EXECUTIVE SUMMARY

PURPOSE OF THIS REPORT

This report is not a Federal decision document and is not suitable for seeking Congressional authority to construct the project. The purpose of this initial economic evaluation is to provide information on study progress primarily in two key areas: economics and plan formulation. This report identifies potential project benefits and describes methods available to estimate their monetary value. For the purpose of this initial economic evaluation, a single alternative was selected for analysis; project benefits and costs for this alternative were then estimated and compared. Selection of this alternative for evaluation in this report does not represent the identification of a recommended or preferred alternative for display in a Feasibility Report or for consideration by Congress.

A focus of the report is on economics related to one of the LVE's primary objectives, to provide a less costly water supply for a long-term Environmental Water Account (EWA). Established by CALFED in 2001, the EWA facilitates pumping curtailments in the south Sacramento-San Joaquin Delta (Delta) and other changes to Central Valley Project (CVP) and State Water Project (SWP) operations to protect at-risk fisheries. To date, the short-term EWA has relied on transfer market water purchases and short-term transfer agreements to secure water supplies, primarily from agricultural users, for EWA actions. However, uncertainty exists regarding the cost and sources of water for environmental water acquisition programs such as the EWA in the future. A key future without-project condition for the LVE is that the EWA, or a similar program, will exist in the long-term future.

BACKGROUND

In 2001, the U.S. Department of Interior, Bureau of Reclamation (Reclamation), California Department of Water Resources (DWR), and Contra Costa Water District (CCWD) began appraisal-level studies of the potential to expand Los Vaqueros Reservoir to address regional water quality and supply reliability 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. In 2003, Reclamation was directed in Public Law 108-7 (Omnibus Appropriations Act of 2003) to conduct a feasibility-level investigation of the potential expansion of Los Vaqueros Reservoir. Reclamation and DWR are the Federal and State agencies conducting the Los Vaqueros Expansion Investigation (LVE), respectively. CCWD, as owner of the existing Los Vaqueros Project, also has an integral role in the LVE. The LVE study location is shown in **Figure ES.1**.

FIGURE ES.1 - STUDY LOCATION

Initial results of the first phase of the LVE were described in the *Initial Alternatives Information Report* (IAIR) of September 2005. The IAIR identified technically feasible alternatives to

meet project objectives within established criteria and constraints, but did not evaluate the potential economic feasibility of a project to expand Los Vaqueros Reservoir.

The three objectives identified for the LVE focus on using an expanded Los Vaqueros Project to accomplish the following:

- *Increase drought period water supply reliability for municipal and industrial water providers within the study area.*
- *Develop a less costly replacement water supply for the long-term Environmental Water Account.*
- *To the extent possible through pursuit of the water supply reliability and Environmental Water Account replacement supply objectives, improve the quality of water deliveries to municipal and industrial customers in the study area.*

Alternative Evaluated in This Report

The current phase of the LVE is focused on developing detailed alternatives for comparison and evaluation in the Draft Feasibility Report / Environmental Impact Statement / Environmental Impact Report. Technical studies are focused on refining operations, facility sizes, and facility locations. For the purpose of this initial economic evaluation, a single alternative was selected for analysis. To select this alternative, operational model simulations were performed for two potential reservoir sizes: a 275-thousand-acre-foot (TAF) reservoir and a 400 TAF reservoir (total capacity). These reservoir sizes were selected because they appeared to be most cost effective in previous operational analyses.

Preliminary operational modeling was performed to determine the most efficient Delta intake and conveyance facility sizes associated with the two reservoir expansion options. In these model simulations, the expanded reservoir was operated exclusively to provide EWA replacement supplies via the South Bay Aqueduct (SBA); no deliveries are made from the expanded reservoir to increase SBA or CCWD water supply reliability, and no additional storage space was dedicated to supply reliability. In addition, no operational changes were made specifically to improve water quality. Based on current modeling results and engineering analyses, a 275 TAF (total capacity) reservoir alternative that includes the following major facilities was selected for evaluation in this report:

