4.3 Water Management Strategy

The Water Management Strategy (WMS) is a strategy to coordinate and integrate the activities of several key CALFED program elements in order to help secure sufficient, reliable water supplies to support environmental, urban and agricultural beneficial uses. The WMS:

- Describes a menu of water management tools to increase water use efficiency, promote water transfers, modify water supply operations and infrastructure, and create synergistic benefits with associated water quality improvements.
- Identifies specific water management tools from this menu which will be implemented in Stage 1 of the CALFED Bay-Delta Program.
- Provides a long-term decision making framework for evaluating the success of implementation efforts and for selecting additional tools needed to achieve CALFED objectives.

As mentioned in Chapter 2, in light of the substantial variability of water demand and supply, as well as the different utility of the various water management tools, CALFED believes that the appropriate water management strategy will not be a single approach, but the proper combination of all of the available tools. This concept was portrayed in the December 1998 *Revised Phase II Report* as a matrix of measures, shown in the adjacent figure. This chart is further modified below to include revised goals/objectives and additional water management tools.

Integrated Water Management Strategy

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

The WMS has continued to evolve since the beginning of the Program and will be further defined prior to the Record of Decision on the Programmatic EIS/EIR. Unlike the other three CALFED problem areas (levee system integrity, water quality, and ecosystem quality) which each resulted in development of a program, no single program was developed to focus on water supply reliability. However, CALFED did develop programs for Water Transfer, Water Use Efficiency, Storage, and Conveyance which are all important tools in the WMS. Early in the development, CALFED recognized a number issues needed to be resolved for water supply reliability to improve:

- Make better use of existing water supplies

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- Allow market mechanisms for the movement of water to function more efficiently
- Reduce diversion conflicts between instream beneficial uses (environmental uses) and out-of stream beneficial uses (consumptive uses)
- Make water cleaner so it is suitable for more uses and reuses
- Decrease drought impacts , both for the environment and for other water users
- Increase water supply availability by providing means for water users and the environment to acquire additional water at high priority times and places
- Increase operational flexibility by improving the ability of the system to respond appropriately to biological or hydrological conditions or other unforseen circumstances

No single water management tool or CALFED program element can adequately address each of these issues. Therefore, the strategy is to use the proper combination of all of the available tools. The menu of tools which may be used to ~~achieve the above goals and objectives in the WMS~~ improve water supply reliability are:

- Water Transfer Program
- ~~Project operations, including the Environmental Water Acount (EWA)~~
- Water Use Efficiency Program (agricultural, urban, and wetlands water conservation and wastewater recycling/reclamation)
- Storage element~~, including Integrated Storage Investigations (ISI)~~
- Conveyance elements, including South Delta Improvements
- Watershed Program
- Water Quality Program
- Monitoring and real-time diversion management to help facilitate each of the above tools

Each of these are discussed in more detail later in Chapter 4.

Water Supply Reliability Objectives

Chapter 1 included a description of the CALFED mission statement together with broad objectives for each of four resource areas. The broad objective for water supply reliability is to ***reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system.*** In its simplest form, the definition is based on two major needs:

1. **Reduce the conflict** among agricultural, urban, and environmental water users by maintaining adequate supply and timing of that supply
2. **Reduce the uncertainty** by improving the predictability of supplies and reducing the vulnerability from potential disasters

Meeting all of California's water needs is not a purpose of CALFED. However ~~it~~CALFED does intend to improve water management for beneficial uses of the Bay-Delta system. The WMS needed ~~to define~~ a set of more measurable objectives that will reverse the trend of heightened conflicts and unacceptable uncertainty in Bay-Delta water supplies. "Measurable" is not intended to require a set of specific water quantity numbers or other metrics, but a description of objectives which can be measured by obvious reversals of past negative trends. However, in some cases, the objectives may be supplemented in future drafts by numerical targets developed through ongoing and new work efforts before the Record of Decision on the Programmatic EIS/EIR.

Collectively meeting the following goals and objectives will reduce water user conflicts, risk and uncertainty in Bay-Delta water supplies and improve overall water supply reliability:

Goal A: Increase the utility of available water supplies (making water suitable for more uses and reuses).

- **Objective A-1:** Achieve the objectives for agricultural water use efficiency contained in the Water Use Efficiency Program.
- **Objective A-2:** Achieve the objectives for urban water conservation contained in the Water Use Efficiency Program.
- **Objective A-3:** Achieve the objectives for water recycling contained in the Water Use Efficiency Program.
- **Objective A-4:** Reduce TDS (total dissolved solids) in Delta water supply, overall and at sensitive periods, to increase capability for blending of supplies from Delta and non-Delta sources.
- **Objective A-5:** Reduce TDS in Delta water supply, overall and at sensitive periods, to allow for increased opportunities for recycling.
- **Objective A-6:** Reduce TDS in Delta export water supply in order to reduce need for additional treatment of industrial process water.
- **Objective A-7:** Improve the multiple uses of water as it moves through the Bay-Delta system and export areas.

Goal B: Improve access to existing or new water supplies, in an economically efficient manner, for environmental, urban and agricultural beneficial uses.

