

Content

Chapter [#] Surface Storage—CALFED	1
CALFED Surface Storage in California	1
Potential Benefits of CALFED Surface Storage.....	4
Potential Costs of CALFED Surface Storage.....	6
Major Issues Facing CALFED Surface Storage	8
Funding for Study.....	8
Effects.....	8
State and Federal Interest	8
Financing.....	9
Recommendations to Facilitate CALFED Surface Storage Decision-making	9
Selected References.....	10

Tables

Table #-1 CALFED Surface Storage initial alternatives ¹ benefits summary.....	3
Table #-2 CALFED Surface Storage initial project alternatives ¹ cost summary.....	7

Figure

Figure #-1 General location of CALFED surface storage initial alternatives.....	2
---	---

Boxes

PLACEHOLDER Box #-1 Abbreviations and Acronyms Used in This Chapter.....	1
Box #-1 Analysis of CALFED Surface Storage Benefits.....	5

Subgroup: Increase Water Supply

Chapter [#] Surface Storage—CALFED

CALFED Surface Storage in California

The CALFED Record of Decision (2000) identified five potential surface storage reservoirs that are being investigated by the California Department of Water Resources, US Bureau of Reclamation, and local water interests.

- Shasta Lake Water Resources Investigation (SLWRI)
- North-of-the-Delta Offstream Storage (NODOS)
- In-Delta Storage Project (IDSP)
- Los Vaqueros Reservoir Expansion (LVE)
- Upper San Joaquin River Basin Storage Investigation (USJRBSI)

This summary provides a snapshot of the current status of the five CALFED surface storage investigations. Additional information can be found at <http://www.storage.water.ca.gov/> The general locations of the initial alternatives reflected in the summary below are shown in Figure #-1 (General location of CALFED surface storage initial alternatives).

PLACEHOLDER Box #-1 Abbreviations and Acronyms Used in This Chapter

Water resources planning has changed significantly over the past several decades. New approaches to planning for CALFED surface storage has resulted in a new era of project formulations designed to address a new era of water resources needs. The State and federal governments have funded the five surface storage investigations, which were explicitly conceived to support at least three of CALFED's program objectives: water supply reliability, water quality, and ecosystem restoration. From the outset, investigation planners acknowledged that the dam building model of the past (i.e. onstream reservoirs built primarily for agricultural and urban users and flood protection) would not be helpful in solving California's water challenges. In fact, these approaches would likely exacerbate many of the State's water resources problems, especially perceptions about winning and losing in California's water battles. Consequently, CALFED considered new onstream storage untenable. Offstream storage or expansion of existing storage proposals were considered, but formulations would emphasize effective mitigation of impacts. In addition, these new proposals would not limit consideration of environmental effects to mitigation, but would instead be designed to improve environmental conditions. Project purposes emphasize multi-objective storage, combining newer objectives associated with ecosystem restoration and water quality with more traditional purposes of water supply reliability, hydro-power and flood control. These new projects would support aquatic and riparian ecosystem restoration focused on the Delta and its tributaries, improved drinking and habitat water quality, and the water supply needs associated with California's growing population and diverse economy.

Figure #-1 General location of CALFED surface storage initial alternatives



The CALFED surface storage project formulations have dedicated significant project resources to broad public benefits including ecosystem restoration, habitat water quality, and water supply reliability for environmental uses (see [Table #-x CALFED Surface Storage Initial Alternatives Benefits Summary](#)) that would be paid for by the State and/or Federal governments. Contributions to a reliable water supply for California are also explicitly included. Urban and agricultural water supply reliability and drinking water quality are generally considered non-public benefits that would be paid for by water retailers and users.

