

CALFED Integrated Storage Investigation

Introduction: Water Management Strategy

The CALFED Bay-Delta Program has developed a Water Management Strategy in recognition of the substantial uncertainty inherent in a large natural resource system and the multiple objectives to be achieved. CALFED has long recognized that there are no individual actions (or water management tools) which can "fix" the system, but rather groups of integrated tools which can be implemented to achieve multiple objectives. The framework of the CALFED Water Management Strategy (as illustrated in Figure 1) is intended to provide a mix of water management tools to achieve the objectives in the context of risk and uncertainty and the CALFED Solution Principles.

Developing an effective water management strategy requires identification of opportunities, limitations, and relation of water management tools to other CALFED actions. An important part of refining the Water Management Strategy is refining the tools. This is particularly true where actions, such as storage, require a significant initial investment and are less conducive to incremental implementation and adaptive management. Storage, as a water management tool, includes consideration of significant action that requires a strategy to guide utilization of storage in the broader water management strategy. The Integrated Storage Investigation (ISI) is intended to provide necessary information on the different storage opportunities and provide a framework for utilizing storage in the Water Management Strategy.

Integrated Water Management Strategy											
Water Management Objectives	Water Management Tools										
	Transfers		Conservation			Recycling	Storage		Watershed Management	Water Quality Control	Monitoring and Real-Time Diversion Management
	Long-Term	Short-Term	Agricultural	Urban	Wetlands		Groundwater	Surface			
Reduce Diversion Conflicts											
Decrease Drought Impacts											
- Environmental Flows											
- Ag/Urban supply											
Increase Supply Availability											
- Drought											
- Average											
Increase Operational Flexibility											
Increase Supply Utility (WQ)											

DRAFT

1

DRAFT

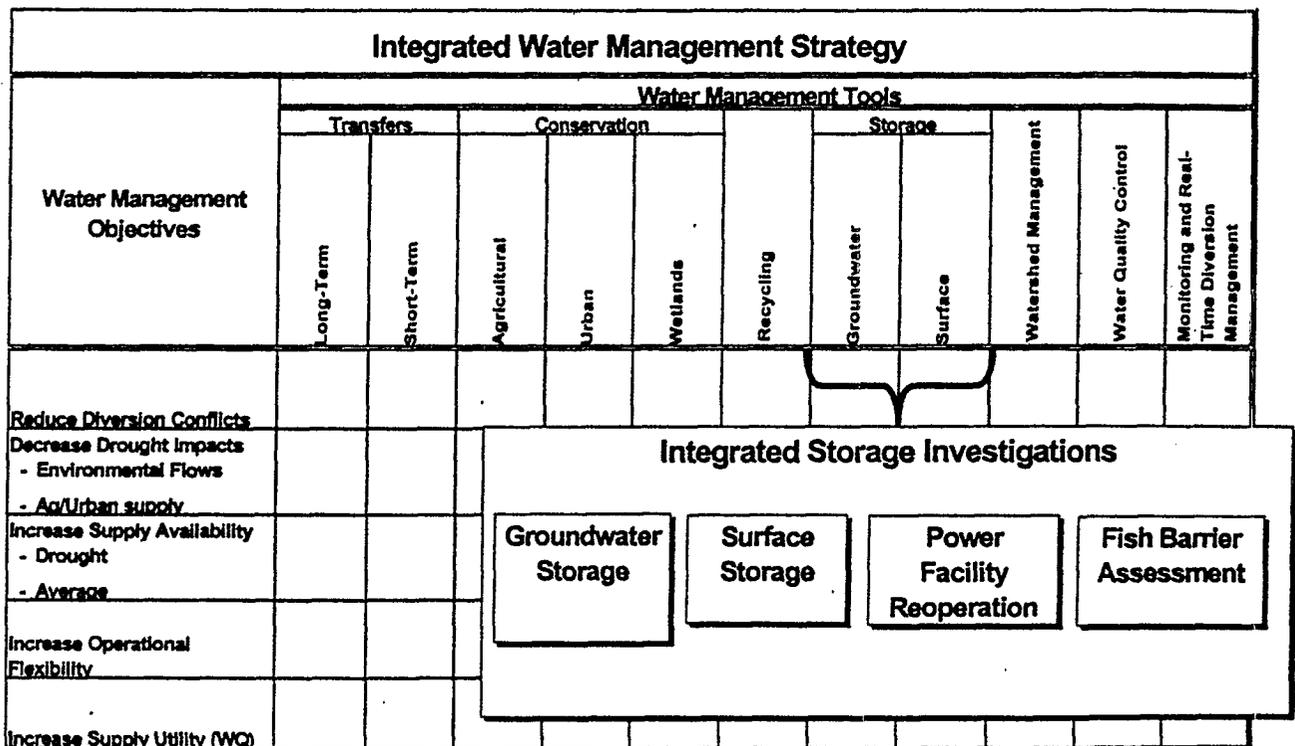
April 28, 1999

The ISI

The ISI will evaluate the relationship between various types of storage and the overall role of storage as part of the Water Management Strategy (as illustrated in Figure 2).