- **Objective B-1:** Secure reliable water supplies to achieve Ecosystem Restoration Program objectives.
- **Objective B-2:** Assist water users in mitigating current or anticipated impacts of regulatory actions and other changes in water supply availability.
- **Objective B-3:** Provide an institutional structure in which a properly regulated and protective water market will allow water to move between users, including

environmental uses, on a voluntary and compensated basis.

Goal C: Improve flexibility of managing water supply and demand in order to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability.

- **Objective C-1:** Shift timing of diversions and exports to less biologically sensitive time periods identified by the Ecosystem Restoration Program.
- **Objective C-2:** Increase ability to interrupt or shift exports and diversions in rapid response to unforeseen biological or hydrological conditions or other circumstances.

The CALFED Water Management Strategy will focus on meeting these goals and objectives. More specific, preferably numeric, targets will be developed to complement these narrative objectives where possible. Many of the objectives will require technical efforts to evaluate assumptions such as demand schedules for water deliveries for beneficial uses, source and cost of water supply (economics), and relative impact on level of beneficial use. Some objectives will be more specifically defined through ongoing work within the program elements, such as the CALFED Water Use Efficiency Program.

WMS Framework

Work is continuing on ~~all the above~~refining the WMS tools and a more complete draft of the Water Management Strategy is planned for late September 1999. A final version of the Water Management Strategy will be included with the Final Programmatic EIS/EIR. Given that much of the work on the various water management tools will continue to be refined over the next year, the ~~Water Management~~ strategy will also continue to be refined. The WMS Framework is a start at defining the strategy. Between this draft of the Framework and the September draft of the Water Management Strategy work will continue on:

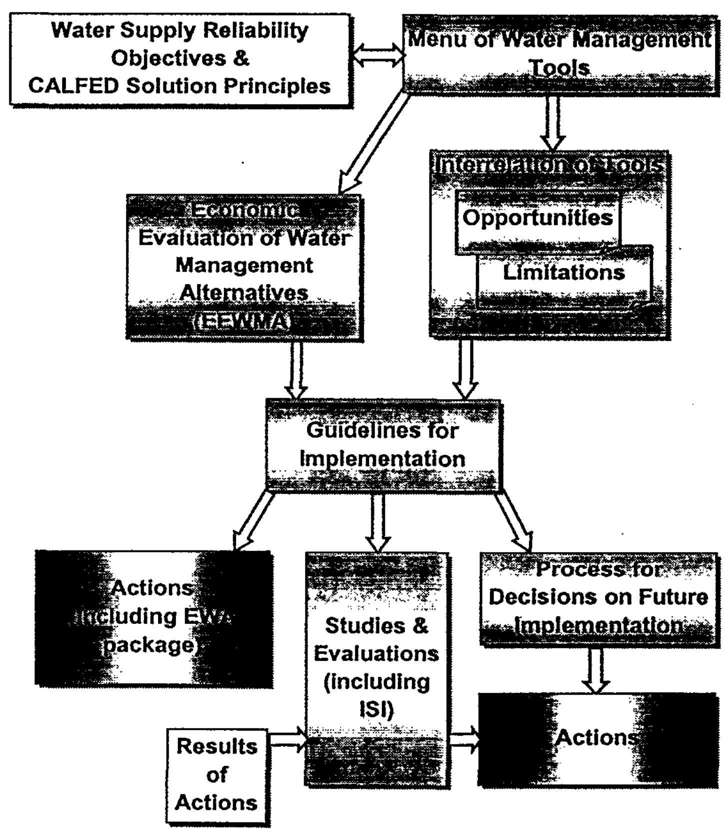
- Adding definition to the water supply reliability objectives by considering measurable targets being developed for the program elements
- Adding definition to the opportunities, limitations and ~~linkages~~interaction of the water management tools
- Providing conceptual descriptions for the use of the tools in combination during different hydrologic periods
- ~~Updating the summary with available information from the economic analysis and the Integrated Storage Investigations~~

Between September 1999 and the Record of Decision on the Final EIS/EIR, much of the Water Management Strategy effort will focus on interfacing with the Clean Water Act Section 404 analysis and determining funding levels to begin implementation and funding level guidelines for longer-term implementation.

~~As described in Chapter 2, natural runoff patterns are significantly different (season to season and year to year) than water demand patterns. Major runoff occurs in the winter through late spring. Agricultural demand occurs primarily from late spring through early fall. Urban demand is more uniform year round. Environmental demand is closer to the natural flow pattern. There is less runoff during dry years and not a significant change in water demands. Demand patterns are not easy to rearrange so existing storage (over 40 MAF statewide) helps change the water supply pattern to more closely match demand patterns but this does not result in a total match. At the same time, the state is facing an increasing need for water (primarily due to increasing population and environmental needs).~~

The foundation of the strategy remains that CALFED will use the proper combination of all of the available tools to meet the water supply reliability objectives and CALFED solution principles. CALFED is developing information on the utility of each WMS tool through the Economic Evaluation of Water Management Alternatives (EEWMA) and descriptions of the opportunities, limitations, and ~~linkages~~interaction ~~are key information for the strategy and are summarized later in this section~~ of the tools. The EEWMA will provide valuable information on the "cost-effective" mix of tools. However, other information on how the tools function must be considered. Summaries of the economic analysis and the description of the opportunities, limitations and interaction of tools are provided in the following sections. This information will help determine the guidelines for implementation and ultimately the actions, studies and process for decisions on future implementation.

