclamation and CCWD to resolve the identified water resources problems and needs in the project study area.
- **1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability.** Raise the existing Los Vaqueros Dam in-place with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to improve Bay Area water supply reliability during dry periods.
- **2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to improve Bay Area water supply reliability during dry periods.
- **4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to develop environmental water replacement supplies.
- **5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with Bethany Reservoir, primarily to develop environmental water supplies.
- **6 – Water Supply Reliability / Improved Environmental Water Management Combination with Dyer Canal Intertie.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal to improve Bay Area water supply reliability and develop environmental water supplies.
- **7 – Water Supply Reliability / Improved Environmental Water Management Combination with Bethany Reservoir Intertie.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with

Bethany Reservoir to improve Bay Area water supply reliability and develop environmental water supplies.

- **8 – Water Supply Reliability / Improved Environmental Water Management Combination with Water Quality Improvements.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal to improve Bay Area water supply reliability, develop environmental water supplies, and improve the quality of delivered water supplies.

## Other Initial Plan Analyses

### Moderate In-Place Dam Raise (275-TAF Reservoir Expansion)

In September 2006, taking into consideration engineering studies and analyses and further refinement of the operations modeling and cost estimates, it was determined that a reservoir expansion to 275 TAF was the preferred reservoir expansion size.

Engineering studies and analysis determined that it would be possible to raise the existing dam in-place to achieve a moderate reservoir expansion of up to 275 TAF total capacity, versus the initial plans for either a mini in-place dam raise (up to 115 TAF total capacity) or a major reservoir expansion (up to 500 TAF total capacity, requiring demolition of the existing dam). This dam raise scenario has the potential for cost savings over large expansion scenarios because portions of the existing dam structure, inlet/outlet, and associated facilities could be preserved, and a portion of the foundation of the existing dam left intact. Dewatering the reservoir would be required during construction, similar to the major reservoir expansion scenarios.

The *Initial Economic Evaluation for Plan Formulation Report* considered the benefits and costs of a 275-TAF reservoir expansion, and the conclusion was reached that the alternative was potentially economically feasible (Reclamation, 2006). It included the following major facilities:

- Reconstruct the existing Los Vaqueros Dam in place to create a reservoir with a total capacity of 275 TAF.
- Expand the existing Old River Intake and Pump Station by 170 cfs to a total capacity of 420 cfs (note that the existing facility has a current capacity of 250 cfs and a planned build out capacity of 320 cfs, total).
- Construct new conveyance from the expanded Old River Intake and Pump Station to the existing Transfer Facility, and from the existing Transfer Facility to the expanded reservoir
- Enlarge the Transfer Facility balancing reservoir and increase Transfer Facility pumping capacity.
- Construct a new pump station, pipeline, and delivery intertie to connect Los Vaqueros Reservoir to the SBA upstream from Dyer Canal.

Larger (than 275-TAF) reservoir expansion options up to 500 TAF were eliminated by subsequent operational analyses that determined that Bay Area water supply reliability

demands and environmental water demands did not warrant the higher cost associated with demolishing the existing dam and building a new facility. Operational analyses also indicated that the volume of new storage would not be the sole limiting factor in developing environmental water management benefits. Availability of Delta surplus, potential restrictions on Delta pumping due to water quality or fisheries impacts, timing and location needs for environmental water, potential SBA water supply reliability beneficiaries, and availability of space for environmental water in storage facilities south of the Delta would all exert influence on project operations and yield. As a result, the comprehensive plans described in the next section do not consider expansion of Los Vaqueros Reservoir to greater than 275 TAF.

## **Desalination without New Storage**

Although Initial Plan 3 (Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability) was dropped from the eight initial plans (see Initial Plans Selected section above), it was thought that desalination could still be a viable alternative component. Consequently, a scenario was identified that would involve constructing a new, brackish water desalination plant drawing water from Mallard Slough and located adjacent to the existing Randall-Bold Water Treatment Plant. Potential benefits/accomplishments were:

- High quality water from the desalination plant to enable CCWD to meet water quality goals in lieu of receiving water supplies from Los Vaqueros Reservoir.
- Desalinated supplies blended with other CCWD supplies in a manner similar to existing conditions.
- Storage space in Los Vaqueros Reservoir (that would otherwise have been exercised to meet CCWD water quality goals) used instead to contribute to environmental water management and Bay Area water supply reliability objectives.
- New intertie, either to Bethany Reservoir or to the SBA upstream from Dyer Canal, to deliver supplies from the reservoir to beneficiaries.

However, through assessment of CCWD's service area and examination of existing infrastructure, it was determined that only about 30 percent of CCWD's demand on Los Vaqueros Reservoir could be offset. After accounting for the emergency storage space that CCWD reserves in the reservoir (40 TAF in dry and critical years and 70 TAF in all other year types), the resulting capacity made available by the desalination facility would be about 10 TAF to 15 TAF, depending on year type—not enough to provide sufficient environmental water management benefit to offset the significant cost of construction and operation. In addition, disposal of concentrated brine waste from the desalination facility (both in terms of the facilities that would be needed to transport the waste and the potential environmental impacts to the receiving estuary) and potential greenhouse gas issues posed challenges. Therefore, it was determined that the desalination without new storage scenario would not be carried forward for further development as an alternative.