Table #-1 CALFED Surface Storage initial alternatives¹ benefits summary

Investigation (Reservoir initial formulation shown)	New storage capacity (thousand acre-feet)	Avg annual yield estimate (taf/year)	Yield estimate includes	Benefits not included in yield estimate
Los Vaqueros Expansion	175	104	EWA Replacement	-Emergency Water Supply -Water Quality -Fishery Protection
North-of-the-Delta Offstream Storage (Sites Reservoir)	1,800	622 184 35 57 170 176	Total Urban + Ag Refuge EWA Replacement Water Quality Ecosystem Restoration	-Hydropower -Recreation
Shasta Lake Water Resources	634	50	Urban + Ag	-378 taf dedicated storage for anadromous fish -Hydropower -Recreation
Upper San Joaquin River Basin Storage (Temperance Flat RM 274)	1,260	158	Urban + Ag	Flood Damage Reduction Hydropower Recreation Ecosystem Restoration Water Quality Emergency Water Supply
In-Delta Storage	217	107 30 18 13 2 44	Total Urban + Ag Groundwater Banking Ecosystem Restoration Refuge Water Quality	Ecosystem Restoration (non flow-related)

taf = thousand acre-feet

¹ Initial Project Formulations are not feasibility or environmental document alternatives and are not preferred.

California’s water resources future has become increasingly uncertain. Consequently, these projects will need to perform well under a number of potential future conditions including climate change, alternative Delta conveyance and management, and disaster / emergency response. Sensitivity analyses will determine a project’s effectiveness as precipitation and runoff patterns change and sea level rises, with either existing or new Delta conveyance and management and potential implementation of multiple storage facilities. Storage must also support adaptively managed restoration approaches based on “new or improved science,” changes in the viability of species, and modified restoration priorities. While flexibility may be challenging to value, a robust response to various future scenarios will help ensure that projects would remain no regrets investments.

The continuing CALFED Surface Storage Investigations are in their final phase of planning. Funding for In-Delta Storage ended in Fiscal Year 2005; the four remaining investigations are continuing. State funding for State agencies to participate in the Shasta Lake investigation also

ended in Fiscal Year 2005. State Feasibility Reports will be completed in 2008 and 2009 for LVE, NODOS, and USJRBSI. Draft Federal Feasibility as well as Draft State and Federal environmental reports will be released in 2008 and 2009 for the four continuing investigations. Final reports will be completed in 2010. DWR and Reclamation plan significant outreach and stakeholder input throughout this final phase and especially during the comment period of the environmental documents. Planning requirements for large surface storage projects are extensive. A more comprehensive listing of regulatory permits and compliances that would likely be required, as compiled by one of the investigations is shown here.

Primary Environmental Permits / Compliance Issues

- State and Federal Endangered Species Acts
- Federal Fish and Wildlife Coordination Act
- Federal Migratory Bird Treaty Act
- California Department of Fish and Game Code Sections
 - o 5937-Water Diversions and Fish
 - o 3511-Fully Protected Birds
 - o 4700-Fully Protected Mammals
 - o 3503-Specified Birds
 - o 3505-Eggs and Nests
 - o 3503.5-Birds of Prey
- California Department of Fish and Game Streambed Alteration Agreement
- State Natural Community Conservation Planning Act
- California Native Plant Protection Act
- Federal Clean Water Act Sections 404 and 401
- Federal 1899 Rivers and Harbors Act
- Federal Energy Regulatory Commission License
- Regional Water Quality Control Board Storm-water Permit
- National Environmental Policy Act
- California Environmental Quality Act
- Executive Order 12898-Environmental Justice
- Executive Order 11990-Wetlands Protection
- California Water Right
- Public Trust
- Local Permits and Compliances

Primary Cultural Resource Permits / Compliance Issues

- National Historic Preservation Act of 1966(16 U.S.C. 470, Section 106)
- Archaeological and Historic Preservation Act of 1974 (16 U.S.C 469)
- Archaeological Resource Protection Act of 1979 (16 U.S.C. 470)
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001)
- Protection of Cultural and Historic Properties (36 CFR Part 800)
- Protection of Archaeological Resources: Uniform Regulations (43 CFR 7)
- Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 FR 44716)
- National Register of Historic Places (36 CFR Part 60)
- Determination of Eligibility for Inclusions in the National Register of Historic Places (36 CFR Part 63)
- Reclamation Cultural Resources Management Policy LND-P01
- Reclamation Cultural Resources Directives and Standards LND 02-01
- California Environmental Quality Act (Public Resources Code Sections 21083.2 and 21084.1, and Section 15064.5 of the CEQA Guidelines)
- California Health and Safety Code (Section 7070.5(b))