WMS Framework



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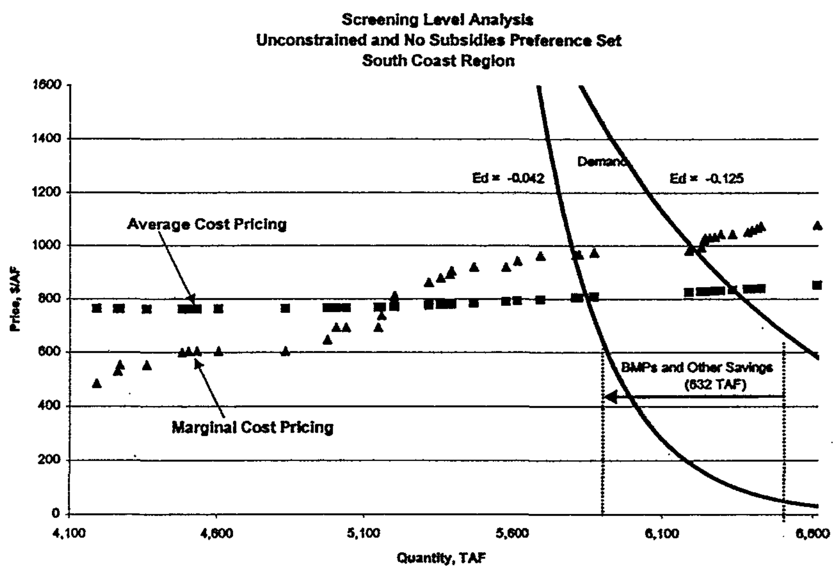
Economic Evaluation of Water Management Alternatives

The Economic Evaluation of Water Management Alternatives (EEWMA) provides information to help define the opportunities for the water management tools. The evaluation is considering water supply demand relationships for five demand regions within the CALFED study area with a range of constraint (or stakeholder preferences) sets. These sets indicate how different groups would constrain or encourage use of the various water management tools. For example, a group may prefer to leave the potential quantity of urban recycling unconstrained while another group may prefer to limit recycling to a specified maximum quantity because of cost. One group may prefer no new surface storage while another group may prefer a minimum amount that replaces water reallocated by past regulatory actions. ~~This economic evaluation considers the price elasticity, or how the demand for water changes with increasing cost of water.~~

The results of the screening analysis will be presented in charts that show supply and demand relationships for each of the five demand regions by constraint sets. Accompanying each chart will be a table detailing the particular water supply options including price and quantity adjustments at the destination. The relationships consider how the demand for water may change (elasticity) as water price increases. The adjacent figure shows an example for one demand region and one ~~stakeholder preference~~constraint set.



Preliminary supply and demand screening analysis results include the following:

- Water supply functions (quantity versus price at destination) are relatively flat. Considering the uncertainty in the estimates of cost and water supply availability of the options, there is little economic difference among many supply options.
- Active conjunctive use and new surface storage supply options included in the scenarios (a scenario is a list of the most cost-effective water supply options necessary to meet demands subject to the constraint sets) are similar across the sets, unless water management tools are specifically excluded or included.
- Urban demand for new water supply is relatively "inelastic", such that water

supply price changes have only a small effect on demand.

- Land fallowing is included in the base assumptions for all the scenarios. Water supplies from the least expensive land fallow measures are assumed to be exhausted by purchases for planned environmental restoration measures.
- Without revised cost allocations, there is minimal willingness to pay for new agricultural water supplies.

The economic evaluations each provide one view of the effectiveness of the water management tools but do not present the complete answer. The economic information must be supplemented by descriptions of the opportunities, limitations, and interrelation of the water management tools. For example, the most economic mix of tools may not provide the necessary operational flexibility, or may present high third party or environmental impacts.

Opportunities, Limitations, and Interrelation of Tools

~~As discussed above, no single water management tool or CALFED program element can adequately address all the needs for improving water supply reliability. The strategy is to use the proper combination of all of the available tools. The chart on the following page shows a summary of how well the water management tools contribute to meeting the goals and objectives for water supply reliability. Each tool is described in more detail later in this chapter.~~ Following is a brief description of how each tool fits within the overall ~~framework of the~~ strategy ~~for each tool~~.

__Water Transfers__ - The term "water transfers" is generally used to mean the reallocation of water (diverted under water right, contract, or by groundwater extraction) between users on a voluntary and compensated basis. The Water Transfer Program proposes a framework of actions, policies, and processes that, collectively, will facilitate water transfers and further development of a state-wide water transfer market. Because water transfers can affect third parties (those not directly involved in the transaction) and local groundwater, environmental, or other resource conditions, the framework also includes mechanisms to provide protection from such impacts.