The ISI will coordinate existing storage investigations by individual CALFED agencies, CALFED-initiated storage evaluations and broader water management strategies and analysis to provide a comprehensive assessment of alternative storage options and their utility to overall water management.

Specifically, the ISI will evaluate surface storage, groundwater storage, power facility reoperation and the potential for conjunctive operation of these different types of storage. These investigations, as part of the Water Management Strategy, will contribute to the Section 404 Guidelines requirement to select the least environmentally damaging practicable alternative to constructing new storage facilities. The ISI will consider all practicable alternatives for storage and determine the proper mix of groundwater and surface storage facilities. Additionally, these investigations will provide a comprehensive assessment and prioritization of critical fish migration barriers for modification or removal.



The investigation will evaluate these elements both on a Bay-Delta system scale using currently available system modeling tools such as DWRSIM and PROSIM and on a local scale with more detailed modeling tools. It must assure that proposals for system changes take into consideration regional, as well as statewide water management objectives. For example, reoperation of power generation facilities currently being

considered for sale by PG&E and other utilities as part of the state's energy market deregulation, if done conjunctively with downstream water supply reservoirs, as well as groundwater banking, may avoid impacts or in fact enhance overall benefits. Therefore, the development of regional strategies for water resources management will be an important work effort linking the study elements. This will require more detailed evaluation of local hydrologic conditions and interactions than can be provided by the large-scale models.

The study elements within the Integrated Storage Investigation include:

- Overall Storage Strategy
- Surface Storage Investigations
 - Surface Storage Facilities Screening
 - North of Delta Off-Stream Storage Study
 - In-Delta, Adjacent to Delta Storage and Off-Aqueduct Storage Studies
 - On-Stream Storage Enlargement Studies: Shasta and Friant
- Groundwater/Conjunctive Use Studies
- Power Facilities Re-operation Evaluation
- Fish Migration Barrier Removal Prioritization and Evaluations

The program elements are designed to achieve the following:

Overall Storage Strategy: Describe the role of storage in the Water Management Strategy and its programmatic utility and limitations. Identify the potential to achieve water quality, water supply reliability and ecosystem benefits. Determine the proper mix of surface and groundwater storage and the general operational strategy necessary to meet CALFED objectives, based on policy assumptions agreed to by the CALFED Policy Group, technical assumptions developed with assistance from CALFED agencies and stakeholders, and linked economic and hydrologic modeling. The modeling will take into account the effect of potential water transfers, water use efficiency measures, alternative water supplies, impacts of unmet demands, system storage, and the effects of all these measures on the need for and proper mix of new storage. Additionally, the investigation will be coordinated with other Program components including an evaluation of the role of storage in improving drinking water quality, the operation of an Environmental Water Account and an assessment of the time value of water and geofluvial processes in cooperation with the ERP science panel.

The Section 404 Guidelines require selection of the least environmentally damaging practicable alternative when constructing new facilities which may impact Waters of the United States, including streams, wetlands, and special aquatic sites. The overall storage strategy will describe whether or not all practicable alternatives to storage facilities have been implemented to the extent feasible and whether there is still an unmet need for additional storage facilities when beneficiaries pay the full cost of new facilities. This effort will be coordinated with the overall CALFED 404 process and will provide guidance throughout Stage 1.

DRAFT

3

DRAFT

April 28, 1999

Surface Storage Investigations: Depending on their locations and operating criteria, surface storage facilities can provide a wide range of water management functions. CALFED and its cooperating agencies have conducted a preliminary screening of potential surface storage locations and project configurations, then selected a smaller number for more detailed evaluation. The screening process, although it has already provided preliminary guidance for more detailed investigations, continues to be refined to assure consistency with current planning conditions and available environmental data. DWR is conducting more detailed investigations for north of Delta off-stream surface storage under separate authority, while USBR is investigating enlargement of Shasta Reservoir. CALFED will evaluate in-Delta, adjacent to Delta, and off-aqueduct storage. There has been considerable interest in a potential expansion of upper San Joaquin River storage; this alternative may be evaluated further if the combined benefits of increased flood control and other water management opportunities warrant it. These study elements will be integrated through system hydrologic modeling, economic analysis, and regional evaluations.

Surface Storage Facilities Screening: Narrow the range of candidate surface storage sites based on engineering, economic, and environmental considerations. The initial list included 52 potential sites; during the Program implementation phase it is anticipated that only a handful will be given serious consideration. This screening effort is necessary to ensure that consideration is only given to sites with some viability and is essential to better defining specific operational criteria and expected costs. Additionally, by reducing the number of sites under consideration the screening study will help limit the scope of expensive and time consuming environmental and technical investigations needed to comply with the required 404 alternatives analysis.

