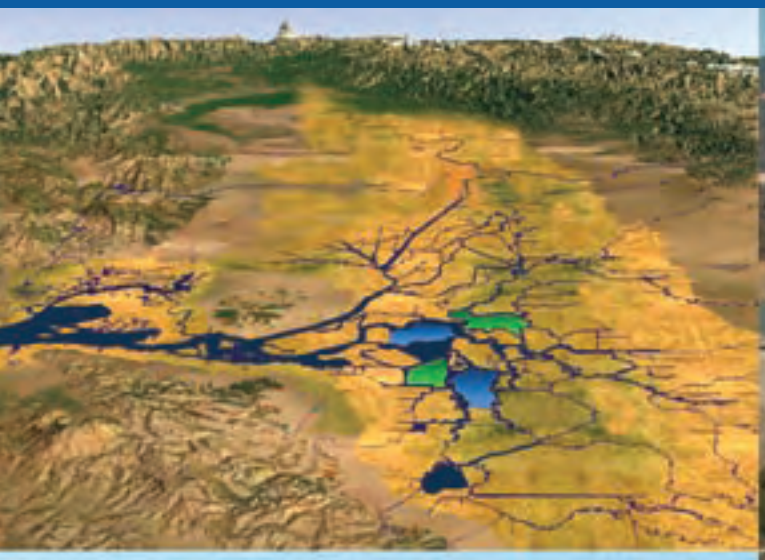
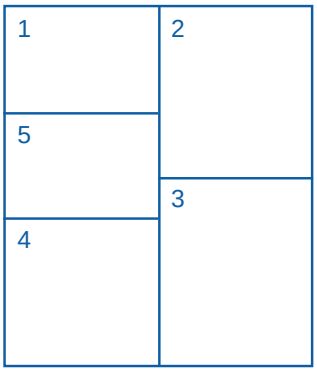
Surface Storage – CALFED





1. Locations of potential in-Delta storage. Habitat islands (Bouldin Island and Holland Tract) are highlighted in green. Reservoir islands (Webb Tract and Bacon Island) are highlighted in blue.
2. Shasta Dam, which may be raised to provide additional water resources benefits.
3. Los Vaqueros Reservoir, which may be raised to provide additional water resources benefits.
4. Artist's rendition of a potential Temperance Flat reservoir, with Millerton Lake in the background.
5. Artist's rendition of a potential Sites Reservoir.

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Chapter 12. 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 12-1 (General location of CALFED surface storage initial alternatives).

The 2009 Comprehensive Water Package includes a water bond that may provide a portion of the financing to construct one or more CALFED surface storage projects. The Safe, Clean, and Reliable Drinking Water Supply Act of 2010, if approved by voters, would include up to $3 billion for storage that improves statewide water system operations. This public money would be used to invest in public benefits including ecosystem restoration, flood management, water quality, emergency response, and recreation. According to the bond proposal, water supply reliability benefits for urban or agricultural users would be paid for by those beneficiaries.

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 on-stream 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

Figure 12-1 General location of CALFED surface storage initial alternatives

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, hydropower and flood control. More specifically, these new projects would support aquatic and riparian ecosystem restoration focused on the Delta and its tributaries; improved drinking and habitat water quality; and water supply reliability improvements that ultimately support California's growing population and diverse economy.

The CALFED surface storage project formulations have dedicated significant project resources to public benefits including ecosystem restoration, habitat water quality, and water supply reliability for environmental uses (see Table 12-1 CALFED Surface

Box 12-1 Acronyms and Abbreviations

CALFED	California Bay-Delta Program (CALFED is a partnership between the State of California and the federal government)
CALSIM	California Water Resources Simulation Model
CBDA	California Bay-Delta Authority
CVP	Central Valley Project
DWR	Department of Water Resources
EIR/EIS	Environmental Impact Review/Environmental Impact Statement
IDSP	In-Delta Storage Project
IRWM	Integrated Regional Water Management
LVE	Los Vaqueros Reservoir Expansion
NEPA/CEQA	National Environmental Policy Act/ California Environmental Quality Act
NODOS	North-of-the-Delta Offstream Storage
Reclamation	US Bureau of Reclamation
SLWRI	Shasta Lake Water Resources Investigation
SWP	State Water Project
TAF	thousand acre-feet
USJRBSI	Upper San Joaquin River Basin Storage Investigation

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. In addition, Tribes could be potential beneficiaries of the projects. Tribes may have interest in any of the benefits previously listed including urban, environmental, and agricultural supply reliability, drinking water quality, and ecosystem restoration.