Potential Benefits of CALFED Surface Storage

The size and location of these surface storage projects facilitates the accomplishment of benefits in two distinct ways. First, many benefits are achieved directly by releases from a new reservoir. Second, additional storage can provide significant system flexibility such that other facilities'

operations can be modified (without reducing current benefits) to support additional benefits within the system. Additional water in storage can be used to either improve ecosystem functions and conditions for targeted species, or improve water quality or supply reliability for water users. Another important characteristic of these proposals is the geographic location of the benefits. A number of the environmental benefits occur within the Sacramento-San Joaquin Delta. Other environmental benefits are targeted at the Delta's tributaries including the Sacramento and San Joaquin rivers and the Yolo Bypass, recognizing the direct connections between tributary and estuarine health. Water supply reliability improvements are generally for State Water Project and Central Valley Project contractors or environmental uses.

Performance of the CALFED surface storage projects is measured using an operations simulation of the Central Valley Project and State Water Project systems, using the historic hydrologic sequence 1922 - 2003. CALSIM II provides detailed information related to operations of the system under with and without project conditions. Results are often reported with both average annual values and driest periods (1928-34, 1976-77, and 1987-92) average annual values, reflecting the importance of performance under drought conditions. This type of comprehensive analysis allows investigators to determine how much water from a proposed project will be used to meet needs that would not be met without the project. In addition, DWR and Reclamation have developed a suite of analytical tools that are used in a coordinated manner with the operations simulation to assess other important characteristics including Delta water quality; Sacramento River temperature, water quality, fishery effects, river meander, sediment transport, riparian success; and water resources economics. DWR, Reclamation, and other agencies have developed a Common Assumptions process that establishes a common set of analytical tools, operations, planning assumptions, and reporting metrics so that projects are evaluated with a common foundation.

Box #-1 Analysis of CALFED Surface Storage Benefits

Reported benefits of CALFED Surface Storage projects shown here should not be interpreted as similar to benefits reported by other strategies. Since the CALFED Surface Storage strategy uses an operations simulation, only benefits that would otherwise go unmet are accounted. In addition, an economic analysis determines whether benefits could be achieved at a lesser cost by other strategies. The comprehensive nature of these analyses allows the investigations to more accurately describe benefits that are both operationally feasible, within limitations of the water resources system, and economically feasible. Other strategies that do not use operations simulations or economics report a benefit capacity. Using a benefit capacity analysis, the quantity of water developed or saved may or may not be needed at the time and location the capacity is available. The capacity approach does not determine what needs exist, including the amount of the need or the timing of the need. In addition, the capacity approach does not determine if the benefit can be feasibly accomplished, based upon the operational limitations of either the State's large or local water resources system and economic considerations. More specifically, these benefit capacity estimates may or may not improve water supply reliability at the times and in the locations where it is needed. However, other benefits not related to water supply reliability may be valuable.

More detail associated with specific benefits is shown in Table #-1 CALFED Surface Storage Initial Alternatives Benefits Summary and is derived from each investigation's plan formulation documents. One initial alternative from each investigation's planning documents is described here and summarized in Table #-x. The initial alternatives shown here are those with the relative highest benefit / cost ratio for each investigation. These initial alternatives are not feasibility or environmental documentation alternatives and are not preferred. However, the initial alternatives

described here are being used to inform the development of alternatives for feasibility and environmental documents that are now in development. DWR published a state feasibility study report for the In-Delta Storage Program in 2004. No additional state or federal funding for the program has been received since then. Consequently, study results are not consistent with the Common Assumptions being used by the other investigations. Results from the 2004 In-Delta Storage State Feasibility Study Report are available at http://www.calwater.ca.gov/calfed/oversight/calfed_Oversight_IDS_2004.html.

