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RECLAMATION

# Final Feasibility Report Executive Summary

Los Vaqueros Reservoir Expansion Investigation



## **Mission Statements**

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

# Final Feasibility Report Executive Summary

Los Vaqueros Reservoir Expansion Investigation, California  
Interior Region 10 • California-Great Basin

*prepared for Reclamation by Stantec under Contract No. R12PC20255, GS-00F-0040L*

Cover Photo: A full Los Vaqueros Reservoir in the spring (Contra Costa Water District)



# Executive Summary

The Los Vaqueros Reservoir Expansion Investigation (Investigation) is a feasibility study that evaluates alternatives for the development and improvement of environmental water supplies, as well as the reliability and quality of those supplies in the San Francisco Bay Area (Bay Area)—primarily through the expansion of Los Vaqueros Reservoir in Contra Costa County, California. This Feasibility Report, created for the Investigation, presents potential plans to accomplish the project objectives and makes recommendations for further action.

Expansion of Los Vaqueros Reservoir, owned and operated by the Contra Costa Water District (CCWD), is being conducted in two phases. A *Final Environmental Impact Statement* (EIS)/*Environmental Impact Report* (EIR) was completed in 2010 (2010 Final EIS/EIR) and served as the basis for Phase 1 construction, which was completed in 2012. A draft *Supplement to the Final EIS/EIR* (Supplement) was released to the public in July of 2017 to reflect all changes that had been made since the 2010 Final EIS/EIR, including refined alternatives that are being considered for Phase 2 of the expansion.

The Feasibility Report, along with the 2010 Final EIS/EIR and Supplement, will be used by the Secretary of the Interior and U.S. Congress to determine both the type and extent of Federal interest in Phase 2.



Photo by Stephen Joseph

Los Vaqueros Reservoir

## Background

Los Vaqueros Reservoir is an offstream storage facility located in the coastal foothills west of the Sacramento-San Joaquin Delta (Delta). CCWD completed construction of the Los Vaqueros Project in 1997 with an original storage capacity of 100 thousand-acre-feet (TAF). CCWD stores water in Los Vaqueros Reservoir that is diverted from the Delta when water quality is favorable for later release and blending when Delta water quality is degraded. An initial expansion, Phase 1, to 160 TAF was completed in 2012 to address seasonal water quality degradation and drought needs. The reservoir also provides important emergency water supply storage, recreation, and flood management.

Expansion of the Los Vaqueros Reservoir was one of five potential surface water storage projects identified by the CALFED Bay-Delta Program (CALFED). In 2001, the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), California Department of Water Resources, and CCWD began appraisal-level studies of the potential to expand Los Vaqueros Reservoir to address

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regional water quality and supply reliability needs. The appraisal-level studies evaluated expanding the reservoir to as much as 500 TAF capacity.

Reclamation was directed by Public Law 108-7 (*Omnibus Appropriations Act of 2003*) to conduct a feasibility-level investigation for the potential expansion of Los Vaqueros Reservoir. In 2004, voters in CCWD's service area approved a ballot measure to evaluate expanding the reservoir. The proposed expansion project was further developed through public outreach and preparation of environmental documentation in accordance with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA).

After the Draft EIS/EIR was published in 2009 by Reclamation and CCWD, a two-step approach was implemented for expanding the Los Vaqueros Reservoir. This allowed CCWD to move forward with an initial expansion that would address urgent water supply and quality needs, particularly during dry years, while the feasibility-level investigation was still in process. The initial Phase 1 expansion was completed as a local action by CCWD, without construction funding from the Federal Government. The CCWD Board of Directors (CCWD Board) certified the EIS/EIR and approved an expansion from 100 TAF to 160 TAF on March 31, 2010 (Reclamation and CCWD 2010). Reclamation issued a Record of Decision in February 2011 to enter into the *Los Vaqueros Reservoir Coordinated Operations Agreement* with CCWD based on the 2010 EIS/EIR. Construction on the initial Phase 1 expansion was completed in 2012.

Reclamation and CCWD have continued to investigate the feasibility of larger expansion alternatives, as documented in this Feasibility Report. This feasibility-level investigation includes updates to Project plans and studies previously performed to account for changes that have occurred since the 2010 EIS/EIR was released and are anticipated to occur within the coming years.



Los Vaqueros Reservoir Phase 1 Dam Raise Construction Activities, September 27, 2011.

## Study Area

Los Vaqueros Reservoir is located in the Kellogg Creek watershed of Contra Costa County, California, as shown in Figure ES-1. The study area for the Investigation includes the Los Vaqueros Reservoir watershed and associated facilities, central and south Delta, and the service areas of potential Bay Area partner water agencies. The central and south Delta is roughly bound by the San Joaquin River on the north and the boundaries of the legal Delta to the south (as established in Section 12220 of the California Water Code).

Prospective partner water agencies include CCWD; Alameda County Water District; Alameda County Flood Control and Water Conservation District, Zone 7; Bay Area Water Supply and Conservation Agency; Byron-Bethany Irrigation District; City of Brentwood; Del Puerto Water District; East Bay Municipal Utility District; East Contra Costa Irrigation District; Panoche Water District; San Francisco Public Utilities Commission; San Luis & Delta-Mendota Water Authority; Santa Clara Valley Water District; and Westlands Water District. These are collectively referred to herein as Local Agency Partners. Other potential partners include the managing agencies of south-of-Delta (SOD) Central Valley Project Improvement Act (CVPIA)-designated wildlife refuges (Refuges): California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and Grassland Water District, in cooperation with Reclamation.



**Figure ES-1. Location of Los Vaqueros Reservoir**

Due to the potential influence on other programs and projects, the study area also includes the Refuges, operational areas of the Central Valley Project (CVP) and State Water Project (SWP), and the service areas of other water agencies that may be indirectly affected.

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### Problems, Needs, and Opportunities

Major identified water and related resources problems, needs, and opportunities in the study area include environmental water management, CVP operational flexibility, Bay Area water supply reliability, and Bay Area water quality, as described below.

#### Environmental Water Management

The CVPIA established fish and wildlife management as a co-equal priority with other CVP water uses. The CVPIA directs the Secretary of the Interior to deliver 555,515 acre-feet per year of firm and reliable water supplies to support the wetland habitat needs of nineteen Federal, state, and private wildlife refuges in California's Central Valley. The refuges encompass a critical portion of the last remaining five percent of the historic wetlands that once existed in the Central Valley, providing birds of the Pacific Flyway habitat during vital migration periods.

CVPIA refuge water supplies are comprised of Level 2 and Level 4 (optimum) supplies. Level 2 water is provided from CVP supplies (about 271,000 acre-feet per year to SOD refuges) and Incremental Level 4 (the difference between Level 2 and full Level 4 supplies and equal to about 105,500 acre-feet per year to SOD refuges) is acquired through voluntary measures. Reclamation's Refuge Water Supply Program (RWSP) was created to implement Section 3604(d) of the CVPIA. The RWSP prefers long-term purchases and permanent water rights acquisition but acquires Incremental Level 4 supplies primarily through short-term (annual) and medium-term (multi-year) purchases or exchanges from willing sellers.

Incremental Level 4 refuge water supply obligations established by the CVPIA are not being fully met at all refuges. From 1994 to 2016, average annual Incremental Level 4 Refuge water supply deliveries were less than 50 percent of required volumes. During the peak of California's drought in 2014 and 2015, the RWSP was unable to acquire any water supplies because of scarcity and high prices.

Challenges in meeting wildlife refuge obligations include the limited availability of water supplies, particularly during droughts; lack of dedicated conveyance and storage capacity for refuge supplies; water quality and groundwater pumping impacts; and the increasing cost of water supplies. Challenges are likely to increase into the future due to forecasted increases in competition for water resources in California. An expanded Los Vaqueros Reservoir could provide a long-term Refuge water supply through dedicated storage and conveyance facilities.



San Joaquin River National Wildlife Refuge

#### CVP Operational Flexibility

The CVP is operated to meet a variety of project purposes, including providing water for irrigation and domestic uses, fish and wildlife mitigation, fish and wildlife enhancement, and water quality. The

CVP has the potential to deliver about 7 million acre-feet (MAF) annually to agricultural and M&I customers in addition to environmental purposes. California's Federal and state water systems have limited flexibility in timing, location, and capacity to meet the multiple purposes of the projects due to operational and demand constraints. The annual delivery capability of 7 MAF exists; however, actual deliveries have been much lower in recent years. For example, approximately 4.8 MAF were delivered for agricultural and M&I users on average between 2009 and 2014, with a high of 6.1 MAF in 2011 and a low of 2.9 MAF in 2014. There are several factors that have significantly affected the availability of the CVP to store and provide water for contract delivery: Delta pumping constraints; the establishment of three major regulations – the CVPIA, State Water Resources Control Board Decision 1641, and the Reasonable and Prudent Alternatives from the 2008/2009 Biological Opinions on Long-Term Operation of the CVP and SWP; and natural variations in water supply based on annual precipitation. These factors diminished CVP project deliveries to meet project purposes. Constraints vary annually based on governing conditions that would result in water available for a particular purpose in any year being restricted for that purpose but potentially being available to serve an alternate CVP project purpose.

Operational flexibility purpose under the Water Infrastructure Improvements for the Nation (WIIN) Act is defined as the benefit accruing to the Federal government from an increased ability to allocate additional water supplies through an investment by the United States in a water supply project. The investment would enable the Federal Government to deliver benefits and better meet project purposes by increasing the efficiency, reuse, or multiple use of existing supplies or by reducing impacts of regulatory or capacity constraints on an existing Reclamation project.