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 ongoing. State funding for State agencies to participate in the Shasta Lake investigation also ended in Fiscal Year 2005. Pre-feasibility studies are

Table 12-1 CALFED surface storage initial alternatives[1] benefit 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	91	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 necessarily the preferred alternative.

scheduled to be completed in mid-2010 for LVE, NODOS, SLWRI, and USJRBSI in advance of the November election that will include the bond initiative previously described. DWR and Reclamation are coordinating planning assumptions and documents with the Bay Delta Conservation Plan and Delta Habitat Conservation and Conveyance Program so that potential future changes to Delta conveyance can be appropriately incorporated into surface storage planning. Consequently, the agencies anticipate similar release dates as the BDCP/DHCCP Public Draft EIR/EIS for the surface storage investigation's draft feasibility and draft EIR/EIS documents. Final reports will then be completed one year later. 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 in Tables 12-2 and 12-3.

Table 12-2 Primary environmental permits/compliance issues

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

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 new storage. 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.

Table 12-3 Primary cultural resource permits/compliance issues

Federal
American Indian Religious Freedom Act of 1978 (42 USC 1996)
Archaeological and Historic Preservation Act of 1974 (16 USC 469)
Archaeological Resource Protection Act of 1979 (16 USC. 470)
Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 CFR 44716)
Determination of Eligibility for Inclusions in the National Register of Historic Places (36 CFR Part 63)
National Historic Preservation Act of 1966(16 USC 470, Section 106)
National Register of Historic Places (36 CFR Part 60)
Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)
Protection of Archaeological Resources: Uniform Regulations (43 CFR 7)
Protection of Cultural and Historic Properties (36 CFR Part 800)
Reclamation Cultural Resources Directives and Standards LND 02-01
Reclamation Cultural Resources Management Policy LND-P01
State
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))

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. Drought performance has become increasingly important, as water managers and decision-makers acknowledge challenges we currently face with the continuing drought. 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.

More detail associated with specific benefits is shown in Table 12-1 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 in Table 12-4, CALFED Surface Storage Initial Alternatives Cost-Benefit Summary. The initial alternatives shown here are those with

Box 12-2 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 typically 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 associated with the capacity and not related to water supply reliability may be valuable.

the relative highest benefit - cost ratio for each investigation. These initial alternatives are not feasibility or environmental documentation alternatives and are not necessarily the preferred alternative. 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. Reclamation and Contra Costa Water District released a draft EIS/EIR for LVE in February 2009 with new cost estimates. However, the 2006 initial economic evaluation remains the most recent final document that includes both costs and benefits and those values are shown here. DWR published a state feasibility study report for the In-Delta Storage Program in 2004. A draft supplemental report was released in January 2006. 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 CALFED surface storage investigations. The In-Delta storage reports are available at http://www.water.ca.gov/storage/indelta/index.cfm

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 12-4 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 necessarily the preferred alternative, but will be used to inform the alternatives that will be selected and analyzed in the environmental and feasibility planning documents. Costs and benefits are shown as they are reported in each report and older studies have not be updated to reflect same date comparisons of the five investigations. As noted previously, both Los Vaqueros and In-Delta information is from 2006; Shasta is 2007; NODOS and San Joaquin is 2008. Table 12-4 shows the storage capacity, cost, annual cost,

Table 12-4 CALFED surface storage initial alternatives[1] cost – benefit summary

Investigation initial formulation summarized here (Reservoir)	New storage capacity of initial project formulation (TAF)	Cost (million$)	Annual cost (million$/yr)	Annual benefit (million$/yr)	Benefit - cost ratio (Ann. Ben/ Ann. Cost)	Approximate percentage[2] of initial formulation dedicated to 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	48%
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 necessarily the preferred alternative.

[2] Percentage is based upon preliminary economic benefits of initial alternative formulations, consistent with public benefits as described in the Safe, Clean, and Reliable Drinking Water Supply Act of 2010

annual benefit, benefit-cost ratio, and an estimate of the percentage of the initial project formulation that is dedicated to public benefits, as described in the Safe, Clean, and Reliable Drinking Water Supply Act of 2010. Costs of the initial formulations shown range from $667 million to $3.6 billion. Benefit-cost ratio is an indicator of a project's economic justification. The approximate percentage dedicated to 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 are considered to be the contractors of the CVP and SWP.