Although desalination facilities were not carried forward as an alternative for the reservoir expansion project, the Bay Area water agencies continue to evaluate a regional desalination facility at this location to meet long-term, dry-year water supply reliability needs. This project,

the Bay Area Regional Desalination Project, is a cooperative effort of East Bay Municipal Utility District, SFPUC, SCVWD, and CCWD. While not yet shown to be potentially feasible, such a project may prove feasible in the future, and could complement an expanded Los Vaqueros Reservoir.

### **Step 3: Alternatives Development and Refinement**

As described above, a number of initial concepts were identified and used to formulate a range of initial plans addressing the project planning objectives. The initial plans that were chosen to move forward from Step 2 were selected because of their ability to contribute to the primary project objectives: providing environmental water management benefits and/or Bay Area water supply reliability. The initial plans carried forward from Step 2 eliminated all reservoir size options greater than expansion to 275 TAF. Plans that took into consideration multiple Delta intakes and conveyance options, as well as multiple delivery options to Dyer Canal or Bethany Reservoir, were carried forward.

The initial plans were further evaluated against the planning principles and guidelines established for the project, and additional studies and operations modeling efforts were simultaneously conducted. During evaluation and comparison of the initial plans, various combinations of components, configurations, and operations were identified for further development in detailed alternative plans.

Specifically, the sizing of project intakes, conveyance, and pumping facilities considering operations, benefits, adverse impacts, and costs were evaluated. During this step, it was determined that the South Bay Connection at Bethany Reservoir provided greater potential project benefits than the connection to Dyer Canal. In addition the costs and environmental impacts of the connection to Dyer Canal were greater than those for the connection to Bethany Reservoir. Therefore, the connection to Dyer Canal was dropped from further consideration. All alternatives that include a connection to South Bay water agencies also include the South Bay Connection to Bethany Reservoir.

### **Additional Plans Considered**

Two specific alternative plans were developed and evaluated during this step including a conveyance-only alternative, which was not carried forward as a final alternative, and a smaller 160-TAF reservoir expansion alternative, which is included in the final alternatives evaluated in the Draft EIS/EIR.

### **Conveyance-only Plan**

This plan includes construction of a new intake on Old River, new conveyance facilities from the Delta to the Transfer Facility, and a new pipeline to deliver supplies from the Transfer Facility to Bethany Reservoir. Los Vaqueros Reservoir would not be expanded. Operation of these facilities would provide some environmental water management benefit by moving water to Bethany

through screened diversions, which could also improve water supply reliability to South Bay water agencies by avoiding the CVP and SWP Delta pumps, and could be used to move surplus Delta supplies to Central Valley refuges. However, without the operational flexibility and greater certainty of storage these benefits are limited. Under this plan, there would be less environmental water management benefits and limited water supply reliability benefits compared to alternatives including expansion of Los Vaqueros Reservoir.

This plan was not carried forward as a final alternative because it did not contribute substantially to one of the primary project objectives, providing Bay Area water supply reliability and had less environmental water management benefits. The plan was also the least consistent with the CCWD Board Principles and with the water management objectives set forth in the CALFED ROD. The plan was found to have the least potential for local agency participation.

## 160-TAF Reservoir Plan

During this review, a new plan was considered that would facilitate CCWD's future plans to secure water transfers for CCWD customers providing supplemental dry-year water supply and reducing the extent of supplemental drought supply acquisition required. CCWD would increase the size of Los Vaqueros Reservoir to 160 TAF. This alternative could be implemented solely by CCWD and specifically addresses water supply reliability planning objectives without requiring new intake or conveyance facilities. This alternative was further refined as a smaller reservoir alternative that could serve CCWD customers and other Bay Area water agencies through existing interties. This alternative was carried forward as a final alternative.

## Facilities Siting

In addition to developing and refining project alternatives, alternative facility sites were identified and evaluated for the intake, conveyance, and recreation facilities associated with the alternatives. The purpose of the siting studies was to help define the alternatives, identify location constraints, outline the areas to be evaluated in the EIS/EIR, and potentially avoid environmental impacts. The facilities siting process is described briefly here. Additional information is available in the *Facilities Siting Report* (ESA, 2007).

A number of sources were used to complete the facilities siting analysis, including published literature, recent aerial photographs, geology, soils, and slope stability maps, previous project reports and maps for the Los Vaqueros Watershed, and other publicly available databases such as the *East Contra Costa County Habitat Conservation Plan and Natural Communities Conservation Plan* (ECC HCPA, 2006) and previously recorded cultural resource sites from the Northwest Information Center. The analysis relied heavily on Geographic Information System analysis to determine the range and magnitude of potential effects, to quantify siting results, and to illustrate various facility configurations. Field work was conducted as necessary to complete the siting recommendations.