There are opportunities to improve operational flexibility to enhance the CVP's ability to meet CVP demands in an ever-changing environment. This would include providing environmental benefits to anadromous fish, refuges, and water quality, as well as the restoration of CVP deliveries that have been lost due to regulatory changes. Water from the operational flexibility purpose would be allocated by Reclamation to any of Reclamation's authorized purposes based on need and operational ability to fulfill that need.

For the Investigation, an example of an operational constraint is lack of conveyance capacity at Jones and Banks Pumping Plant due to regulatory pumping curtailments to protect fish. Another example of an operational constraint is the inability for a water user to physically take delivery of their CVP contract supply during a certain time of year because of availability of other supplies or lack of storage capacity. For the Investigation, CVP operational flexibility can be accomplished by (1) changing the timing of the CVP water delivery, so that the operational constraint is no longer a factor, or (2) changing the method of delivery (using Los Vaqueros facilities that are not subject to the operational constraint).

### **Water Supply Reliability**

Bay Area water agencies rely heavily on the Delta and other imported water supplies. CCWD customers receive more than 90 percent of their supply from the Delta, while the three Bay Area water agencies that receive water from the SWP each receive 40 to 65 percent of their supply from the Delta (ACWD 2015, SCVWD 2015, Zone 7 2016). However, simulated CVP and SWP contract deliveries in the study area during multi-year drought periods show substantial reductions in

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deliveries, with CVP contract allocations of 34 to 54 percent and SWP contract allocations of 11 to 34 percent. Bay Area water agencies have diversified their water supply portfolios to include increased conservation, water recycling, and multiple sources of supply, including local groundwater and storage. Although these diversified supply portfolios provide flexibility in responding to droughts and emergencies, Bay Area water agencies remain especially vulnerable to Delta supply interruptions and statewide water supply shortages.

During recent droughts, Bay Area water agencies experienced substantial cutbacks in water supply despite aggressive conservation programs, water transfers, and storage in local reservoirs and groundwater basins. There is an increasing need to improve dry-year water supply reliability for Bay Area water agencies and California as a whole. An expanded Los Vaqueros Reservoir, including associated intakes equipped with state-of-the-art fish screens, with new conveyance facilities would improve Bay Area supply reliability.

### **Emergency Water Supply**

California's water operations, as well as Bay Area water agencies, rely on a fragile Delta levee system that is under increasing risks from floods, earthquakes, and climate change. Multiple levee failures, or a failure when Delta inflows are low, could cause saltwater intrusion as far south as the CVP and SWP pumping facilities, affecting the water supplies of millions of Californians. Seismic strain continues to accumulate on Bay Area faults and aging levees are increasingly vulnerable to failure. Sea level rise further compounds these risks. An expanded Los Vaqueros Project could provide a reliable, local source of emergency water supply in the event that Delta water deliveries were disrupted by a severe flood, earthquake, or other long-term outage, without relying on the operation of CVP and SWP facilities.

### **Bay Area Water Quality**

The quality of water supplies in the study area has generally declined over the past century. Water quality in the study area is a function of both water source and volume because Bay Area water agencies typically blend water from local and imported sources to attain a desired quality. The ratio of local to imported supplies in any given year, and effectiveness of blending, depends on CVP and SWP allocations, the quality of supplies drawn from the Delta, and the availability of local supplies. An expanded Los Vaqueros Reservoir, operated with multiple intakes in different Delta locations, would improve Bay Area water users' seasonal and annual access to water of suitable quality.

## **Public Involvement and Outreach and Study Management**

An extensive public and stakeholder involvement process was implemented in Phase 1 that included working groups, public workshops, stakeholder and agency meetings, newsletters, and a project website. Between 2001 and 2006, Reclamation and CCWD conducted more than 170 meetings with regional water task forces, city and county governments, local water agencies, elected officials, media, other Delta-related projects, environmental and stakeholder groups, homeowners' associations in the project area, and potentially affected landowners.

Public and stakeholder involvement has continued throughout Phase 2 of the Investigation, including coordination meetings between the Local Agency Partners and CCWD; multi-agency meetings among Reclamation, CCWD, and Local Agency Partners; and meetings among CCWD, Reclamation, Refuge managers, non-governmental organizations, and other Refuge stakeholders. Public meetings were held after the Supplement to the Final EIS/EIR was released to the public in July 2017 and following release of the public Draft Feasibility Report in February 2018. Public comments were accepted on both the Draft Supplement to the Final EIS/EIR and the Draft Feasibility Report. No significant areas of controversy were raised through these efforts. Comment themes included recreational opportunities that could be provided in conjunction with a project, financing and potential impacts on rate payers, and the potential effects of project operations on other Delta water users.

## Planning Objectives, Constraints, and Considerations

This section discusses the planning objectives, constraints, and considerations specific to the Investigation.

### National Planning Objectives

The Federal objective is defined in the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G) (WRC 1983), which focuses on national economic development. The National Water Resources Policy defined in the *Water Resources Development Act of 2007* (Public Law 110-114, Section 2031), also specifies that Federal water resources investments should reflect national priorities, encourage sustainable economic development, and protect people and the natural environment.

### Investigation-Specific Planning Objectives

The Investigation planning objectives were developed based on identified water resources problems, needs, and opportunities in the study area and specific direction in the study authorization. The Investigation's primary and secondary objectives are to use an expanded Los Vaqueros Reservoir system to:

#### Primary Objectives

- Develop water supplies for environmental water management that support fish protection, habitat management, and other environmental water needs.
- Increase water supply reliability for water providers within the Bay Area, help meet M&I 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 M&I customers in the Bay Area without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

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### Directives and Planning Considerations

Various Federal, state, and local authorizations and directives, as listed below, provide guidance and other considerations specific to the Investigation, which informed alternatives formulation.

- Title III, Subtitle J, of the 2016 *Water Infrastructure Improvements for the Nation Act* (Public Law 114-322) includes provisions for Federal investments in water storage projects. Section 4007 of the act requires the Secretary of the Interior to determine that a proposed State-led storage project is feasible in accordance with Reclamation laws and secure agreement(s) for upfront funding of the non-Federal share of the capital cost.
- The objectives for the Investigation are consistent with the CALFED Programmatic Record of Decision (CALFED 2000a), signed by the Secretary of the Interior, which called for expansion of Los Vaqueros Reservoir by up to 400 TAF with local partners as part of a Bay Area water quality and supply reliability initiative.
- The California *Water Quality, Supply, and Infrastructure Improvement Act of 2014* (Proposition 1) provided \$2.7 billion for California water supply infrastructure projects and designated the California Water Commission as the state agency responsible for allocating these funds through the Water Storage Investment Program. CCWD applied for funding in August 2017 for the Phase 2 expansion, and in July of 2018, the California Water Commission made an initial funding decision of \$459 million towards construction, including \$13.6 million in early funding to support preconstruction activities.
- The CCWD Board has adopted principles and conditions (2003) governing CCWD's participation in an expansion project, restricting participation unless CCWD ownership and management of the Los Vaqueros watershed is ensured, CCWD continues as operator of the Los Vaqueros system, CCWD customer water rates are not increased as a result of the project, and the stated project objectives are met. In 2004, voters in the CCWD service area advised the CCWD Board to participate with Federal, state, and local agencies to pursue project implementation.

### Formulation of Alternative Plans

The Investigation relies on alternative development and screening included in the CALFED Programmatic EIS/EIR. CALFED evaluated and screened 52 potential surface water storage sites and selected several for project-specific studies (2000b): Shasta Lake enlargement, Los Vaqueros Reservoir Expansion, Sites Reservoir, In-Delta Storage, and development of storage in the upper San Joaquin River Basin (CALFED 2000a).

The iterative plan formulation process for the Investigation was separated into three phases. In the Initial Plans Phase, over 30 resources management measures were identified to address the planning objectives and seven were retained for further development in initial plans. The Initial Plans Phase is summarized in the *Initial Alternatives Information Report* (Reclamation 2005) and the *Initial Economic Evaluation for Plan Formulation Report* (Reclamation 2006). Among the key findings, a 275 TAF

reservoir expansion option was identified as an important cost breakpoint and a pipeline with a tie-in to Bethany Reservoir was identified as providing flexibility to deliver water supplies to a variety of potential beneficiaries.

The Alternative Plans Phase included further refinement of the initial plans to develop complete alternative plans, including options to expand Los Vaqueros Reservoir to 160 TAF and 275 TAF. These were analyzed in the 2009 Draft and 2010 Final EIS/EIR (Reclamation and CCWD), which evaluated expansion of Los Vaqueros Reservoir in a two-phase approach with an initial expansion to 160 TAF (Phase 1) followed by a later expansion up to 275 TAF (Phase 2). CCWD completed construction of the initial expansion of Los Vaqueros Reservoir to 160 TAF in 2012 as a local action, without construction funding from the Federal Government.

The Alternative Refinement and Recommended Plan Phase further evaluated the feasibility of a 275 TAF expansion of Los Vaqueros Reservoir (Phase 2) through refinement, evaluation, and comparison of the alternative plans initially evaluated in the 2010 Final EIS/EIR. A draft Supplement was released in July of 2017 to address changes since the 2010 Final EIS/EIR was completed. This Feasibility Report summarizes evaluation of the refined alternatives (Final Alternatives) and identifies a recommended plan for implementation in Phase 2.

## **Final Alternatives**

The Final Alternatives (No Action Alternative and four Action Alternatives) are evaluated in this Feasibility Report.

### **No Action Alternative (No Additional Federal Action)**

Under the No Action Alternative, Reclamation and CCWD would take no additional actions toward implementing the second phase of Los Vaqueros Reservoir expansion to help improve water supply reliability and environmental water management. This alternative would not change operations of the Los Vaqueros Reservoir system and no new facilities would be constructed. Local Agency Partner and Refuge operations would likewise be unchanged. The No Action Alternative provides a basis for comparing potential benefits and effects of alternative plans.