- Reconstruct the existing Los Vaqueros Dam in-place to create a reservoir with a total capacity of 275 TAF (current reservoir capacity is 100 TAF)
- Expand the existing Old River intake and pumping plant by 170 cubic feet per second (cfs) to a total capacity of 420 cfs
- Construct a new 350 cfs pipeline from the expanded Old River intake to the existing Transfer Facility; this new pipeline would likely parallel the existing 320 cfs pipeline, providing total conveyance of 670 cfs from the Delta to the Transfer Facility
- Replace the existing Transfer Facility balancing reservoir with a larger, 8-million-gallon reservoir
- Construct a new 470 cfs pump station at the Transfer Facility and replace pumps in the existing 200 cfs transfer pump station, for a total transfer capacity of 670 cfs to the expanded reservoir

- Construct a new 670 cfs pipeline from the Transfer Facility to Los Vaqueros Reservoir
- Construct a new 175 cfs pump station and new pipeline to convey water from Los Vaqueros Reservoir to the SBA at the Dyer Canal

The configuration of the alternative selected for evaluation is shown in **Figure ES.2**.

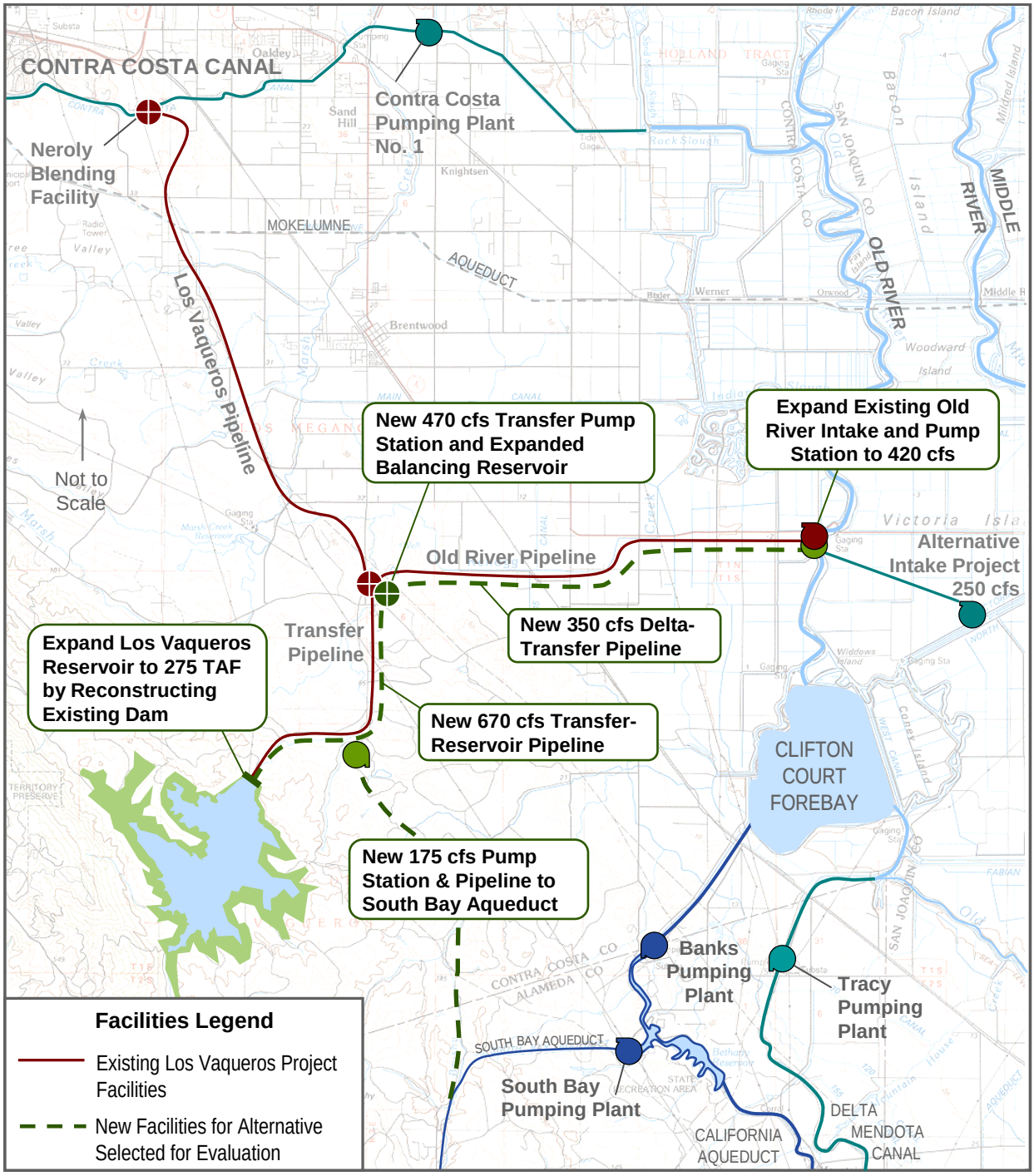

FIGURE ES.2 – ALTERNATIVE EVALUATED IN THIS REPORT

This alternative develops EWA replacement supplies by delivering SWP water supplies to the SBA that would otherwise have been delivered via Banks Pumping Plant and the South Bay Pumping Plant. Space made available at Banks is then used to pump EWA supplies to San Luis Reservoir, for later use by EWA when pumping is curtailed. In this manner, EWA supplies stored in San Luis Reservoir as a result of Los Vaqueros deliveries would replace EWA purchases south of the Delta.

This alternative is being used only for the purpose of preliminary economic analysis in this report to determine if a potentially feasible alternative exists under current formulation parameters.

Future Without-Project Conditions

An important aspect of any economic analysis is establishing appropriate future conditions, both with and without the proposed action. The following summarizes important conditions that are assumed to exist in the future without the LVE:

- The EWA or a similar program continues to purchase water to support pumping curtailments and other actions that promote protection and recovery of at-risk Delta fisheries. The program continues to be funded by both the Federal and State governments and operates/functions similar to the existing program. The program is assumed to use the EWA asset acquisition and management resources identified in the 2000 EWA Operating Principles Agreement, as may be amended, including the following:
    - Storage in existing CVP/SWP reservoirs (as available)
    - Dedicated pumping capacity of 500 cfs (July through September) at Banks Pumping Plant