A water transfer is not a source of new water but is a mechanism to move water between water users. Transfers are closely linked with most of the other water management tools. Water saved from water conservation, generated by new storage facilities, or developed by any of the water management tools could be transferred from one user to another. Water transferred from one user to another requires special coordination when the timing of use is different between the two uses. For example, if a farmer decides not to irrigate a parcel of land in the summer and transfer that water to a city, the timing of use could change. Storage in groundwater or surface reservoirs could significantly increase the flexibility to transfer water.

Long-term and short-term water transfers are the source of the majority of the water needed for the Ecosystem Restoration Program for restoring critical instream flows and improving Delta outflow during key springtime periods. Also, ~~the Environmental Water Account~~real-time diversion management requires the ability to purchase water and transfer for modifying export pumping, instream flows and Delta flow patterns or ~~the account cannot function~~real-time management will not work. During Stage 1, most of the dry period water transfer capacity from north to south of the Delta will likely be for environmental purposes as part of ~~the Environmental Water Account~~real-time diversion management. Towards the end of Stage 1, as new facilities are available ~~to the account~~for use with real-time management, more of the cross-Delta transfer capacity will be available for other uses.

Since the Water Transfer Program primarily requires administrative changes and does not require major funding investments, the program will be put in place in its entirety at the beginning of Stage 1. Once in place, it will not require additional implementation but only modest annual funding to maintain it. The WMS will not plan for future potential adaptions of the Water Transfer Program. If future needs for modification materialize, the modifications will be left to those existing agencies with jurisdiction for transfers (DWR, USBR, WRCB) and the legislature.

<u>Agricultural Water Conservation</u> - Agricultural water conservation helps meet the water utility and water access goals. Improved agricultural water conservation can result from both management and technical improvements at both the district and farm level. The benefits of conservation may result in reductions in percolation to salt sinks, reductions in evapotranspiration, or reductions in warm or polluted runoff.

Agricultural water conservation can be a source of water for other agricultural users or be transferred to other water users including the environment. As mentioned earlier, storage can significantly increase the flexibility of these transfers. The Water Use Efficiency Program is currently developing performance standards for all types of water use efficiency measures. Financial incentives provided by CALFED can encourage implementation of conservation measures that are cost effective from a statewide perspective but not at the local level. The Water Management Strategy will develop initial and long-term annual funding targets to facilitate agricultural water conservation measures that are cost effective on a statewide basis. Future funding will be adjusted (up or down) as more experience is gained with the conservation effectiveness and new cost-effective technologies are developed.

<u>Urban Water Conservation</u> - Urban water conservation helps meet the water utility and water access goals. Most major California urban areas discharge wastewater into the Pacific Ocean. For these cities, urban water conservation will reduce total urban demand for water. Urban conservation measures in the Central Valley will reduce the need to divert water (and the environmental and water quality impacts of diversions) and, will effectively generate water to the extent that landscape measures reduce evapotranspiration. However, waste water from cities in the Central Valley returns to the water system and is reused downstream. While making better use of urban water supplies makes sense, increased urban water conservation can reduce the system flexibility. During drought periods, users normally conserve more water to withstand the water shortage. As more water conservation is included as part of the normal water use there is less ability to conserve more water to respond to shortages ("demand hardening").

The Water Use Efficiency Program is currently developing performance standards for all types of water use efficiency measures. Financial incentives provided by CALFED can encourage implementation of conservation measures that are cost effective from a statewide perspective but not at the local level. The Water Management Strategy will develop initial and long-term annual funding targets to facilitate urban water conservation measures that are cost effective on a statewide basis. Future funding will be adjusted (up or down) as more experience is gained with the conservation effectiveness and new cost-effective technologies are developed.

<u>Wetlands Water Conservation</u> - Wetlands water conservation helps meet the water access goal. Wetlands water conservation is almost identical to agricultural water conservation

<u>Water Recycling</u> - Water recycling involves reusing water that is not consumptively used during a previous application. Recycled water can be redistributed as potable water, with sufficient treatment, or can be used as a substitute supply in areas where high quality is not needed (e.g., golf courses). Urban areas have a very high potential for reuse, on the order of 1-2 MAF/year, though the cost can be quite high. However, it is a very reliable source of water and can have among the least environmental impacts of any of the water management tools.

The ability to recycle water is highly dependent on the total dissolved solids (TDS) in the water. Each use of water adds salts to the water so cleaner source water provides more opportunities for recycling or blending with other sources than source water higher in TDS. Water quality control measures, operational changes, storage, and conveyance can all increase the recycling potential.

The Water Use Efficiency Program is currently developing performance standards for water recycling. Financial incentives provided by CALFED can encourage implementation of recycling measures that are cost effective from a statewide perspective but not at the local level. The Water Management Strategy will develop initial and long-term annual funding targets to facilitate water recycling that is cost effective on a statewide basis. Future funding will be adjusted (up or down) as more experience is gained with the conservation effectiveness and new cost-effective technologies are developed.