Potential Costs of CALFED Surface Storage

Costs have been estimated for an initial alternative for each of the CALFED surface storage investigations. The costs shown in Table #-2 reflect the same initial alternative formulation as described in the benefits section above so that benefits and costs can be considered together. As noted previously, the initial alternatives shown here are not preferred, but will be used to inform the alternatives that will be selected and analyzed in the environmental and feasibility planning documents. Costs for the In-Delta Storage investigation are not shown here because they are not current. Table 2 shows the storage capacity, cost, annual cost, annual benefit, benefit – cost ratio, and an estimate of the percentage of the initial project formulation that is dedicated to environmental public benefits. Costs of the initial formulations shown range from \$667 million to \$4.1 billion. Benefit cost ratio is an indicator of a project's economic justification. The approximate percentage dedicated to environmental public benefits is shown to indicate the portion of the project that may be paid for by the State and/or federal governments. The remaining portion of the cost of each project would then need to be paid for by local and regional water interests. In these initial alternatives, the local and regional water interests represent contractors of the CVP and SWP.

Table #2 CALFED Surface Storage initial project alternatives¹ cost summary

Investigation initial formulation summarized here (Reservoir)	New storage capacity of initial project formulation (taf)	Cost (millions)	Annual cost (million\$/yr)	Annual benefit (million\$/yr)	Benefit cost ratio (Ann. Ben/ Ann. Cost)	Approximate percentage² of initial formulation dedicated to environmental public benefits
Los Vaqueros Expansion	175	\$667	\$34	\$45	1.29	76%
North-of-the-Delta Offstream Storage (Sites Reservoir)	1,800	\$3,600	\$189	\$215	1.14	52%
Shasta Lake Water Resources	634	\$825	\$46	\$75	1.61	61%
Upper San Joaquin Basin Storage (Temperance Flat RM 274)	1,260	\$3,358	\$169	\$179	1.06	13%
In-Delta Storage	217	\$789	61	\$28	0.46	28%

¹ Initial Project Alternatives are not feasibility or environmental document alternatives and are not preferred.

² Percentage is based upon preliminary cost allocation of initial alternative formulation

Major Issues Facing CALFED Surface Storage

Funding for Study

Sufficient and stable State and federal funding are critical to successful completion of the feasibility and environmental studies for the CALFED surface storage investigations. California's Proposition 50 (2002) provided initial stable State funding for the surface storage investigations; Proposition 84 (2006) provided additional funds to complete the studies. In October 2004, the President reauthorized the CALFED Bay-Delta Program. PL108-361 reaffirms federal feasibility study authorization for four of the five storage investigations (SLWRI, NODOS, LVE, and USJRBSI). In 2007, DWR received no funding to support surface storage studies for the previous state budget year. However, funding of the Proposition 84 funds is anticipated to resume this year. To efficiently complete the continuing CALFED surface storage investigations, DWR has prioritized its work efforts to focus resources on identifying the most viable projects and project tasks. DWR and Reclamation will work cooperatively to evaluate projects using information from planning studies and reports. Funding instability in the past has caused delays for the investigations. Stable funding will be especially critical during this final phase.

Effects

Implementation of new CALFED surface storage would affect environmental and human conditions, including economic effects to surrounding communities, as well as flow effects both up and downstream of diversions and throughout California's water resources system. Some potential effects will be positive and some negative. Regulatory and permitting requirements, as listed previously, will require surface storage investigations to consider, for example, potential effects to stream flow regimes, water quality, stream geomorphology, fish and wildlife habitat, and risk of failure during seismic and operational events. In addition, agencies are developing analytical methodologies to determine greenhouse gas emissions and their contribution to climate change associated with project construction and operations. Mitigation of significant effects is required under State and Federal environmental laws and is accomplished through implementation strategies that avoid, minimize, rectify, reduce over time, or compensate for negative effects. Significant input from the public and agencies have already been received by DWR and Reclamation related to effects associated with potential implementation. Additional input is anticipated as feasibility and NEPA/CEQA alternatives are developed and evaluated during the current phase of the investigations.

State and Federal Interest

A continuing essential task is the identification of State and Federal interest in each of the investigations. Identification of State interest is a primary objective of state feasibility reports that will be completed soon for the investigations that DWR is participating in. DWR will identify broad public benefits (such as ecosystem restoration and sustainability of endangered or threatened species) that warrant investment by the State. Similarly, Reclamation will continue to determine federal interest in projects as the federal feasibility studies are developed. In addition, DWR and Reclamation are working with stakeholders to identify which projects have the greatest local interest and possible willingness to pay for project costs. The CALFED surface storage investigations will then use results of all these evaluations to develop partnerships with local and regional interests to continue refining alternatives development and plan formulations. Local and regional water entities have indicated a preference that the State and Federal governments express

some commitment to potential State and Federal investments in the projects prior to their commitment. If partnerships are not formed (demonstrating lack of interest in advancing a project) and/or the outcome of technical and economic studies indicate any of the five projects are not feasible, the State and/or Federal governments may decide to defer future studies of specific projects.