    - SWP annual carryover debt in San Luis Reservoir of 100 TAF, when available
    - Existing water purchase mechanisms (primarily spot market purchases and short-term transfer agreements)
- The CCWD Alternative Intake Project is constructed and operating with a capacity of 250 cfs (high lift pump station) on Victoria Canal.
- The East Bay Municipal Utility District Mokelumne Aqueduct Intertie with the CCWD Los Vaqueros Pipeline is constructed.
- The South Bay Aqueduct Improvements and Enlargement Project is constructed, increasing the capacity of the SBA to 430 cfs.
- Allowable pumping capacity at Banks Pumping Plant is increased to 8,500 cfs, per the South Delta Improvements Program.

INITIAL ECONOMIC ANALYSIS

The initial economic analysis presented in this report was performed at the concept level (pre-feasibility). Construction is assumed to begin in 2013 and conclude in 2015. The economic benefits and annual operating costs of the project would begin to accrue in 2016, and were analyzed over a 100-year period ending in 2115. The Federal discount rate of 5-1/8 percent was used in this

initial economic analysis to adjust the stream of benefits and costs to the base year of 2016. Costs and benefits estimated for the alternative selected for evaluation in this report are summarized below.

Costs

Total implementation cost (including appropriate factors for unlisted items, contingencies, and indirect costs, and interest during construction) and annual operation, maintenance, and replacement costs are summarized in **Table ES.1**.

TABLE ES.1
SUMMARY OF ESTIMATED PROJECT COSTS FOR ALTERNATIVE EVALUATED IN THIS REPORT (2006 PRICES)

Type	Item	Cost[1]
Implementation Costs	Los Vaqueros Dam and Appurtenances	$139,426,000
	Delta Intake, Pumping, and Conveyance to Transfer Facility	$42,669,000
	Transfer Facility Pumping and Conveyance to Reservoir	$76,957,000
	Pumping and Conveyance from Reservoir to SBA	$48,783,000
	Total Field Cost	**$307,835,000**
	Unlisted Items (15%)	$46,176,000
	Subtotal	**$354,011,000**
	Contingency (25%)	$88,503,000
	Total First Cost	**$442,514,000**
	Indirect Costs[2] (25%)	$110,629,000
	Subtotal	**$553,143,000**
	Interest During Construction[3]	$43,746,000
	Total Implementation Cost	**$596,889,000**
Annual Operation, Maintenance, Repair, and Replacements	**Operation and Maintenance**	
	- Dam and Appurtenances	$211,200
	- Delta Intake	$82,500
	- Pipelines	$645,500
	- Pump Stations	$792,000
	- Substations and Transmission Lines	$61,500
	Subtotal	**$1,792,700**
	Net Power[4]	$1,518,000
	Replacements (annualized)	$235,300
	Total Annual OMR&R	**$3,546,100**
	Capital Value of OMR&R	**$70,353,000**
TOTAL COSTS	**Capital Value of All Costs**	**$667,242,000**
	Average Annual Cost over 100 Years	**$34,429,000**