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) provides 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). DWR received no funding to support surface storage studies for the previous state fiscal year 2007-2008. However, appropriation of Proposition 84 funds was approved and the surface storage investigations resumed after State funding became available March 2009 (after twenty months). 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 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 Tribes, 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 final 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 the pre-feasibility studies that will be completed in 2010 for the investigations that DWR is participating in. DWR will identify public benefits (consistent with the description in the bond proposal) 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 federal-State-local 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 multiple types of financing. The Safe, Clean, and Reliable Drinking Water Supply Act of 2010 could provide general obligation bonds to pay for the public benefits portion of CALFED surface storage projects. Repayment bonds could facilitate contractor (i.e., local agencies) participation in benefits to specific water users, as has been provided in the past. Local agencies may also develop their own financing. 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. DWR and Reclamation are aware that these agencies and the public will want assurances that projects will be operated in a manner to protect these public investments. 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; evaluating benefits in light of the bond proposal; and assessing legal and logistical issues related to specific projects.
    - Engage more stakeholders and potential project participants in the process. The investigations should continue to work with tribes, the public, and agencies in identifying, evaluating, and quantifying potential project effects (i.e. both beneficial and negative effects).
    - Develop information on costs, effects and how the projects could be operated for a variety of purposes.
    - Continue evaluation and presentation of alternatives and potential future scenarios, including alternative delta conveyance and operations and climate

change effects that allow potential participants to assess their interest in specific projects.
    - develop mechanisms to provide assurances that projects should be operated in a manner consistent with the objectives.
    - assess tribal, federal, state, and local interest in the investigations, including opportunities for State and federal investment in 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 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 may help facilitate potential investment discussions and then decisions by the public as well as local, regional, State and federal decision-makers.

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Legislation

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[SBx7 2]. Safe, Clean, and Reliable Drinking Water Supply Act of 2010. Passed by the legislature and signed by the Governor. Bond bill must be submitted for approval by voters in the November 2010 election (as a proposition). Statutes 2009-10 Seventh Extraordinary Session, chapter 3. (2009).

Linkages to Other Strategies

The CALFED surface storage investigations are inclusive of a number of other strategies in their formulations. As stated previously, ecosystem restoration and water quality are explicitly included as primary purposes of several investigations. Accomplishments related to restoration and quality are achieved by dedication of developed water to these purposes. Other strategies are included as secondary purposes of the surface storage investigations such as floodflow management and water dependent recreation. A major conceptual component of these investigations is related to how these new facilities would be integrated into the existing water resources systems, especially the CVP and SWP systems. In each investigation, new storage integrated into these systems provides unique opportunities to provide benefits associated with system re-operation. In many cases, the existing facilities can be operated in a more efficient manner with additional storage. These re-operative approaches are described in greater detail in each investigation's most recent planning documents.

The CALFED surface storage investigations are also incorporating many other strategies into their planning. For example, a cooperative and collaborative Common Assumptions process has led to agreed-upon assumptions associated with future strategy implementations including agricultural and urban water use efficiency, Delta conveyance, water transfers, conjunctive management, desalination, and recycled municipal water. The CALFED surface storage investigations is one of just a few strategies that assumes increased implementation of other strategies in its planning estimates shown in the water plan. For example, the common assumptions include increased water use efficiency, water transfers, conjunctive management, desalination, and recycling. The Common Assumptions process and assumptions are described in each investigation's current planning documents.

The 2005 Water Plan Update provided a planning roadmap with two initiatives for achieving sustainable and reliable water supplies for California through 2030. The CALFED surface storage investigations fall naturally in the "Improve Statewide Water Management Systems" initiative since the investigations seek to integrate with the Central Valley Project and the State Water Project, California's largest water systems. The second initiative, implementation of Integrated Regional Water Management (IRWM), is essential to California's water resources future. Many of the surface storage investigations' purposes also need to be integrated with local and regional planning efforts. Ecosystem restoration, water quality, and improved regional and local supplies all need to be incorporated into local and regional planning. The new era approach by the CALFED surface storage investigations is very similar to the approach now being promoted through IRWM.