<u>Storage</u> - Storage can make major contributions to each of the water supply reliability goals but is especially helpful in improving overall system flexibility. Storage is an essential element for successful ~~operation of the Environmental Water Account~~real-time diversion management. While ~~the account~~CALFED will access existing storage where possible to move water in time for the benefit of the ecosystem, new storage would significantly improve effectiveness of~~the account~~real-time diversion management. New storage would provide an assurance for continued operation ~~of the account~~real-time management that temporary rights to existing storage would

not. The environmental impacts of site development and of the water diversion to storage are a major concern to many.

Groundwater and Conjunctive Use - Groundwater storage is usually the least expensive type of storage that can be implemented, the type that can be implemented most rapidly, and the type with the least environmental impacts. However, groundwater storage is less versatile than surface storage. Fill rates are constrained by the size of distribution systems and by the rate at which water can be introduced into the ground. Extraction rates are limited by the rate at which water can be pumped from the ground. Under a groundwater conjunctive use operation, surface water is used more in wetter years, allowing underlying groundwater aquifers to recharge naturally and from percolation from applied water. During dry years, water is pumped from groundwater storage to meet consumptive uses, allowing less reliance on surface water supplies.

Surface Storage - Surface storage is generally more flexible than groundwater storage, depending on operating criteria; water can be quickly stored and quickly released when needed. The potential environmental impact of new surface storage is the main disadvantage.

Hydropower Reoperation - Existing hydroelectric project reservoirs throughout California provide the potential to help water supply reliability. Rather than the current operation that emphasizes generation of electricity, a change in the timing of storing and releasing water could provide benefits for water supply reliability, especially from the larger reservoirs. However, many of these reservoirs are very small and reoperation would likely provide very limited benefit to CALFED. Many of the reservoirs do not currently store and release water but simply provide a diversion to a hydroelectric plant. A change in pattern of operation for any of the reservoirs would have to consider the many potential impacts on power production, recreation, the environment, etc. Since these hydropower operations are not a consumptive use of water, water flowing from these reservoirs is currently used by other downstream users. Therefore, there may not be major opportunities for developing "new" water from these facilities for CALFED purposes. Some reservoirs could provide benefit for operation for smaller local water supplies. While the "new" water potential may not be large, the reservoirs may provide some unique opportunity to CALFED because they are existing reservoirs and do not present the significant time delays associated with development of new surface storage. ~~The Environmental Water Account~~CALFED could potentially purchase rights for storage in these facilities to meet its need to store and release water for environmental benefits and conduct real-time diversion management.

Fish Barrier Assessment - The fish barrier assessment is included ~~in the ISI~~ so there is a coordinated look at barriers that could potentially be removed or modified to increase fish access to habitat above the barriers. Obviously many of these barriers are dams which provide existing storage or water diversion capability of some kind. The study will include consideration of the potential negative impacts to water supply reliability and ways to mitigate these impacts.

Conveyance - Improved conveyance contributes to each of the water supply reliability goals but makes major contributions to the system flexibility. The South Delta Improvements (see Conveyance section later in this chapter) are necessary as early in Stage 1 as possible to increase the permitted south Delta export capacity and thereby increase the system flexibility. ~~The Environmental Water Account~~For real-time diversion management, CALFED must have the ability to export higher volumes of water at certain times ~~or the account does not work~~to balance times of lower export to protect fish species. This increase in flexibility is dependent on implementation of the Joint Point of Diversion (JPOD) for the SWP and CVP, construction of an intertie between the SWP and CVP, full fish screening of the SWP and CVP exports, an operable barrier at the head of Old River, and operable barriers for water quality and water stage needs in the south Delta. The strategy also includes early study and evaluation of a screened diversion structure on the Sacramento River at Hood (or equivalent water quality actions) to improve water quality. Based on the results of this study, a decision to build a diversion up to 4000 cfs could be made later in Stage 1. Setback levees, dredging and/or improvement of existing levees along the channels of the lower Mokelumne River system during Stage 1 would mainly benefit flood control and habitat improvement but would also provide some improvement for water quality and conveyance to improve water supply reliability.

Watershed Management - Watershed Management can help meet the goals for improving the utility of water and access to water. Actions in the upstream watersheds can have an impact on the patterns of runoff and upon levels of siltation behind dams. For example, restoration of meadows upstream may slow runoff during storms, thereby helping reduce flood danger and effectively naturally storing water during higher stream flows and naturally releasing water during lower stream flows. Thinning of trees can reduce evapotranspiration of water. Improved land management can reduce siltation behind reservoirs, thereby preserving usable storage volumes.

The strategy includes implementation of all the Watershed Management Program actions at the beginning of Stage 1. Once in place, it requires annual funding to maintain it by providing incentives for local participation. Like other parts of the CALFED Program, CALFED will make future adjustments in annual funding level to improve the effectiveness as experience is gained.