KEY: OMR&R = operation, maintenance, repair, and replacements SBA = South Bay Aqueduct

Notes:

1. *All costs are presented at 2006 price levels.*
2. *Indirect costs include engineering, design, inspection, administration, and legal costs.*
3. *Interest during construction calculated for a 3-year construction period.*
4. *Net power cost represents the difference between pumping costs in the with-project and without-project conditions.*

The estimation of project costs is based on pre-feasibility level engineering and designs. Construction costs are based primarily on the cost to construct the original Los Vaqueros Project facilities, which were completed in 1997.

The unit cost of EWA replacement yield is the estimated average annual cost to develop the project divided by the estimated yield of the project. Estimated average annual EWA replacement yield for the alternative selected for this analysis is about 104.2 TAF per year, resulting in a unit cost of about $330 per acre-foot for this alternative.

Benefits

Benefits of this initial economic evaluation include the following:

- EWA replacement supplies, valued based on the estimated future cost of EWA purchases on the water transfer spot market
- Emergency water supply, valued based on the emergency storage provided by an expanded reservoir in the event of an interruption in imported Delta water supplies
- Improvement in the quality of water supplies delivered to the SBA from the expanded reservoir
- Fishery benefits potentially achieved when SWP supplies for SBA contractors are delivered via the screened Old River Intake instead of the unscreened Banks Pumping Plant

Various economic valuation methods were identified for these benefit categories that are consistent with guidance provided in the 1983 U.S. Water Resources Council *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*. Methods used to calculate benefits in this initial economic evaluation, and initial results for the alternative selected for analysis, are summarized below.

EWA Replacement Supplies

Estimation of the value of EWA replacement supplies focused on estimating future prices on the annual water transfer spot market. This analysis found that, in response to increasing water demands and the lack of planned new water supply infrastructure, water users will likely rely increasingly on spot market water transfers to bridge the gap between supply and demand. As early as 2020, traditional sources of spot market water supply may be unable to put more water on the market in response to price signals due to conveyance and contract constraints. If no new water supplies are developed, prices will likely increase at a rate faster than the rate of normal inflation.

Unlike many other commodities subject to supply and demand, there are no substitutes for water and it is essential to life. In addition, an important dynamic of water supplies is that they need to be both temporally and spatially available (water when needed, where needed). Conveyance, hydrology, and storage all limit the temporal and spatial availability of water supplies. Physical and biological constraints are limiting factors in the movement of water through the Delta during certain periods, an occurrence that is likely to intensify in the future as more users enter the transfer market. Furthermore, there are few new water supply projects currently approved, under construction, or in the environmental review phase that would significantly increase the State's water supplies.

While this analysis suggests that the price of water in the spot market will increase over time faster than the rate of inflation, at this initial level of analysis, identifying a precise rate of increase is not recommended. Rather, a reasonable range of potential prices may be identified. Consequently, three possible rates of growth were examined: 0 percent, 1.1 percent, and 2 percent (above inflation). The 1.1 percent growth rate is an interim estimate developed by the CALFED Common Assumptions Economic Workgroup (CAEWG) based on historical EWA purchases. The 0 percent growth rate is presented as a low book end for the purpose of this initial economic evaluation, but this trend is unlikely to occur. A 4 percent growth rate was also examined as a high book end, but is not presented in the benefits analysis. Rather than letting the spot market price increase over time without any limit, prices were constrained by an upper bound reflecting current estimates for the cost of desalting brackish water.

Figure ES.3 illustrates the estimated spot market water price paths given growth rates of 0 percent, 1.1 percent, and 2 percent above inflation, and considering a $1,200 per acre-foot price cap. The weighted average initial price of water used in the analysis is $215 per acre-foot (2006 price levels, 2004 level of development), based on interim values developed by the CAEWG.