During the facility siting studies, the alternate sizes and locations were examined for the following facilities to determine the optimal facilities and locations for evaluation in the EIS/EIR:

- New Delta Intake and Pump Station
- Conveyance facilities
- Recreation facilities

In October 2004, analysts visited or viewed all the facility alternatives that were accessible within the Los Vaqueros Watershed or visible from public roads. Facility sites and pipeline alignments were further refined to avoid or minimize environmental impacts or to improve conditions for construction. To achieve a systematic approach to facility siting evaluation, siting criteria were developed for engineering, biological resources, cultural resources, and land use.

Once the preferred reservoir expansion size of 275 TAF was determined, facilities sizing and siting were refined to accommodate a smaller reservoir expansion project; however, much of the analysis conducted previously and summarized in the *Facilities Siting Report* (ESA, 2007) remained relevant and new recommendations to accommodate the smaller project were made. The recommendations were:

- New Delta Intake and Pump Station to be located along the western bank of Old River; approximately 1,000 feet south of the existing pump station or expansion of the existing Old River Intake and Pump Station and associated facilities could occur.
- Balancing reservoir to be located at the existing Transfer Facility (rather than a new, separate site within the watershed as previously proposed).
- Inlet-outlet pipeline to be located generally within the Kellogg Creek Valley; creek corridor including buffer zone to be avoided.
- Stockpile area to be located at the northern end of the Kellogg Creek valley, east of Walnut Boulevard in an upland field.
- Delta-Transfer and Transfer-LV Pipelines to be co-located within the existing easement for the Old River and Transfer pipelines, rather than a separate, new alignment.
- Transfer-Bethany Pipeline alignment to be located generally parallel to Vasco Road to the point where Armstrong Road turns south, following Armstrong Road to the terminus, heading southeast toward the Harvey O. Banks Pumping Plant and then westward to Bethany Reservoir; alignment adjusted to avoid wetlands and sensitive plant areas.

More reconnaissance surveys, required to include a full analysis of certain facilities where full access was not previously available, and to locate access roads, spoil disposal areas, pipeline staging areas, and power facilities, were conducted in 2007–2008. After a review of the surveys, it was determined that the proposed site of the new Delta Intake and Pump Station could be farther south to avoid potential maintenance issues associated with the accumulation of sediments in the channel at the original site. Additionally, two route alternatives for the last 1.5-mile segment of the Transfer-Bethany Pipeline were developed to avoid impacts to vernal pool fairy shrimp (*Branchinecta lynchi*) complexes and burrowing owl (*Athene cunicularia*). These two alternatives include a combination of tunnel and open trench construction.

After a review of the facilities siting analysis, the best apparent alternatives were identified to advance to the next step of analysis. The facility siting process supported a systematic approach to establishing a reduced set of feasible alternatives for detailed EIS/EIR analysis, which are designed to avoid and minimize adverse effects while contributing to project objectives.

## Final Alternatives

Plan formulation efforts resulted in definition of the No Project/No Action Alternative and identification of the following four comprehensive alternative plans. These alternatives are described more fully in Chapter 3 of the Draft EIS/EIR.

### No Project/No Action Alternative

Under the No Project/No Action Alternative, Reclamation and CCWD would take no action toward implementing a specific plan to develop additional water supplies for environmental water management programs or to help address water supply reliability and quality in the Bay Area.

### Action Alternatives

Four action alternatives are summarized below and described in detail in Chapter 3 of the Draft EIS/EIR. **Table B-7** shows the key distinguishing characteristics of the final alternatives.

Alternative 1 is considered the Proposed Project for purposes of CEQA and is treated as the Proposed Action for purposes of NEPA. Alternative 1 includes the largest reservoir expansion and greatest extent of associated facilities considered in the Draft EIS/EIR and is designed to meet both of the primary objectives. At the other end of the range, Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities.

- **Alternative 1**– Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management and Water Supply Reliability Dual Emphasis
- **Alternative 2** – Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management Emphasis
- **Alternative 3** – Expanded 275-TAF Reservoir, No South Bay Connection, Environmental Water Management Emphasis
- **Alternative 4** – Expanded 160-TAF Reservoir, No South Bay Connection, Water Supply Reliability Emphasis

**TABLE B-7  
ACTION ALTERNATIVES  
WITH KEY DISTINGUISHING CHARACTERISTICS**

<b>Project Characteristic</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Expanded Reservoir Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water Management and Water Supply Reliability	Environmental Water Management	Environmental Water Management	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170-cfs intake facility on Old River	Construct new 170-cfs intake facility on Old River	Expand existing CCWD intake facilities by 70 cfs	No changes to existing intake facilities
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity by 420 cfs to 670 cfs	Expand pipeline capacity by 420 cfs to 670 cfs	Expand pipeline capacity by 320 cfs to 570 cfs	No changes to pipeline capacity

## References – Appendix B

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