North of Delta Off-Stream Storage Investigation: This DWR study was initially authorized under the Safe, Clean, Reliable Water Supply Act of 1996 and is continuing under augmented funding provided through the State budget process. Its scope was developed in coordination with the CALFED Bay-Delta Program, and includes four potential reservoir projects on the west side of the Sacramento Valley. The proposed projects would rely on a mix of local runoff and/or diversions from the Sacramento River to develop additional water supply reliability. This effort is now being more fully integrated into the ISI and will provide site-specific biological, operational, and cost information which is essential to developing a realistic storage strategy.

In-Delta, Adjacent to Delta Storage and Off-Aqueduct Storage Studies: Delta area storage could provide significant operational flexibility to enhance water supply reliability, water quality, and ecosystem benefits. Water would be pumped from Delta channels when conditions allow, and pumped back into Delta channels in times when there is a demand for the water. An alternative explored by CALFED would connect in-Delta storage to the export facilities in the south Delta, thus eliminating a second screening cycle for export water supplies. Delta area storage may have several unique operational attributes for water quality and

DRAFT

4

DRAFT

April 28, 1999

real time system operation which must be specifically evaluated as part of the ISI. Similarly, off-aqueduct storage can enhance operational flexibility by providing additional opportunity to export Delta water when biological and water quality conditions warrant.

On-Stream Storage Enlargement Studies: USBR has completed an initial assessment of potential Shasta Lake enlargement alternatives. Raising the dam elevation by about 6 feet may prove to be a cost-effective option for expanding capacity by about 290,000 acre-feet. The primary impact concerns would include additional inundation of streams entering the lake, loss of terrestrial habitat, and impacts on recreation facilities on the existing shoreline. There has also been considerable interest in exploring an enlargement of Millerton Reservoir by modifying Friant Dam for potential improvements in flood control, water supply reliability, and ecosystem restoration. Given the potential for multiple benefits from such enlargements, these efforts are included in the ISI for further development in the context of the other options.

Groundwater/Conjunctive Use Programs: CALFED has developed a framework for evaluation and development of additional groundwater and conjunctive use opportunities, based on voluntary participation by local water management entities. The proposed framework would provide opportunities for intensified groundwater monitoring, modeling, and evaluation of local and regional opportunities as well as potential impacts and mitigation requirements. It calls for use of pilot studies to methodically assess opportunities and impacts before full implementation. In addition, DWR and USBR are working with local agencies to explore specific groundwater banking and conjunctive use opportunities. DWR's North of Delta Off-Stream Storage Study also includes evaluation of opportunities for exchanges and groundwater management in conjunction with surface storage. The ISI will identify beneficial pilot projects and develop operational strategies to optimize conjunctive management opportunities with existing and potential new surface storage.

Power Facilities Reoperation Evaluation: There is existing storage capacity in the Bay-Delta system dedicated to the generation of hydroelectric power. AB 1890 (Chapter 854, Statutes of 1996, Public Utilities: electrical restructuring) has triggered an evaluation and potential divestiture of some or all of these facilities. There is the potential to re-operate some of these hydroelectric facilities to produce water supply or ecosystem benefits. The ISI will evaluate the potential for achieving CALFED water management objectives through the re-operation of existing hydroelectric facilities. The evaluation will include consideration for conjunctive operation with existing surface storage and/or groundwater storage.

Fish Migration Barrier Removal Evaluations: As part of CALFED's Ecosystem Restoration Program, some obstructions to fish passage (such as small dams) are being considered for modification or removal in order to restore anadromous fish access to critical spawning habitat. There is a need for a more systematic approach to identifying and prioritizing barriers for future action. The scope of ISI provides an opportunity for

DRAFT

5

DRAFT

April 28, 1999

such a comprehensive assessment. The evaluation will consider the potential ecosystem benefits and alternative ways to address potential water supply reliability, flood control, and power impacts associated with facility removal or modification. Interested stakeholders will participate in the evaluation of each candidate facility in an open evaluation and decision process.

Implementation Process

The integrated evaluation of these complex components will require substantial, coordinated effort. The CALFED investigation will initially focus on programmatic, system-wide interrelationships. CALFED will then work with the involved agencies and stakeholders to fill in detailed system-wide, regional, and local evaluations. Appropriate conceptual models will be developed to illustrate and evaluate potential storage and water management strategies. CALFED will utilize a storage technical team of agency and stakeholder representatives to help guide, integrate and evaluate the study components. The ISI will be coordinated closely with the ecosystem science panel review to develop diversion and flow strategies and the Economic Evaluation of Water Management Alternatives (EEWMA) to properly integrate economic considerations (see Figure 3). Additionally, CALFED will provide for critical peer review at key milestones of the ISI. The outline of the scope of work is shown as Attachment 1.

ISI