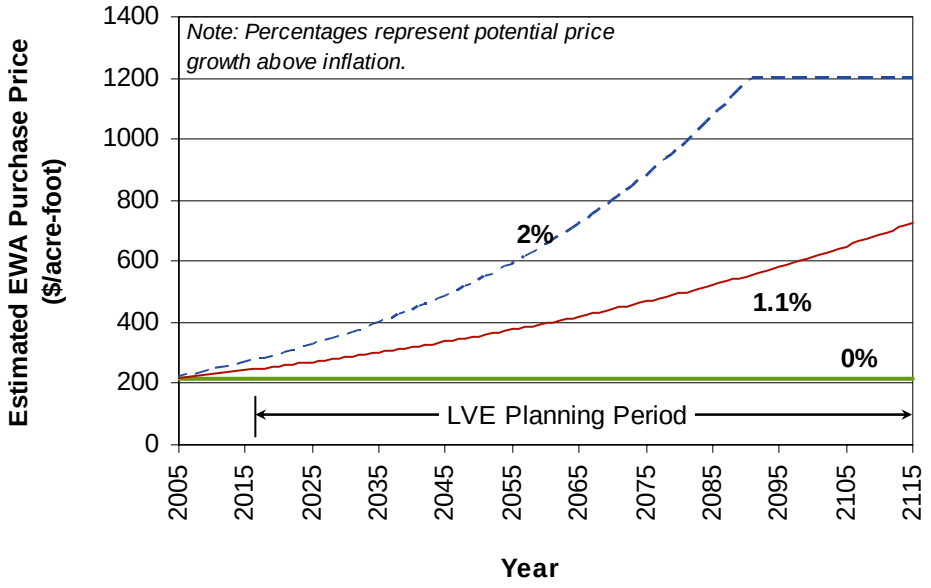

FIGURE ES.3 – CHANGE IN EWA SPOT MARKET PURCHASE PRICE OVER LVE PLANNING PERIOD AT VARIOUS GROWTH RATES, $1,200/ACRE-FOOT PRICE CAP

Other Benefits Evaluated

Preliminary benefits also were estimated for three other potential benefit categories: emergency water supply, water quality, and fishery benefits.

The reservoir expansion alternative selected for evaluation in this report was formulated primarily to provide EWA replacement supplies. Although no yield was dedicated to improving Bay Area water supply reliability, the project would provide emergency supplies in the event of an earthquake

or levee failure in the Delta. Consequently, the water supply reliability benefits calculated for the alternative are based solely on preliminary estimates of the value of these emergency supplies.

Emergency storage benefits are the value of supplies stored in Los Vaqueros Reservoir in the event of a major levee failure in the Delta that would significantly degrade water quality, or a major earthquake in the San Francisco Bay Area (Bay Area) that would disrupt the ability of Bay Area water agencies to import water into their service areas. The amount of water available for emergency purposes is estimated as the average reservoir storage with the expanded reservoir, less the average storage without the expansion, or 143,400 acre-feet for the alternative evaluated. For the purpose of this initial economic evaluation, the value of this water during an emergency was conservatively estimated to be $1,700 per acre-foot (2006 prices). Based on work by others, the combined probability of an earthquake or levee emergency occurring is estimated as once in every 50 years, or a 2 percent chance in any year. Using these values, the economic benefit of additional water stored in an expanded Los Vaqueros Reservoir was estimated to be $5.0 million per year (2006 prices). Further analysis is needed to better quantify the economic value of emergency supplies.

Water quality benefits result from improvements to the water quality of municipal supplies. These improvements fall into three categories: (1) lower consumer costs associated with changes in total dissolved solids (TDS) and total hardness (TH), (2) lower groundwater management costs by recharging the local groundwater basins with lower TDS water, and (3) lower water treatment costs by delivering water with lower turbidity, total organic carbon, and bromides. These cost savings were estimated for agencies receiving water from the SBA. Categories of consumer cost savings considered in the analysis include reduced bottled water purchases, longer life of household appliances and plumbing, less use of home water softeners, and reduced purchases of detergents. These benefits accrue when water supplies with lower TDS and TH are delivered to households served by water treatment plants that receive water from the SBA. Economic benefits from lower groundwater basin management costs were estimated as the avoided cost of additional treatment prior to recharge, or about $22 per acre-foot recharged. Savings in water treatment plant operating costs were not estimated as part of this evaluation. The average annual water quality benefits of the alternative evaluated in this report are estimated to total about $5.53 million per year.