Water Quality Control - Water quality control is essential to meeting the goal of increasing water utility. The Water Quality Program will help reducing the concentration of pollutants through source control measures. In addition, the Water Management Strategy seeks to further lower TDS through operational changes as part of ~~the EWA~~real-time diversion management beginning early in Stage 1. Conveyance improvements, such as the South Delta improvements, implemented by the end of Stage 1 will increase the system flexibility and the ability to divert water at times more beneficial to water quality. Study and potential implementation of a Hood diversion from the Sacramento River can improve project operations for water quality. ~~The Integrated Storage Investigations will study~~CALFED evaluations of storage will consider potential operational changes in the existing system and the potential water quality benefits of new storage. CALFED will use this information, together with other ongoing studies to help fulfill CALFED's commitment to continuous water quality improvement and to help make future decisions on how best to meet its water quality objectives.

The Long-Term Levee Protection Program is also a necessary element in maintaining water quality in the Delta. Loss of any of the western Delta islands would increase salinity intrusion and significantly decrease the utility of Delta water. If the loss occurred during times of low Delta outflow, it could require release of large quantities of reservoir water and/or stopping exports from the south Delta for an extended period of time.

Monitoring and Real-Time Diversion Management - Real-time monitoring has great potential in helping system flexibility and reducing diversion conflicts. The majority of the fish entrainment at water diversions for individual species typically occurs during only small periods of time. If those times can be predicted in advance, diversions can be curtailed and entrainment dramatically reduced with a relatively low reduction in diversion levels. This is an essential component of ~~the Environmental Water Account~~real-time diversion management. Likewise, greater diversions can then be allowed during periods when entrainment is not a major issue. ~~Real-time~~ Monitoring and real-time diversion management can also significantly improve water utility by helping coordinate operational changes for biological benefits with other needs such as water quality. Monitoring is essential for the success of every water management tool so success can be measured and adjustments made where necessary.

Monitoring is a long-term need of the Water Management Strategy. The strategy relies on adequate implementation of biological, water flow, and water quality actions of the Comprehensive Monitoring, Assessment and Research Program (CMARP) at the beginning of Stage 1. Like other parts of the CALFED Program, future adjustments will be made to make the monitoring more effective as experience is gained.

The following page shows a summary of the general, relative potential for the tools to meet the water supply reliability objectives. Some tools are very important for meeting one objective and other are important for meeting the other objectives. However, none of the individual water management tools meet all of the objectives. Each tool provides somewhat different opportunities and limitations considering the interrelation with the other water management tools.

Relative Potential for Water Management Tools to Meet Objectives

Water Supply Reliability Goals & Objectives	Long-Term and Short-Term Water Transfers	Water Conservation: Agricultural	Water Conservation: Urban	Water Conservation: Wetlands	Wastewater Recycling	Storage (ISI): Groundwater & Conjunctive Use	Storage (ISI): New Surface Storage	Storage (ISI): Hydropower Reop.	Storage (ISI): Fish Barrier Assessment	Conveyance (South Delta Improvements)	Watershed Management	Water Quality Control	Monitoring and Real-Time Diversion Management
Goal A: Increase the utility of available water supplies													
Objective A-1 Ag. Water use efficiency	•	⬤				●	●	•		•		●	
Objective A-2 Urban conservation	•		⬤		•	●	●	•		•		•	
Objective A-3 Wastewater recycling		•	•		⬤					•		●	
Objective A-4 Reduce TDS for blending	•					●	●	•		•	•	●	●
Objective A-5 Reduce TDS for recycling	•					●	●	•		•	•	●	●
Objective A-6 Reduce TDS for treatment	•					●	●	•		•	•	●	●
Objective A-7 Improve multiple use	•	•	•	•	●	●	●	•		●		●	●
Goal B: Improve access to existing or new water supplies, in an econimically efficient manner, for environmental, urban and agricultural beneficial uses													
Objective B-1 Water for ERP	⬤	●	●	●	●	●	●	●		●	•	•	•
Objective B-2 Assist water users in mitigating changes in water supply availability	●	●	●	●	•	●	●	•		●	•	•	•
Goal C: Improve flexibility of managing water supply and demand to reduce conflicts between beneficial uses, improve access to water supplies, and decrease system vulnerability													
Objective C-1 Shift timing of diversions and exports to less biologically sensitive time periods	⬤	•	•	•	•	●	⬤	●		⬤	•	•	⬤
Objective C-2 Increase ability to interrupt or shift exports due to unforseen circumstances	•					●	⬤	●		●		•	•

blank = tool provides negligible or no contribution to meeting objectives
• = tool provides minor contribution to meeting objectives
● = tool provides moderate contribution to meeting objectives
⬤ = tool provides strong contibution to meeting objectives

WMS Tools for Implementation in Stage 1

With CALFED Program implementation extending over 30 years or more, the WMS ~~will develop~~needs guidelines for timing implementation of various tools so the strategy progresses in the most effective manner. The following draft guidelines for early implementation help identify actions, especially during Stage 1 (approximately the first seven years following the Record of Decision):

- Implement actions with **early** and lasting benefits for water supply reliability.
- Implement actions with **multiple** benefits. These can include multiple benefits for water supply reliability and help meet objectives for other CALFED resource areas.
- Implement actions which are **economical.**
- Use incentives for **local** participation and leverage where possible.
- Institute **operational**, administrative and fiscal actions where possible due to time delay for new facilities.
- Continue active, substantial **progress** for actions with long-lead times or for those requiring additional evaluation before decisions can be made.