Financing

Implementation of one or more CALFED surface storage projects would likely require two types of bond financing for the State. An initiative measure could approve general obligation bonds to pay for the broad public benefits such as ecosystem restoration. Repayment bonds could facilitate contractor participation in benefits to specific water users. Federal participation in the projects would potentially make them much more effective. State and Federal investment in developed water supplies dedicated to the restoration of the Delta and tributary ecosystems would give fish and wildlife managers new tools to proactively revitalize these ecosystems. Managers could then use these environmental water supplies to support water-required actions that would improve conditions for aquatic and riparian ecosystems and species that depend upon them. These dedicated restoration supplies may prove an essential element in recovery of the Delta, its tributaries, and dependent species. State and Federal fish and wildlife management agencies would then be tasked with proactively and adaptively managing restoration water supply assets. The federal government may also invest in refuge water supplies or make a capital investment in water supplies for CVP contractors.

Recommendations to Facilitate CALFED Surface Storage Decision-making

1. CALFED signatories and stakeholders should continue to prioritize work efforts to complete the feasibility and environmental studies of the surface storage investigations.
 - As indicated in the funding discussion above, DWR is prioritizing future surface storage work efforts due to insufficient funding to complete environmental documentation and feasibility analyses for three CALFED surface storage investigations (NODOS, LVE, and USJRBSI). Reclamation is prioritizing work on four investigations (SLWRI, NODOS, LVE, and USJRBSI). Prioritization criteria include reviewing conclusions and recommendations from ongoing State and federal planning studies; determining federal, State, and local interest, including willingness to pay; and assessing legal and logistical issues related to specific projects.
 - The investigations should continue to test potential projects against CALFED solution principles and implementation commitments as well as other local, State, and federal planning criteria for deciding to move to construction of any projects.
 - Engage more stakeholders and potential project participants in the process. The investigations should continue to work with the interested public and agencies in identifying, evaluating, and quantifying potential project effects.
 - Develop information on how the projects could be operated for a variety of purposes, costs, and impacts.
 - Continue evaluation and presentation of alternatives and potential future scenarios that will allow potential participants to assess their interest in specific projects.

- Develop mechanisms to provide assurances that projects will be operated in a manner consistent with the objectives.
 - Assess Federal, State, and local interest in the investigations, including opportunities for State and Federal investment in broad public benefits.
2. DWR, Reclamation, other CBDA agencies and local interests should continue work with related planning efforts including Delta Vision, the California Water Plan Update, and the Bay Delta Conservation Plan.
 3. CBDA, DWR, and Reclamation should continue their development of conceptual finance plans that will include descriptions of relevant State and federal financial policies and a determination of the potential for State and federal investment in benefits to the general public. The scenarios and finance plans will help facilitate potential investment decisions by local, regional, State and federal decision-makers.

Selected References

- CALFED Bay-Delta Program. 2000. Record of Decision. Aug 28.
- California Department of Water Resources. 2004. Draft State Feasibility Study, In-Delta Storage Project. Feb.
- California Department of Water Resources. 2006. 2006 Supplemental Report to 2004 Draft State Feasibility Study, In-Delta Storage Project. May.
- US Bureau of Reclamation. 2006. Initial Economic Evaluation for Plan Formulation, Los Vaqueros Expansion Investigation. July.
- US Bureau of Reclamation. 2007. Plan Formulation Report, Shasta Lake Water Resources Investigation. Dec.
- US Bureau of Reclamation and California Department of Water Resources. 2008. Administrative Draft Plan Formulation Report, Upper San Joaquin River Basin Storage Investigation. July.
- US Bureau of Reclamation and California Department of Water Resources. 2008. Plan Formulation Report, North-of-the-Delta Offstream Storage Investigation. July.