### **Action Alternatives**

The following sections summarize the physical features and operational priorities of the four Action Alternatives. The Action Alternatives are refined versions of the alternatives evaluated in the 2010 Final EIS/EIR with the exception of Alternative 3, which was rejected in the 2010 Final EIS/EIR and is not further refined or evaluated herein. Alternatives 1A, 1B, and 2A include the same physical features, but differ in terms of their operational priorities. Alternative 4A does not include an expansion of Los Vaqueros Reservoir, but it does contain some of the conveyance and operational features common to Alternatives 1A, 1B, and 2A.

### **Physical Features**

The physical features of the alternatives are summarized in Table ES-1. All the Action Alternatives would upgrade the existing Transfer Facility, build a new Transfer-Bethany Pipeline, improve

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Pumping Plant #1, and build a new Neroly High Lift Pump Station. Alternatives 1A, 1B, and 2A would also expand Los Vaqueros Reservoir storage from 160 TAF to 275 TAF, build a new Delta-Transfer Pipeline, and relocate recreational and access facilities inundated by the reservoir expansion. Figure ES-2 shows the facilities associated with the alternatives.

**Table ES-1. Summary of Facilities in the Alternatives**

	No Action	1A, 1B, 2A <sup>1</sup>	4A
<b>Existing Facilities (no change)</b>			
Old River Intake	250 cfs	250 cfs	250 cfs
Middle River Intake	250 cfs	250 cfs	250 cfs
Old River Pipeline	320 cfs	320 cfs	320 cfs
Los Vaqueros Pipeline	400 cfs	400 cfs	400 cfs
Transfer Pipeline (Fill/Release)	200/400 cfs	200/400 cfs	200/400 cfs
EBMUD-CCWD Intertie	155 cfs	155 cfs	155 cfs
Transfer Reservoir	4 million gallons	4 million gallons	4 million gallons
<b>Proposed Modifications to Existing Facilities</b>			
Los Vaqueros Reservoir Capacity	160 TAF	275 TAF	160 TAF
Los Vaqueros Reservoir Maximum Water Surface Elevation	507 feet	560 feet	507 feet
Transfer Facility Pump Station Capacity	150 cfs	200 cfs	200 cfs
<b>Proposed New Facilities</b>			
Transfer-Bethany Pipeline Capacity	None	300 cfs	300 cfs
Delta-Transfer Pipeline Capacity	None	180 cfs	None
Expanded Transfer Facility Pump Station Capacity	None	300 cfs	300 cfs
Expanded Transfer Facility Storage Reservoir Capacity	None	5 million gallons	5 million gallons
Neroly High Lift Pump Station Capacity	None	350 cfs	350 cfs
Pumping Plant #1 Capacity	200 cfs	350 cfs <sup>2</sup>	350 cfs <sup>2</sup>
<b>Los Vaqueros Watershed Facilities</b>			
Los Vaqueros Marina Complex	No change	Relocated upslope	No change
Los Vaqueros Watershed Trails	None	Expanded	None
Los Vaqueros Interpretive Center	No change	Improved	Improved
Los Vaqueros Watershed Office Barn	No change	Seismically upgraded and improved	Seismically upgraded and improved

**Table ES-1. Summary of Facilities in the Alternatives (contd.)**

Notes:

General: Local Agency Partners plan on constructing several projects related to the proposed Los Vaqueros Reservoir expansion.

These include the Brentwood Pipeline, the EBMUD-CCWD Intertie Pump Station, the EBMUD Walnut Creek Pumping Plant Variable Frequency Drives, the EBMUD Mokelumne Aqueduct Relining, and the East Contra Costa Irrigation District Intertie.

These associated local projects are not part of the Federal feasibility study but are important related improvements to Local Agency Partners' infrastructure that would be constructed in conjunction with this project.

<sup>1</sup> Alternatives 1A, 1B, and 2A differ from one another only in the proposed operational priorities of the facilities. Alternatives evaluated in the Investigation are refined versions of the alternatives evaluated in the 2010 Final EIS/EIR. Alternative 3 was rejected in the 2010 Final EIS/EIR and was not evaluated further in Phase 2 of the Investigation.

<sup>2</sup> Permitted capacity is 350 cfs as defined in the Supplement to the Final EIS/EIR. 300 cfs is the capacity modeled and designed under the Feasibility Study to reflect the current operation requirements. Capacity requires improvements to the existing Rock Slough Fish Screen's rake cleaning system, included under Pumping Plant #1 improvements in this Feasibility Report.

Key:

CCWD = Contra Costa Water District

cfs = cubic feet per second

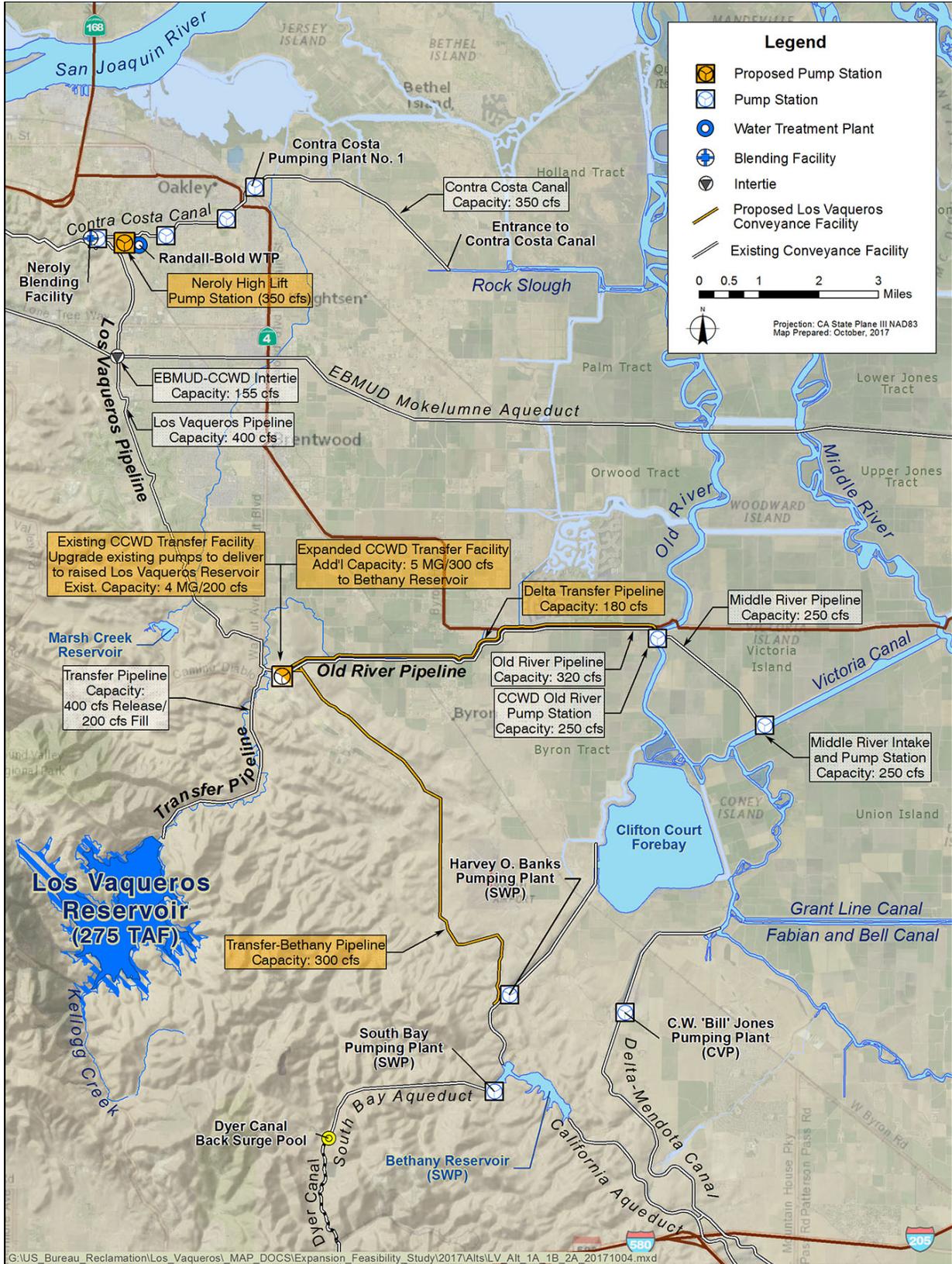
EBMUD = East Bay Municipal Utility District

EIS = Environmental Impact Statement

EIR = Environmental Impact Report

TAF = 1,000 acre-feet

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**Figure ES-2. Major Alternative Components**

### **Operational Priorities**

All alternative plans would utilize CCWD's existing Delta intakes at Old River, Middle River, and Rock Slough to divert water from the Delta. CCWD, Local Agency Partners, and the RWSP may (subject to obtaining the appropriate water rights modifications and other approvals) also receive water diverted from the Freeport Intake on the Sacramento River via the EBMUD-CCWD Intertie. Water diverted at these four locations could be directly delivered to beneficiaries or stored in Los Vaqueros Reservoir for later use.

The Refuges would receive water delivered through the Transfer-Bethany Pipeline to the California Aqueduct. The delivered water would be direct diversions or rediversions from the Delta, or releases from Los Vaqueros Reservoir storage—depending on the alternative plan. The water would be Delta surplus water<sup>1</sup> or water otherwise made available from CCWD, a Local Agency Partner, or the RWSP. The alternatives would not change the manner in which water is conveyed by the RWSP to the various Refuges.