These draft guidelines recognize the fact that many of the WMS tools take longer to implement than other tools. Also, for some actions, CALFED has enough information to proceed with implementation while other actions require additional evaluation before a decision on their implementation can be made. CALFED's concept for an Environmental Water Account (EWA) is an example of a package of WMS tools that must be implemented early in the Program while the Integrated Storage Investigations (ISI) is an example of a needed evaluation before a decision for implementation can be made. Both the EWA and the ISI are discussed in more detail in the following sections.

Chapter 5 describes Stage 1 actions and bundles (for years 2000 and 2001) for all parts of the CALFED Bay-Delta Program including the ~~above~~ WMS tools. Work will continue on defining the Water Management Strategy. The following page presents a summary of current thoughts for initial implementation and/or study for each WMS tool and what future decisions could be included as part of the strategy.

<u>**Environmental Water Account (EWA)**</u> - The EWA concept is based upon the notion that flexible management of water operations will achieve fishery and ecosystem benefits more efficiently than a completely prescriptive regulatory approach. The account is dependent on monitoring and real-time diversion management and will be funded each year with dollars, water, and rights to storage and conveyance. These assets will be used to modify export pumping to avoid times more critical for fish species and move more water at times less critical to the fish.

<u>**Integrated Storage Investigations (ISI)**</u> - The ISI will evaluate the relationship between various types of storage and the overall role of storage as part of the Water Management Strategy. 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.

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Water Management Strategy Framework Summary		
Tool	**Initial Implementation**	**Future Decisions for Modification**
Water Transfers	All actions in Water Transfer Program *(no quantity targets).*	Changes to functioning water market by current state and federal jurisdictional entities (DWR, USBR, SWRCB) or by the legislature.
Agricultural conservation	Actions in Water Use Efficiency Program which are economic locally and statewide *(performance targets before ROD).*	Additional actions based on economics, market conditions and technical advances.
Urban conservation	Actions in Water Use Efficiency Program which are economic locally and statewide *(performance targets before ROD).*	Additional actions based on economics, market conditions and technical advances.
Wetlands conservation	Actions in Water Use Efficiency Program which are economic locally and statewide *(performance targets before ROD).*	Additional actions based on economics, market conditions and technical advances.
Wastewater recycling	Actions in Water Use Efficiency Program which are economic locally and statewide *(performance targets before ROD).*	Additional actions based on economics, market conditions and technical advances.
Groundwater & conjunctive use	Start pilot projects, locally implemented groundwater projects. ISI to identify appropriate mix of storage.	Implement in conjunction with water use efficiency when beneficiaries need and pay.
Hydropower reoperation	Study in ISI to identify appropriate mix of storage.	Implement in conjunction with water use efficiency when beneficiaries need and pay.
New surface storage	Study in ISI to identify appropriate mix of storage.	Implement in conjunction with water use efficiency when beneficiaries need and pay.
Fish barrier assessment	Study in ISI to identify modification priorities for barriers.	Implement in conjunction with the ERP and mitigation of water supply and other impacts.
Conveyance	South Delta Improvements including JPOD. Mokelumne floodway. Study Hood diversion. Study isolated facility, other water management alternatives to improve drinking water quality.	If appropriate, implement Hood diversion based on study. Present results of study to improve drinking water quality and determine actions
Watershed management	All actions in Watershed Program ($___/year financial and technical support).	Monitor and adjust $/year.
Water quality control	Operation in conjunction with EWA. Source control. Study operational improvements in ISI. Study other physical improvements and water management options.	Adjust operational guidelines and funding as experience is gained.
Monitoring	All actions in Comprehensive Monitoring, Assessment and Research Program.(CMARP)	Adjust CMARP as experience is gained.
Environmental Water Account (EWA)	Provide assets to the EWA ($__-__ Million/yr, access to storage, ability to flex. standards & access to water).	Adjust operational guidelines and funding as experience is gained.

The Environmental Water Account

Many of the water management tools described above can be put to work immediately to solve problems of ecosystem quality and water supply reliability simultaneously. This can be done by altering the way we manage and move water within the Bay-Delta system, with our actions guided not by a single objective to provide water supply, or protect fish, or improve water quality, but by considering all of these needs at the same time. This adds complexity to a system of water management that is already very complex, and requires a high degree of cooperation among interests that have often been at odds. Despite the difficulty, the potential rewards are great: an integrated approach to water management can contribute substantially to the recovery of threatened and endangered fish species in the Bay-Delta system while providing for continuous improvement in water supply reliability and water quality.

In the past, Bay-Delta fish species have been protected from the potential impacts of water diversions through the application of prescriptive standards. For example, under the current regulations, the State and federal water projects can divert no more than 35 percent of Delta inflow during February through June of most years. This type of rigid standard is easy to understand and enforce, but it may impose unnecessary hardship on water users if there are times during the February to June period when a higher rate of diversion would not be harmful to fish. Conversely, there could be circumstances under which a reduction in diversions would be more beneficial to fish at some other time of year.