Water delivered to the SBA from Los Vaqueros Reservoir would be diverted from the Delta through modern, state-of-the-art fish screens similar to the existing fish screens at CCWD's Old River intake and pumping station. Currently, water delivered to the SBA passes through Clifton Court Forebay, which is not equipped with modern, positive-barrier fish screens. The economic benefit of diverting water through a screened intake versus an unscreened intake could be valued in several ways. For the purpose of this initial economic analysis, a nonmarket valuation approach based on the fish and wildlife mitigation charge for CVP contractors was used. This charge, established through the Central Valley Project Improvement Act to fund restoration projects, is currently $16 per acre-foot for CVP municipal and industrial contractors. Applying this nonmarket valuation to the average annual EWA supply of 104,200 acre-feet developed by the alternative under evaluation would result in an annual economic benefit of about $1.71 million. Further analysis is needed to better define the nature of potential fishery benefits and the methods to value the benefits, if appropriate.

Preliminary Comparison of Benefits and Costs

Table ES.2 summarizes estimated benefits and costs for the alternative evaluated in this report. Based on the initial economic analysis, this alternative appears to be economically feasible, resulting in average annual positive net benefits between about $0.37 million and $22.30 million (annual), and with a ratio of average annual benefits to costs between about 1.01 and 1.65.

TABLE ES.2
SUMMARY OF AVERAGE ANNUAL ECONOMIC EFFECTS

		2006 Prices ($ millions)[1]		
		0% Real Price Escalation[4]	1.1% Real Price Escalation	2% Real Price Escalation
Costs	**Total Annual Costs[2]**	**(34.43)**	**(34.43)**	**(34.43)**
Benefits	EWA Replacement Supplies	22.56	32.31	44.49
	Water Supply Reliability	0.00	0.00	0.00
	Emergency Water Supply	5.00	5.00	5.00
	Bay Area Water Quality	5.53	5.53	5.53
	Fishery Benefits[3]	1.71	1.71	1.71
	Total Annual Benefits	**34.80**	**44.55**	**56.73**
Net Benefits	**Net of Annual Costs & Benefits**	**0.37**	**10.12**	**22.30**
	Ratio of Annual Benefits to Costs (B:C)	**1.01**	**1.29**	**1.65**

Notes:

1. *Values reflect 2006 price levels with the exception of EWA benefits (which have been escalated based on a range of potential growth rates above inflation, then discounted back using the Federal discount rate of 5-1/8 percent). A $1,200 per acre-foot price cap was applied (corresponding to the cost to desalinate brackish water supplies).*
2. *Total annual costs include implementation (construction cost with unlisted items and contingencies, interest during construction, and engineering, administration, and legal costs), operation and maintenance, power, and major replacements.*
3. *Further analysis is needed to better define the nature of potential fishery benefits and the methods to value the benefits, if appropriate.*
4. *The 0 percent growth rate is presented as a low book end for the purpose of this initial economic evaluation, but this trend is unlikely to occur based on a preliminary assessment of supply and demand conditions affecting the spot market. A 4 percent growth rate was also examined as a high book end, but is not presented in the table because the lower growth rates resulted in positive net benefits.*

Uncertainties

Uncertainty and variability are inherent in water resources planning. For this initial economic analysis, key areas of uncertainty relate to the following:

- The rate of growth in water transfer prices, and the extent to which these prices may or may not reflect the opportunity cost of the water supply in other uses, is uncertain and requires further analysis.