Similarly, water delivered to Local Agency Partners would be direct diversions from the Delta, rediversions from the Delta, or releases from Los Vaqueros Reservoir storage. The water would be Delta surplus water or water available from Local Agency Partner water rights and contracts. In addition, some alternatives include dedicated storage space in Los Vaqueros Reservoir for Local Agency Partner storage and withdrawal, including reserved drought and/or non-drought emergency storage.

All operations were formulated to meet the project objectives while minimizing impacts and avoiding harm to other water users. Water rights modifications, including changes to place of use or points of diversion/redirection, would be required to achieve maximum benefits and operational flexibility and are described later under Implementation Considerations.

The operational differences and priorities for the Action Alternatives are summarized below.

- Alternative 1A is operated to maximize deliveries to the Local Agency Partners, including drought and emergency water supply reliability. The operations first seek to deliver Delta surplus and/or Local Agency Partner's water rights and contract supplies to meet current demands. Available supplies above current demands are stored in Los Vaquero Reservoir for later use in dry years. If additional system capacity is available after these operations, CVPIA Level 2 Refuge water is wheeled through CCWD facilities instead of C.W. Jones Pumping Plant, freeing up capacity. Remaining CCWD system capacity is then used to deliver water supplies SOD to help meet Incremental Level 4 Refuge contract allocations. These operational priorities result in high water deliveries to Local Agency Partners, but the lowest deliveries to Refuges, compared with the other alternative plans.
- Alternative 1B includes the same physical facilities as Alternative 1A but is operated to provide roughly equal water deliveries (on average, long-term) to both Local Agency Partners and Refuges, thereby balancing the Investigation's two primary objectives. Level 2

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<sup>1</sup> "Delta surplus water" is water diverted when the Delta is in excess conditions as defined in the SWRCB's Decision 1641.

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Refuge supplies (which result in increased CVP operational flexibility) are wheeled through CCWD facilities once the needs of Local Agency Partners and Refuges are met, similar to Alternative 1A. In addition, SOD CVP contractor deliveries that would otherwise be limited by Delta conveyance or demand constraints are rescheduled using Los Vaqueros Reservoir expanded storage, resulting in additional CVP operational flexibility. Long-term water supplies previously purchased by the RWSP NOD can also be moved SOD using Los Vaqueros facilities. These operational priorities result in the highest combined benefits to Local Agency Partners, Refuges, and CVP contractors, compared with the other alternative plans.

- Alternative 2A includes the same facilities as Alternatives 1A and 1B but is operated to maximize potential Incremental Level 4 deliveries to the Refuges. Benefits to Refuges occur from both direct deliveries conveyed via CCWD facilities as well as water supplies stored in Los Vaqueros Reservoir. These operational priorities result in the highest benefits to Refuges, compared with the other alternative plans.
- Alternative 4A is formulated to maximize potential project deliveries to both the Local Agency Partners and Refuges, but without the benefit of expanded storage in Los Vaqueros Reservoir. Alternative 4A uses similar operational priorities as Alternative 1B. These operations result in relatively low benefits to Local Agency Partners, Refuges, and CVP contractors, compared with the other alternative plans.

## Plan Evaluation and Comparison

The alternatives were compared based on the four P&G criteria of completeness, effectiveness, efficiency, and acceptability (WRC 1983). Completeness is a determination of whether a plan includes all elements necessary to realize planned benefits and the degree to which the intended benefits might depend on the actions of others. Effectiveness is a determination of the extent to which a final alternative would alleviate problems and achieve objectives. Efficiency is a measure of how efficiently an alternative alleviates identified problems while realizing specified objectives. Last, acceptability is a determination of the workability and viability of a plan concerning its acceptance by other Federal agencies, state and local governments, and public interest groups and individuals.

As summarized in Table ES-2, the alternatives were compared based on the planning objectives and the four P&G criteria. Overall, Alternative 1B was ranked high, Alternatives 1A and 4A were ranked moderate-high, and Alternative 2A was ranked moderate-low.

**Table ES-2. Summary Comparison of the Alternatives**

Criterion	No Action	1A	1B	2A	4A
Effectiveness	None	Moderate	High	Moderate-Low	Moderate
Efficiency	None	Moderate	High	Low	Moderate
Acceptability	None	High	High	High	High
Completeness	None	High	High	High	High
<b>Overall Relative Ranking</b>	<b>N/A</b>	<b>Moderate-High</b>	<b>High</b>	<b>Moderate-Low</b>	<b>Moderate-High</b>

Notes: Rankings are relative to the accomplishments of the other alternatives in meeting the criterion.

Key:

N/A = not applicable

### Summary of Benefits and Costs

Table ES-3 summarizes the long-term average annual benefits of the alternatives, and Table ES-4 compares their associated total national economic development (NED) benefits. See Appendix D – Economic Analysis for a description of the valuation methods and approaches applied. Table ES-5 summarizes estimated field, construction, capital, and annual costs for the alternatives. All cost estimates were developed to a feasibility level.

**Table ES-3. Summary of Estimated Long-Term Average Annual Benefits for the Alternatives**

Benefit	Unit	1A	1B	2A	4A
Increase in M&I Water Supply Reliability	TAF/year	32.4	24.0	7.8	25.5
Emergency Water Supplies Available to M&I Water Purveyors 1	TAF	168.0	148.4	71.2	79.3
Increase in Incremental Level 4 Refuge Water Supplies	TAF/year	35.8	54.6	69.0	41.2
Increase in Irrigation Water Supply Reliability	TAF/year	2.8	8.7	0.0	0.0
Increase in CVP Operational Flexibility	TAF/year	0.0	6.0	0.0	0.0
Increase in recreation days to the Los Vaqueros watershed	visits/year	165,445	165,445	165,445	0

Notes:

<sup>1</sup> Available reservoir storage in a given year that would be available for emergency municipal and industrial use.

Key:

CVP = Central Valley Project

M&I = municipal and industrial

TAF = thousand acre-feet

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**Table ES-4. Summary of Estimated Annual Benefits for the Alternatives (\$ million)**

<b>Benefit Category</b>	<b>1A</b>	<b>1B</b>	<b>2A</b>	<b>4A</b>
M&I Water Supplies <sup>1</sup>	\$23.8	\$17.7	\$5.1	\$18.0
Emergency Water Supplies <sup>2</sup>	\$25.9	\$22.9	\$11.0	\$12.2
Incremental Level 4 Refuge Water Supplies <sup>3</sup>	\$14.4	\$20.9	\$29.0	\$16.4
Irrigation Water Supplies <sup>4</sup>	\$1.2	\$4.7	\$0.0	\$0.0
CVP Operational Flexibility <sup>4</sup>	\$0.0	\$2.9	\$0.0	\$0.0
Recreation <sup>5</sup>	\$0.2	\$0.2	\$0.2	\$0.0
<b>Total Annual NED Benefits <sup>6</sup></b>	<b>\$65.6</b>	<b>\$69.2</b>	<b>\$45.3</b>	<b>\$46.6</b>

Notes:

General: January 2018 price levels. All numbers are rounded for display purposes; therefore, line items may not sum to totals.

<sup>1</sup> Market-based estimates of the cost of water transfers to Bay Area municipal and industrial water agencies.

<sup>2</sup> Market-based estimates of water users' willingness to pay to avoid interruptions in water deliveries.

<sup>3</sup> Market-based estimates of the cost of water transfers to wildlife Refuges in the San Joaquin Valley and of increased value in NOD to SOD water transfers to the Refuges. Represents the value of the increase in Incremental Level 4 Refuge water supplies provided through the Investigation and wheeling of RWSP north-of-Delta supplies south-of-Delta through Investigation facilities.

<sup>4</sup> Market-based estimates of the cost of water transfers to agricultural users in the San Joaquin Valley

<sup>5</sup> Visitation day based estimates using recreation data and U.S. Army Corps of Engineers' Unit Day Values for Recreation.

<sup>6</sup> To account for the annual probability of emergency events causing a Delta supply disruption, of 4.2 percent, non-emergency water supply benefits have been reduced by 4.2 percent.

Key:

CVP = Central Valley Project

M&I = municipal and industrial

NED = National Economic Development

**Table ES-5. Estimated Capital and Annual Costs of the Alternatives (\$ million)**

<b>Cost Item</b>	<b>1A</b>	<b>1B</b>	<b>2A</b>	<b>4A</b>
Construction Costs				
275 TAF Dam Raise	\$300.00	\$300.00	\$300.00	\$0.00
Transfer-Bethany Conveyance Facilities	\$164.36	\$164.36	\$164.36	\$164.36
Delta-Transfer Pipeline	\$51.48	\$51.48	\$51.48	\$0.00
Expanded Transfer Pump Station	\$40.52	\$40.52	\$40.52	\$40.52
Existing Transfer Pump Station Modifications	\$11.79	\$11.79	\$11.79	\$11.79
Neroly High Lift Pump Station	\$33.18	\$33.18	\$33.18	\$33.18
Pumping Plant #1 Improvement <sup>1</sup>	\$25.73	\$25.73	\$25.73	\$25.73
Los Vaqueros Marina Complex Relocation	\$24.40	\$24.40	\$24.40	\$0.00
Los Vaqueros Watershed Trails	\$0.69	\$0.69	\$0.69	\$0.00
Los Vaqueros Interpretive Center Improvement	\$0.84	\$0.84	\$0.84	\$0.84
Los Vaqueros Watershed Office Barn and Interpretive Features	\$0.86	\$0.86	\$0.86	\$0.86
<b>Total Field Cost <sup>2</sup></b>	<b>\$653.84</b>	<b>\$653.84</b>	<b>\$653.84</b>	<b>\$277.27</b>
Non-Contract Cost <sup>3</sup>	\$240.95	\$240.95	\$240.95	\$137.17
<b>Total Construction Cost</b>	<b>\$894.79</b>	<b>\$894.79</b>	<b>\$894.79</b>	<b>\$414.44</b>
Interest During Construction <sup>4</sup>	\$47.70	\$47.70	\$47.70	\$22.12
<b>Total Capital Cost <sup>5</sup></b>	<b>\$942.49</b>	<b>\$942.49</b>	<b>\$942.49</b>	<b>\$436.55</b>
Annual OM&R of Project Facilities <sup>5</sup>	\$10.58	\$10.58	\$10.58	\$8.04
South-of-Delta Conveyance Costs for Refuge Supplies <sup>6</sup>	\$1.89	\$2.44	\$3.65	\$2.18
Increase in Replacement Costs for Existing Facilities - Pumping and Intake Facilities	\$1.01	\$1.68	\$0.75	\$0.35
Increase in Replacement Costs for Existing Facilities	\$1.24	\$1.24	\$1.24	\$1.24
Increased in Annual Energy Costs	\$3.61	\$4.77	\$3.92	\$3.26
<b>Total Annual OM&amp;R Cost</b>	<b>\$18.34</b>	<b>\$20.72</b>	<b>\$20.15</b>	<b>\$15.07</b>
Interest and Amortization of Capital Costs <sup>7</sup>	\$27.76	\$27.76	\$27.76	\$12.86
<b>Total Annual Cost</b>	<b>\$46.10</b>	<b>\$48.48</b>	<b>\$47.91</b>	<b>\$27.93</b>

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**Table ES-5. Estimated Capital and Annual Costs of the Alternatives (\$ million) (contd.)**

Notes:

General: January 2018 price levels. Totals may not sum exactly due to rounding. Project costs in this Federal feasibility study do not include costs for local associated facilities. These costs are included within the project costs considered in the state Water Storage Investment Program grant application.

<sup>1</sup> Includes associated costs for Rock Slough Fish Screen cleaning mechanism. The cost is reduced by an equivalent amount to the existing maintenance and rehabilitation requirements.

<sup>2</sup> Field cost is the sum of the physical construction cost of all project elements. Total construction cost is the sum of total field costs and non-contract costs.

<sup>3</sup> Non-contract costs, including planning, engineering, design, and construction management, are detailed within Appendix C – Engineering. Costs for land acquisitions are also included, as described in Appendix E – Real Estate.

<sup>4</sup> Interest during construction is based on a 2.75 percent Federal discount rate over each facility's scheduled construction period.

<sup>5</sup> These OM&R costs cover only new or modified facilities.

<sup>6</sup> Cost incurred by the Refuge Water Supply Program to convey water from the head of the California Aqueduct (point of delivery from the proposed facilities) to the individual Refuge boundaries. These conveyance costs were estimated by Reclamation to be about \$50 per acre-foot of delivered Refuge water.

<sup>7</sup> Interest and amortization is based on a 2.75 percent Federal discount rate over a 100-year period of analysis.

Key:

TAF = thousand acre-feet

OM&R = operations, maintenance, and replacement

A comparison of the NED benefits, costs, and benefit-cost ratios of each alternative are shown in Table ES-6. Three of these alternatives have a benefit-cost ratio above one. Alternative 2A has a negative net NED benefit and a benefit-cost ratio below one. Alternative 1B would generate the maximum net economic benefits, \$20.7 million annually.

**Table ES-6. Summary of Estimated Annual Costs and Benefits for the Alternatives (\$ million)**

	1A	1B	2A	4A
Total Annual NED Benefits	\$65.6	\$69.2	\$45.3	\$46.6
Total Annual Cost <sup>1</sup>	\$46.1	\$48.5	\$47.9	\$27.9
<b>Net NED Benefits</b>	<b>\$19.5</b>	<b>\$20.7</b>	<b>-\$2.6</b>	<b>\$18.7</b>
<b>Benefit Cost/Ratio</b>	<b>1.42</b>	<b>1.43</b>	<b>0.94</b>	<b>1.67</b>

Note: January 2018 price levels.

<sup>1</sup> Annual costs include total capital costs (annualized based on a 2.75 percent Federal discount rate over a 100-year period of analysis), annual energy costs, and annual operations, maintenance, and replacement costs.

Key:

NED = National Economic Development

### Rationale for Plan Selection

As required by the P&G, the plan with the greatest net NED benefits is to be identified as the NED Plan and is typically selected for recommendation to the Secretary of the Interior for consideration and approval (WRC 1983). A plan recommending Federal action is to be the plan that best addresses the targeted water resources problems considering public benefits relative to costs.

Alternative 1B is the NED Plan, and has also been identified by the non-Federal sponsor as the Locally Preferred Plan. Alternative 1B has the highest net NED benefit (\$20.7 million) among the alternatives and ranks the highest with respect to the four planning criteria. Alternative 1B provides

water supply benefits to a variety of beneficiaries (M&I, environmental, and agricultural). This alternative would balance the need to provide reliable Refuge water supplies in all year types with the seasonal/dry-year water supply needs of M&I and agricultural agencies. This alternative also provides operational flexibility to the CVP through additional water storage and conveyance capacity through the Delta. Alternative 1B has received expressions of support from all Local Agency Partners and was the basis for a preliminary State funding award under Proposition 1.

## Feasibility Determination

Feasibility determination assesses four aspects of feasibility:

- **Technical feasibility** – consisting of engineering, operations, and constructability analyses verifying that it would be physically and technically possible to construct, operate, and maintain the project.
- **Environmental feasibility** – consisting of analyses verifying that constructing or operating the project would not result in unacceptable environmental consequences.
- **Economic feasibility** – consisting of analyses verifying that constructing and operating the project would result in positive net NED benefits.
- **Financial feasibility** – consisting of examining and evaluating project beneficiaries' ability to repay their allocated portion of the Federal investment in the project over a period of time, consistent with applicable law.

### Technical Feasibility

The Recommended Plan (Alternative 1B) is projected to be technically feasible. It is constructible and can be operated and maintained.

Design, Engineering, and Cost (DEC) Reviews were conducted by Reclamation in 2007 and 2018. Except for geotechnical investigations along the Transfer-Bethany Pipeline alignment that are planned to occur post-authorization, all DEC recommendations have been addressed in this Final Feasibility Report. The approaches taken to address uncertainties are acknowledged in the signed November 2018 *Responses to Findings and Recommendations from the Independent Design, Estimating, and Construction (DEC) Review of the Los Vaqueros Expansion Investigation*. Additional information on the DEC reviews can be found in Chapter 6 of the Feasibility Report.

Although new facilities would be constructed and operational priorities would change under the Recommended Plan, the types of facilities and water diversion/storage operations would be similar to that of the existing Los Vaqueros Project; therefore, there is high confidence the project would be technically and operationally feasible. Additional operations and maintenance costs are anticipated for the new project features, but minimal changes are expected in maintenance requirements for existing project features. Other operations and maintenance considerations include increased pumping requirements associated with increased delivery of water supplies.

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### **Environmental Feasibility**

The Recommended Plan (Alternative 1B) was evaluated in the 2010 Final EIS/EIR and in the Supplement, which included detailed discussion of possible effects and proposed mitigation measures. No significant and unavoidable impacts were identified for the Recommended Plan as presented herein. Some adverse effects would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation. Environmental commitments and best management practices to avoid or minimize potential effects will be incorporated in the design, construction, and operations and maintenance phases of the project. The Recommended Plan would have less-than-significant impacts with mitigation.

### **Economic Feasibility**

The Recommended Plan (Alternative 1B) provides the greatest net NED benefits of the alternatives evaluated and is projected to be economically feasible, generating net benefits of \$20.7 million annually. Alternate valuation methods and sensitivity analyses (presented in Appendix D – Economic Analysis) demonstrate that, overall, the estimated economic benefits values and assumptions are reasonable.

### **Financial Feasibility**

Financial feasibility determination during the planning stage consists of (1) allocating costs to project purposes, (2) assigning Federal and non-Federal costs for each identified project purpose, (3) identifying potential project beneficiaries, and (4) determining project beneficiaries' potential ability to pay their allocated and assigned costs, including capital and long-term operations, maintenance, and replacement costs.

A separable costs-remaining benefits analysis was performed to equitably allocate all costs to the project purposes for the Recommended Plan. For Alternative 1B, these costs amount to a total construction cost of \$894.8 million. Costs were allocated to the six project purposes: M&I water supply, emergency water supply, irrigation water supply, CVP operational flexibility, Incremental Level 4 Refuge water supply, and recreation. Table ES-7 summarizes the allocation of costs for the Recommended Plan.

**Table ES-7. Summary of Initial Cost Allocation by Project Purpose for the Recommended Plan (Alternative 1B)**

	M&I Water Supply	Emergency Water Supply	Irrigation Water Supply	CVP Operational Flexibility	Refuge Water Supply	Recreation	Total
Total Construction Costs (\$ million)	\$236.4	\$306.2	\$62.7	\$38.4	\$247.1	\$4.0	\$894.8
(% of total)	26.4%	34.2%	7.0%	4.3%	27.6%	0.4%	100.0%
Total Annual OM&R Costs (\$ million/year)	\$4.8	\$6.3	\$1.3	\$0.8	\$7.5	\$0.0	\$20.7
(% of total)	23.4%	30.3%	6.2%	3.8%	36.2%	0.2%	100.0%

Note:

General: January 2018 price levels. All numbers are rounded for display purposes; therefore, line items may not sum to totals.

Key:

CVP = Central Valley Project

M&I = municipal and industrial

OM&R = operation, maintenance, and replacement

Tables ES-8 and ES-9 summarize costs assigned to project purposes consistent with existing Federal authorities and state laws. Note that Federal costs assigned to the Recommended Plan are compliant with the maximum Federal cost share that would be allowed under the WIIN Act (25 percent of total construction cost). Additional detail on cost allocation and assignment can be found in Appendix G – Cost Allocation. A final cost allocation would be performed when project construction is substantially complete.

Federal funds are requested under the WIIN Act. Operations, maintenance, and replacement (OM&R) costs under the CVP operational flexibility project purpose will be assigned as determined through financial plans with the beneficiaries of these additional supplies. Non-Federal costs will be funded by Local Agency Partners and the State.

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**Table ES-8. Initial Construction Cost Assignment for the Recommended Plan (Alternative 1B)**

Construction Cost Assignment Summary (\$ million)					
Purpose/Action	Non-Federal		Federal		Total
	Assigned Percentage	Cost	Assigned Percentage	Cost	Cost
M&I Water Supply <sup>1</sup>	100%	\$236.4	0%	\$0.0	\$236.4
Emergency Water Supply <sup>1</sup>	100%	\$306.2	0%	\$0.0	\$306.2
Irrigation Water Supply <sup>2</sup>	100%	\$62.7	0%	\$0.0	\$62.7
CVP Operational Flexibility <sup>3</sup>	0%	\$0.0	100%	\$38.4	\$38.4
Refuge Water Supply <sup>4</sup>	25%	\$61.8	75%	\$185.3	\$247.1
Recreation <sup>5</sup>	100%	\$4.0	0%	\$0.0	\$4.0
<b>Total</b>	<b>75%</b>	<b>\$671.1</b>	<b>25%</b>	<b>\$223.7</b>	<b>\$894.8</b>

Notes, General: January 2018 price levels. All numbers are rounded for display purposes; therefore, line items may not sum to totals.

<sup>1</sup> Cost assignment for M&I water supply and emergency water supply is based on Reclamation Act of 1939, as amended. The Investigation is not pursuing Federal funding for these benefits, although this authority was considered during initial determination of Federal interest in the Investigation.

<sup>2</sup> Cost assignment for irrigation is based on Reclamation Act of 1902, as amended. The Investigation is not pursuing Federal funding for these benefits, although this authority was considered during initial determination of Federal interest in the Investigation.

<sup>3</sup> Cost assignment for CVP operational flexibility is based on the WIIN Act (Public Law 114-322).

<sup>4</sup> Cost assignment for Refuge water supply is established to meet the maximum Federal cost sharing requirements of the WIIN Act. In exchange for upfront Federal construction funding, Reclamation will receive Refuge water supplies at no cost. The State of California will provide the non-Federal cost share through Water Storage Investment Program component of Proposition 1. Reclamation has determined that Investigation construction costs associated with Refuge water supply benefits are ineligible for credit under the CVPIA cost-sharing agreement between the State and Reclamation.

<sup>5</sup> Federal law does not require the Federal Government to cost-share recreational benefits. The Investigation is not pursuing Federal funding for this benefit. State and local cost share funding will be applied towards the non-Federal cost assignment.

Key:

CVP = Central Valley Project

M&I = municipal and industrial

**Table ES-9. Initial Annual OM&R Cost Assignment Summary for the Recommended Plan (Alternative 1B)**

Annual OM&R Cost Assignment Summary (\$ million/year)					
Purpose/Action	Non-Federal		Federal		Total
	Assigned Percentage	Cost	Assigned Percentage	Cost	Cost
M&I Water Supply <sup>1</sup>	100%	\$4.84	0%	\$0.00	\$4.84
Emergency Water Supply <sup>1</sup>	100%	\$6.27	0%	\$0.00	\$6.27
Irrigation Water Supply <sup>2</sup>	100%	\$1.28	0%	\$0.00	\$1.28
CVP Operational Flexibility <sup>3</sup>	0%	\$0.00	100%	\$0.79	\$0.79
Refuge Water Supply <sup>4</sup>	75%	\$5.67	25%	\$1.83	\$7.50
Recreation <sup>5</sup>	100%	\$0.03	0%	\$0.00	\$0.03
<b>Total</b>	<b>87%</b>	<b>\$18.09</b>	<b>13%</b>	<b>\$2.62</b>	<b>\$20.71</b>

Notes, General: January 2018 price levels. All values are rounded for display purposes; therefore, line items may not sum to totals.

<sup>1</sup> Cost assignment for M&I water supply and emergency water supply is based on Reclamation Act of 1939, as amended. The Investigation is not pursuing Federal funding for these benefits, although this authority was considered during initial determination of Federal interest in the Investigation.

<sup>2</sup> OM&R costs under the irrigation water supply purpose will be assigned as determined through financial plans with individual beneficiaries.

<sup>3</sup> OM&R costs under the CVP operational flexibility are assumed to be 100 percent federal.

<sup>4</sup> Cost assignment for conveyance of Refuge water supplies from the head of the California Aqueduct to Refuge boundaries is based on the Central Valley Project Improvement Act, Public Law 102-575, which calls for 75 percent Federal and 25 percent non-Federal cost-sharing. Cost assignment for OM&R associated with Recommended Plan facilities (Los Vaqueros Project facilities) was assigned as 100 percent non-Federal, to be paid by the project proponents. The project proponents have expressed a willingness to pay this cost. In exchange for upfront Federal construction funding, Reclamation will receive Refuge water supplies at no cost. This results in an overall cost share of Refuge OM&R of 25 percent Federal and 75 percent non-Federal.

<sup>5</sup> Federal law does not require the Federal Government to cost-share these recreational benefits. The Investigation is not pursuing Federal funding for this benefit. State and local cost share funding will be applied towards the non-Federal cost assignment.

Key:

CVP = Central Valley Project

M&I = municipal and industrial

OM&R = operations, maintenance, and replacement

In exchange for upfront Federal construction funding, Reclamation will receive Refuge water supplies at no cost. Under the planned assignment of costs for the Recommended Plan, the RWSP would be responsible for paying conveyance costs associated with delivering water supplies from the head of the California Aqueduct to the Refuge boundaries, consistent with the cost share requirements of the CVPIA. These costs would vary by year, depending on hydrology and the amount of water delivered from the project.

Pursuant to Section 4007 of the WIIN Act, upfront cost sharing of costs assigned to non-Federal participants will be provided. Therefore, a financial ability-to-pay analysis is not required for non-Federal participants. The Department of the Interior would negotiate and enter into an agreement with non-Federal partners on behalf of the United States for planning, permitting, design, and construction costs up to 25 percent of the total project cost.

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CCWD is pursuing funding for \$459 million towards Alternative 1B from the State of California under the Water Storage Investment Program component of Proposition 1. The California Water Commission made a preliminary funding decision for the project in July of 2018. CCWD is currently negotiating an agreement to receive \$13.6 million in early funding to support post-feasibility planning, engineering, and design. It is anticipated that funds awarded through Proposition 1 would be applied towards the non-Federal costs, with individual Local Agency Partners contributing the remainder. Since the funding request is less than the total non-Federal portion of project costs, State funding would not significantly impact the Federal cost share. Reclamation has determined that Investigation construction costs associated with Refuge water supply benefits are ineligible for credit under the CVPIA cost-sharing agreement between the State and Reclamation. No funding from California's Proposition 1 is assumed in the initial cost assignment and allocation, pending completion of funding agreements with the California Water Commission.

## Key Findings

The following sections summarize key Investigation findings and implementation considerations.

- A need exists to increase CVP operational flexibility, to increase the reliability of water supplies delivered to the Bay Area and south of the Delta, and to secure long-term water supplies for CVPIA wildlife refuges.
- A range of alternatives were formulated and evaluated to address the study objectives, and multiple plans were found to be cost-effective. The benefit-cost ratio for Alternative 1A is 1.42; for Alternative 1B is 1.43; for Alternative 2A is 0.94; and for Alternative 4A is 1.67.
- Alternative 1B, the NED Plan and the Locally Preferred Plan, is the Recommended Plan.
- Alternative 1B was found to be technically, environmentally, economically, and financially feasible.
- Reclamation's interest in the action is based upon the agency's mission "to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public." Federal interest is also emphasized through existing authorities, including the WIIN Act and CVPIA.
- The Recommended Plan provides positive NED benefits for M&I, agricultural, and environmental purposes. The total construction cost of the Recommended Plan is \$894.8 million and the total annual cost is \$48.5 million. The annual net economic benefit is \$20.7 million per year.
- The WIIN Act provides for Federal cost sharing of up to 25 percent for State-led storage projects that contribute to meeting a Federal obligation. The Recommended Plan contributes to meeting the Federal obligation for delivering water supplies to CVPIA wildlife refuges, and also improves CVP operational flexibility. The Federal cost share of

construction costs for the Recommended Plan is \$223.7 million (25 percent of the total construction costs) and the non-Federal share is \$671.1 million. The non-Federal cost share will be borne by Local Agency Partners. State funds provided through Proposition 1 or other sources may be applied towards either cost share. Reclamation has determined that Investigation construction costs associated with Refuge water supply benefits are ineligible for credit under the CVPIA cost-sharing agreement between the State and Reclamation.