- The continued presence of the EWA or similar program in the future is uncertain, including the level of Federal participation in such a program. To date, the EWA has predominantly benefited the SWP by maintaining reliable supplies to SWP contractors.
- Operations modeling results used in this initial economic analysis used the stand-alone CALSIM-II operations model. Future analyses using the integrated CALSIM-II model, under development by the CALFED Common Assumptions group, will allow assessment of how an expansion of Los Vaqueros might affect other Central Valley water management operations. This may lead to refinements in reservoir operations and adjustments in yield.
- Existing and potential future Delta pumping and export constraints (biological opinions, export/import ratio restrictions, future restoration actions, etc.) could affect ability to fill the expanded reservoir or increase the cost to achieve the same benefits. Adaptive management and operational flexibility should be assessed in future analyses.
- Water quality delivered to the SBA generally increases for the alternative selected for evaluation in this report. Future model runs will investigate operation methods to mitigate potential seasonal fluctuations in delivered water quality.
- The cost estimates used in this initial economic analysis are based on appraisal-level engineering and designs. Consequently, conservative factors were applied to account for unlisted items and contingencies. Detailed engineering and design work is needed to refine the cost estimates.
- Numerous factors exist that could potentially impact future water demands, supplies, and scarcity, and could affect operation of the State's water management system. All of these factors have the potential to influence prices on the water transfer spot market.

FINDINGS

This initial economic analysis indicates that feasibility-level studies for the LVE should continue, progressing toward the identification of a plan to be recommended for implementation in a Feasibility Report with accompanying environmental documentation.

The alternative selected for analysis in this report would involve rebuilding the existing Los Vaqueros Dam in-place to create a reservoir with a total capacity of 275 TAF, in combination with a 170 cfs increase in Delta pumping and conveyance and construction of a 175 cfs delivery pipeline from the reservoir to the SBA. Based on the initial economic analysis, this alternative appears to be economically feasible, resulting in average annual positive net benefits between about $0.37 million and $22.30 million (annual), and with a ratio of average annual benefits to costs between about 1.01 and 1.65. This conclusion is preliminary, and may be revised after a more thorough evaluation of project benefits and costs for the feasibility study. Specifically, use of a market price estimation approach for EWA benefits may or may not reflect the opportunity cost of the water supply in other uses.

Federal interest appears to exist in the development of EWA replacement supplies. Assuming this Federal interest is confirmed, it is possible that some portion of the project could be financed by the Federal Government. While some Federal costs may be non-reimbursable, the majority of costs

could be assumed to consist of both reimbursable Federal costs, and non-Federal costs. Additional work is required to complete the cost allocation.

The alternative selected for analysis in this report appears to be economically feasible, and it is not necessary to consider adding project objectives to develop an economically feasible project. Plan formulation efforts should continue to develop alternatives focused on less-costly EWA replacement supplies and Bay Area water supply reliability, while considering the effect of study assumptions and formulation constraints on such alternatives.

FUTURE ACTIONS

Future plan formulation efforts will focus on refining, evaluating, and comparing alternative plans for display in the Feasibility Report. These efforts should include the following activities:

- Identify potential project participants and the financial responsibilities of Federal and non-Federal sponsors; specifically, determine how EWA costs could be shared between the Federal Government and non-Federal cost-sharing sponsor(s)
- Determine project ownership, operation, and maintenance arrangements
- Identify potential water rights issues associated with an expansion project
- Identify any additional elements or requirements of a locally preferred plan
- Identify a recommended alternative for display in the Feasibility Report

Future economic analyses will likely focus on confirming the valuation methodology and refining the estimate of project costs and benefits. Sensitivity analysis of key variables can provide an indication of how the economic analysis results could change given different assumptions. Based on preliminary estimates, it is recommended that future economic analyses include sensitivity analysis of the following variables:

- Inflation and potential changes in the real growth of water prices over time
- Key demand and supply factors influencing the price of water on the spot market
- Hydrologic variability

Future economic analyses also should evaluate the potential economic tradeoffs between formulating alternatives to provide EWA replacement supplies versus improving Bay Area water supply reliability. In addition, a more thorough estimate of other potential benefit categories and associated methods, including emergency water supply and fishery benefits, is required for feasibility.

Future operations analysis, engineering, and design work is needed to refine facility operations, configuration, size, and cost. These activities should include the following:

- Use the integrated CALSIM-II Common Assumptions Model Package to simulate alternative plans and refine operations for the recommended alternative

- Continue to evaluate both moderate (up to 275 TAF total capacity) and larger (up to 500 TAF total capacity) reservoir expansion opportunities
- Assess hydrodynamic impacts in the Delta, including Delta water quality
- Evaluate sensitivity of CALSIM-II modeling results to various input parameters
- Develop feasibility-level designs and costs for a recommended alternative; specifically, refine facility layouts and configurations, including a potential connection to the SBA