- The Recommended Plan as described in this Feasibility Report is identified as having no significant and unavoidable impacts. Some of the adverse effects identified would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation.
- There is strong local and State support for the Recommended Plan. The California Water Commission made an initial funding determination in June 2018 for \$459 million. This funding, when finalized through a contractual funding agreement between CCWD and the State of California, would contribute towards the non-Federal cost-share of public benefits. The State issued a letter to the Secretary of Interior on August 27, 2018 requesting Federal funding for the project under the WIIN Act.
- The Recommended Plan is consistent with other projects and programs:
  - The Recommended Plan would contribute to CALFED objectives, including water supply reliability and environmental water supply reliability.
  - The Recommended Plan would comply with CVPIA objectives by providing a more reliable, long-term Incremental Level 4 water supply to the Refuges. The Department of the Interior is obligated to provide full Level 4 water supplies to the Refuges. In exchange for upfront Federal construction funding, Reclamation will receive Refuge water supplies at no cost.
  - The Recommended Plan meets the requirements for a State-led storage project under the WIIN Act.
  - The Recommended Plan is consistent with the goals and objectives of the State of California's Water Storage Investment Program under Proposition 1.

## Implementation Considerations

### Implementation Requirements

After this Final Feasibility Report is completed, a number of requirements will remain before the project can be implemented. These requirements are described below.

#### ***Agreement on Up-Front Cost-Share with Non-Federal Partner***

Consistent with the WIIN Act, the Secretary of the Interior would need to negotiate and enter into an agreement with non-Federal partner(s) on behalf of the United States for planning, permitting,

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design, and construction costs. Section 4007 of the Act contains a set of requirements that must be met prior to funding. Of these requirements, this feasibility report confirms the following:

- The State-led storage project is technically and financially feasible and provides a Federal benefit in accordance with Reclamation laws;
- In return for the Federal cost-share investment in the State-led storage project, a proportional share of the project benefits are the Federal benefits, including water supplies dedicated to wildlife refuges; and
- The Federal cost-share is an amount equal to but not more than 25 percent of the total cost of the State-led storage project.

The following Section 4007 requirements have been met by CCWD, as the local sponsor, and the State of California:

- Federal participation has been requested by the Governor of the State in which the State-led storage project is located. In August 2018 the Governor of California made a formal request to the Secretary of the Interior for Federal participation.
- California Water Commission has determined that the State-led storage project is consistent with the *California Water Quality, Supply, and Infrastructure Improvement Act*, approved by California voters on November 4, 2014.

CCWD, as the local sponsor, and the State of California must assist in confirming the following remaining Section 4007 requirements, as they are determined:

- Sufficient non-Federal funding is available to complete the State-led storage project.
- The State-led storage project sponsors are financially solvent.

### **Project Funding**

The Recommended Plan is eligible to receive funding under the WIIN Act as a State-led storage project and would be eligible for Federal funding up to 25 percent of total cost. The completed project would be locally owned (not a Federal facility). The non-Federal cost-share partner would be a public entity organized pursuant to California law and would request an agreement with the United States for the permitting, design, and construction of the Recommended Plan. Funding could be provided for the project if enacted appropriations legislation designates funding to it by name, after the Secretary recommends the specific project for funding and transmits such recommendation to the appropriate Congressional committees.

### **Water Rights**

No new water rights are anticipated for the Recommended Plan, but water rights modifications – including changes to place of use or points of diversion/diversion – would be required to achieve

maximum benefits and operational flexibility (see also Chapter 6). Most of the refuge deliveries (about 90 percent) would not require any changes to existing water rights.

CCWD has both a long-term contract with Reclamation for CVP water and separate water rights for storage of Delta surplus water in 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 CVP and SWP operations. Water would also be diverted under the existing CVP and SWP contracts and water right permits of Local Agency Partners and other transfer partners, modified as needed. No new water rights are envisioned, and the majority of Refuge deliveries (about 90 percent) require no changes to existing water rights. New diversions to storage would likely require modifications to existing CVP and SWP water rights.

Petitions to modify existing water rights will be made to the State Water Resources Control Board during the planning, engineering and design phase, and will require coordination among Reclamation, CCWD, and Local Agency Partners. Reclamation would also have to make the determination that the proposed changes and project operations would not injure Reclamation water rights. Results will be summarized in a post-authorization report.

### **Operational Agreements and Plans**

Per Article XIV and Article XVI of the 1986 operations agreement between the United States and the State of California for Coordinated Operations of the CVP and SWP<sup>2</sup>, project operations must be reviewed when adding a state or Federal facility to the system. Although the facilities proposed under the Action Alternatives would be locally owned (not Federal or state), an operations agreement between Reclamation and CCWD would be developed to address the long-term planning and integration processes and how the additional water supplies provided by the project would be managed in coordination with existing water supplies and system features. This operations agreement would update or replace the existing *Los Vaqueros Reservoir Coordinated Operations Agreement* between Reclamation and CCWD (executed April 28, 2011). This agreement will address the long-term planning and integration processes, the change of the Los Vaqueros functionality from a single user reservoir (CCWD) to a water supply functioning reservoir, and how the additional water supplies provided by the project would be managed in coordination with existing water supplies, system features, and common goals under the Coordinated Operations of the CVP and SWP. The operations agreement and/or separate agreements between Reclamation and CCWD would include use of CVP power for conveying water supplies to Refuges and costs associated with Refuge deliveries.

The principles of an updated operations agreement between Reclamation and CCWD are under development by both agencies and are likely to be similar to those included in the 2011 *Los Vaqueros Reservoir Coordinated Operations Agreement* between CCWD and Reclamation. In addition to those issues covered in the existing agreement, operational issues to be addressed in a revised or new integrated operations agreement include the following:

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<sup>2</sup> Note that DWR and Reclamation agreed to an addendum to COA in December 2018 outlining key changes on how reservoir releases and export capacity will be shared.

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- Annual protocol for identifying the availability of and scheduling for Incremental Level 4 water deliveries for the Refuge Water Supply Program.
- Protocol for use of EBMUD's Freeport facilities for diversion of Refuge water supplies that will be delivered through the project.
- Protocol for scheduling and operational coordination for the wheeling of transfer water acquired by Reclamation for delivery to the Refuges through the Los Vaqueros system.
- Protocol for annual start-of-year scheduling and end-of-year reporting of project deliveries to Refuges to the RWSP and Central Valley Operations Office as needed for the CVPIA work plan or for other purposes.
- Protocol for annual scheduling and reporting of project diversions of CVP water and deliveries to CVP contractors.
- Protocol for coordination on WIIN Act reporting requirements and WIIN Act opportunities, including opportunities to increase deliveries to SOD CVP purposes.
- Protocol for exploring adaptive management to increase deliveries to Refuges while protecting the Delta ecosystem.

CCWD, in collaboration with project partners or beneficiaries, would coordinate to develop other plans and agreements required for project implementation, operations, and maintenance. These would include agreements between CCWD and DWR for an easement for construction and operation of the intertie between the Transfer-Bethany Pipeline and the California Aqueduct on land owned by DWR; for maintenance associated with the interconnection of the Transfer-Bethany Pipeline with the California Aqueduct; for use of the California Aqueduct and the South Bay Aqueduct and associated coordination of operations with the State Water Project for diversion, storage and delivery of Local Agency Partners' SWP water, as needed; and for long-term monitoring of the ecosystem, emergency response, and recreation benefits funded by the California Water Commission. CCWD would also execute agreements with the Local Agency Partners for costs associated with agricultural and M&I water supplies.

### ***Regulatory and Related Requirements for Environmental Compliance***

Construction and operation of the Recommended Plan would be subject to the requirements of Federal, state, and local laws, policies, and environmental regulations, as described in this Feasibility Report, and/or as supplemented or modified by authorizing legislation. Reclamation and/or the CEQA lead agency would need to obtain various Federal, state, and local permits and regulatory authorizations before project construction would begin. A list of potential permits and approvals is included in the Supplement.

Federal, state, and local agencies with permitting or approval authority are expected to use the 2010 Final EIS/EIR and the Supplement to make decisions and/or issue permits for an authorized project. Implementation of an authorized project would include review of prior consultation under

the Fish and Wildlife Coordination Act and implementation of any associated recommendations, as appropriate. An addendum to the 2011 Coordination Act Report, which was prepared for Phase 1 expansion of Los Vaqueros Reservoir, will be prepared and published by U.S. Fish and Wildlife Service. In addition, permits and consultations may be required with the U.S. Army Corps of Engineers, the California Department of Fish and Wildlife, National Marine Fisheries Service, and U.S. Fish and Wildlife Service.

### ***Preconstruction Activities***

If the Secretary of Interior recommends and Congress appropriates funds for construction of the Recommended Plan, Reclamation and CCWD, in collaboration with project partners, would initiate and complete required preconstruction activities. Key activities include the following:

- Complete additional surveys and geotechnical investigations for final designs.
- Refine designs and cost estimates; update analyses of potential effects and economics (and related NEPA and/or CEQA analyses and documentation, if necessary); prepare an initial cost allocation; and prepare detailed plans, specifications, and bid packages.
- Establish agreements with key project partners and stakeholders related to planning, design, and construction activities.
- Establish agreements for state-funded activities, including contributed funds agreements and agreement with the California Department of Fish and Wildlife for ecosystem benefits under Proposition 1.
- Acquire lands, easements, and rights of way.
- Conduct a detailed operations study to examine integrated operations, consistent with existing and modified water right permits.
- Develop and/or revise the operations agreement for the Recommended Plan.
- Develop facility maintenance, power, and related plans.
- Modify water right permits.

### ***Federal and Non-Federal Responsibilities***

Federal and non-Federal obligations and requirements would be included in a project cooperation agreement (or agreements).

After a project cooperation agreement (or agreements) is signed and non-Federal partners have provided required financial contributions and assurances, the Federal Government would have the following roles and responsibilities:

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- Process the Final Supplement to the Final EIS/EIR, complete all Federal permitting, and prepare a Record of Decision.
- Prepare a final operating plan(s) and other required agreements.
- Prepare a post-authorization report.
- Enter into cost-share agreement with CCWD or a Joint Power Authority.
- Modify Reclamation water rights, as described herein.

CCWD, as owner and operator of the existing Los Vaqueros Project, and a future JPA would take a lead role in final design and construction of project facilities, in coordination with Reclamation. CCWD would continue to own existing project facilities and CCWD and/or a future JPA would own completed new project facilities. Operations would occur in coordination with CCWD and/or a future JPA and the RWSP. CCWD and/or a future JPA would have the following roles and responsibilities:

- Process and certify the Final Supplement to the 2010 Final EIS/EIR.
- Complete investigation and design of all project facilities, including mitigation requirements.
- Modify CCWD water rights and Local Agency Partner water rights, as described herein.
- Enter into an agreement with CDFW for administration of ecosystem public benefits funded under Proposition 1.
- Enter into an agreement with DWR for administration of emergency supply and recreation public benefits funded under Proposition 1
- Coordination with Local Agency Partners to secure up-front project funding.
- Acquire real estate.
- Construct the new project facilities, including mitigation.
- Own and operate the completed facilities.

CCWD would remain the operator and maintainer of all facilities associated with the project, with the involvement of Local Agency Partners as part of a JPA.

## Risk and Uncertainty

Certain assumptions were made based on engineering, economic, and scientific judgment. While this is effective in helping estimate relative outcomes, various risks and uncertainties could affect implementation, including the following:

- Potential climate variabilities could produce conditions that differ from today, affecting future CVP and SWP operations. The Investigation alternatives were evaluated under 2030 and 2070 climate scenarios. The analysis concluded that the Recommended Plan continued to provide benefits under a range of future climate scenarios.
- Future water system operations and facilities may change, in addition to changing operational constraints, hydrology, demands, and regulatory conditions in California. Unknown aspects of future water system operations include the construction of new storage and conveyance projects. Sensitivity analysis using planned California WaterFix operations under CCWD's 2016 settlement agreement with the State of California, showed that the Recommended Plan continued to provide benefits with WaterFix in place.
- Realization of benefits under the Recommended Plan will require a new or amended *Los Vaqueros Reservoir Coordinated Operations Agreement* between Reclamation and CCWD. CCWD would also coordinate to develop other plans, agreements, and contractual changes required for project implementation, operations and maintenance, including agreements with the State of California. Project implementation is contingent on project partners reaching consensus on operational agreements. Modifications to existing water right permits would be required to achieve maximum benefits and operational flexibility under the Recommended Plan. The SWRCB may determine new water rights are required in lieu of or in addition to changes to existing water rights. Uncertainty exists in whether Reclamation, DWR, and local partners will be able to reach agreement on operations and water rights permit terms and conditions. Further, protests may be made on any water right change petition.
- Construction cost estimates have inherent risks and uncertainties due to unknown future labor, market, and field conditions. Much information is known about physical conditions in the vicinity of the proposed project features due to design and construction activities associated with the existing Los Vaqueros Project. Reclamation conducted DEC reviews in 2007 and 2018. With the exception of geotechnical investigations along the Transfer-Bethany Pipeline alignment that are planned during preconstruction, all DEC recommendations have been addressed in this Final Feasibility Report.
- The timing, source, and availability of funding will affect the construction schedule and cost estimates included in the Feasibility Report.
- The estimation of the economic benefits of potential project accomplishments is subject to uncertainties associated with valuation methods and assumptions. Economic risk and uncertainty sensitivity analyses demonstrate that the estimated economic benefit values are reasonable and consistent with values generated through alternate valuation methods.
- Assuming no changes to the RWSP's historical Incremental Level 4 acquisition patterns, approximately 31.2 TAF of project Refuge water deliveries could be in excess of Incremental Level 4 Refuge obligations during wet years. The RWSP is limited to the volumes established in the CVPIA, and there is no clear mechanism for how additional supplies could be

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acquired and delivered by the RWSP. Potential options to utilize the Refuge water supplies in excess of Incremental Level 4 obligations have been identified, including reducing historical water acquisitions by the RWSP during wet years and/or exchanging additional water supplies with another entity in return for later deliveries.

- In addition to Federal funding, non-Federal funding for a majority of the construction costs will need to be secured for the Secretary of the Interior to recommend WIIN Act funding for construction. A conditional funding award was made by the State of California that would cover a large portion of the non-Federal costs. Financing arrangements are being actively explored by CCWD and the Local Agency Partners for remaining of non-Federal costs.

## Timeline of Authorization and Construction

Project implementation is expected to take place in two phases. The initial phase is estimated to span approximately five years after construction authorization and would include: developing detailed project designs, acquiring necessary permits, acquiring required real estate interests, and other preconstruction activities. Once these activities are complete for individual work packages, construction of major project features would begin. Design and construction activities for project features would likely span seven years.

## Recommendations

The overall recommendation of this Feasibility Report is that the Secretary of the Interior, acting through Reclamation, participate in funding and implementing Alternative 1B, including the environmental commitments and mitigation measures identified in the Supplement to the Final EIS/EIR. The WIIN Act provides authority for the Secretary of the Interior to (1) participate in State-led storage projects, and (2) provide financial assistance to carry out these projects within any Reclamation State, subject to a set of requirements. This Feasibility Report documents partial confirmation of these requirements, and remaining requirements are expected to be confirmed through action by the State of California and CCWD.

## Summary of Recommended Plan

The Recommended Plan (Alternative 1B) would include expansion of Los Vaqueros Reservoir to 275 TAF from the current 160 TAF capacity; a new conveyance pipeline from Transfer Station to Bethany Reservoir; a new conveyance pipeline from the existing Old River Intake to Transfer Station; and expanded pumping station and facility upgrades at Transfer Facility, Neroly High Lift Pump Station, and Pumping Plant #1.

New facilities would be operated in combination with existing Los Vaqueros Project facilities. Available Delta water supplies would be moved through project facilities to meet Local Agency Partner demands and Incremental Level 4 Refuge contract allocations. When system capacity is available, water would also be moved to storage in Los Vaqueros Reservoir for later use in meeting Local Agency Partner demands and/or Refuge contract allocations. Incremental Level 4 supplies would not replace current short- and mid-term acquisitions by the RWSP but would be in addition

to current acquisitions and would contribute toward meeting unmet refuge water supply obligations established by the CVPIA. During certain conditions, irrigation water supplies are provided when a portion of Level 2 Refuge supplies are wheeled through CCWD facilities, freeing pumping capacity at C.W. Jones Pumping Plant to move additional water SOD.

The Recommended Plan would provide increased water supplies to M&I users, agricultural users, and to Refuges; would improve CVP operational flexibility; and would provide emergency water supplies. Water supplies provided would vary by year type.

- **Municipal and industrial supplies** provided to Local Agency Partners are estimated to be about 24.0 TAF/year (long-term average).
- **Refuge water supplies** are estimated to be about 54.6 TAF/year (long-term average), and as high as 98.6 TAF/year in wet years.
- **Irrigation water supplies** provided to Local Agency Partners are estimated to be about 8.7 TAF/year (long-term average).
- **CVP operational flexibility** will increase by 6.0 TAF/year (long-term average) in supplies delivered SOD through Investigation facilities.
- **Emergency water supplies**, estimated at 148.4 TAF/year (long-term average), would be available in the event of a regional water supply disruption.

The estimated total annual monetary benefit is about \$69.2 million. The annual net economic benefit is to be about \$20.7 million per year. The overall B/C ratio is 1.43, and the Federal B/C ratio is 2.0.

The Recommended Plan is determined to be technically, environmentally, economically, and financially feasible.

### Recommendations

The following actions are recommended for the Secretary of the Interior:

- Approve the Recommended Plan, as outlined in this report, and submit the following determinations to Congress, in accordance with Section 4007(c)(2)(D) of WIIN:
  - the Project is technically and financially feasible;
  - sufficient non-Federal funding is available to complete the Project;
  - the Project sponsors are financially solvent; and
  - a proportional share of the Project's benefits are Federal benefits.
- Request that Congress funds the Federal share of construction.

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- Request that Congress authorize Reclamation to increase the construction cost to allow for escalation from stated price levels (2018) to the notice to proceed for each contract or work package, based upon Reclamation's Construction Cost Trends publication or similar source.
- Authorize the Commissioner of the Bureau of Reclamation to enter into a cost-sharing agreement for the construction of the Recommended Plan.
- Authorize the Commissioner of the Bureau of Reclamation to enter into Principles of Agreement, which will be used to develop an Operating Agreement with CCWD or a future JPA and the State of California for the operation of the Recommended Plan.
- Request that Congress annually appropriate funds such that pre-construction activities are completed within 5 years of construction authorization, and construction is completed within 10 years of construction authorization to avoid cost overruns and ensure timely completion.
- Request that Congress annually appropriate funds for the operations, maintenance, and conveyance costs associated with delivering Incremental Level 4 water supplies from the head of the California Aqueduct to the Refuges, as described in this report.

At this time, Reclamation does not have an executed cost-share agreement for construction. By the end of fiscal-year 2019, Reclamation requires a cost-share agreement for pre-construction through 2021 with CCWD and/or a future JPA.

By July 31, 2021, the following would be completed by Reclamation in partnership with CCWD or a future JPA:

- A new or amended operations agreement between Reclamation and CCWD.
- Updated project benefits and costs. It is intended the operations would maintain a Federal benefit/cost ratio greater than one.
- Certification that up-front funding would be provided by CCWD and/or a future JPA.

Due to the complexity of this project and high Federal investment, Reclamation recommends validating the feasibility results in pre-construction and documenting any changes in a post-authorization report.