One way to increase the level of benefit for Bay-Delta fish while maintaining or improving water supply reliability for diverters would be to allow ecosystem managers to operate as if they were running a water district for the environment. This water district would have water available to meet environmental needs, and funds available to make water purchases. This proposed approach has been called an Environmental Water Account (EWA). An EWA could have the ability to buy and sell water as necessary to maximize its ability to protect the environment. It could also have the right to manipulate the operations of the State and federal water projects, ordering a reduction in Delta diversions to benefit fish and making the water up to the projects later from the environmental account.

An environmental water account by itself cannot restore ecological health, but it can be a valuable component of a comprehensive solution. An EWA, coupled with the habitat restoration and flow improvement actions in the Ecosystem Restoration Program, supported by a Comprehensive Monitoring, Assessment, and Research program, is expected to make substantial progress in recovering species as described in CALFED's Multi-species Conservation Strategy.

The EWA would not be a substitute for prescriptive standards. However, an EWA coupled with appropriate prescriptive standards could allow much more flexibility in water management. In order to use this flexibility, ecosystem managers will need timely information on the abundance and distribution of fish species in areas where the fish might be affected by water project operations. Monitoring that provides information to guide immediate decisions is called real-time monitoring. It can be costly and labor-intensive to carry out real-time monitoring needed to guide water project operations, but it is essential in order to have the flexibility to make simultaneous improvements in ecosystem quality and water supply reliability. As we begin to manage water in ways that better integrate multiple objectives, we will be able to test hypotheses about the best ways to use water to improve ecosystem health, and levels of prescriptive standards that are needed to assure protection of Bay-Delta species. Through adaptive management, future actions and standards can be guided by what we learn.

CALFED has carried out initial studies and simulated Delta water operations to evaluate an environmental water account. CALFED has concluded that an environmental water account offering flexible management of water operations is a superior way of achieving both fish protection and water supply benefits. An EWA accomplishes these two objectives more efficiently than a completely prescriptive regulatory approach. The environmental water account is included as part of CALFED's water management strategy, to be further developed and fully implemented as soon as possible after a programmatic Record of Decision. The EWA should have sufficient assets available -- both water and funding -- at the beginning of Stage 1 of CALFED implementation so that preliminary operation and evaluation of an EWA can commence.

The sections below provide additional detail on possible structure and attributes of an environmental water account as well as results of initial evaluations.

Account Structure

There are a variety of potential approaches to defining and operating an EWA. All approaches provide resources to the EWA which can be used to alter project operations. For example the account might have the right to directly reduce project exports for a set number of days or a set volume of exports as part of a broad regulatory control over project operations -- a "credit" approach.. Alternatively, part of the yield of new facilities or regulatory flexibility might be converted into a standard contract for the delivery of water each year. However, the approach which has been studied most closely to date has been the so-called "gallon-for-gallon" approach. In this, the EWA would acquire, move, store, and expend its own water supplies. Water could also be acquired through flexible application of some prescriptive standards or through sharing the use of new facilities. Many EWA operations would be carried out using surplus capacity in existing project facilities.

The EWA could then draw on its water "savings account" to provide additional species protection. The fisheries agencies would work with the project operators in using an EWA to modify project operations in real-time. For example, if fish were detected in the vicinity of the export pumps, reductions in export pumping to protect the fish could be required. In return, the water projects could be compensated out of EWA assets, so that reduced project pumping would not result in reduced water deliveries to the State and federal water contractors. Examples of how an EWA may be operated over the course of several years are presented below:

> If the EWA managers decided to extend the export reductions called for within the Vernalis Adaptive Management Plan (VAMP) for an extra month to protect salmon and delta smelt, the result for the State and Federal projects would be reduced storage within San Luis Reservoir.
>
> The EWA would be required to provide water "collateral" to the Projects in order to assure them that the reduced storage in San Luis would be recouped before it is needed by Project contractors. The collateral could take the form of EWA water already sitting in surface storage, groundwater storage, anticipated efficiency supplies, or water purchases. If San Luis storage is high to begin with (i.e., high enough that the reduced San Luis Storage did not reduce Project deliveries), then EWA may not need to pay back the water during the current water year, but could carry this "secured loan" over to the next year in the hopes that favorable conditions would allow for payback with minimal cost to the EWA. But, if San Luis is already low, then payback might be required before the low point in San Luis storage (typically in August). The EWA would pay off its loan by relinquishing its collateral.
>
> Another result of extending export reductions beyond the VAMP period might be reductions in releases from state and federal reservoirs upstream of the Delta (because Delta outflows can now be sustained with lower Delta inflows). That is, the result of cutting exports would be lower storage in San Luis Reservoir and higher storage upstream. Just as EWA would be responsible for paying back the reduction in San Luis storage, it would gain control over the increased upstream storage. This upstream storage could be used to improve instream conditions below the reservoirs in the fall, and either pay off the debt in San Luis, or increase Delta outflow.

Of course, real operations would be much more complicated, with the EWA managers spending assets to protect fish part of the year; diverting water to rebuild assets over other parts of the year; shifting water between surface storage and groundwater storage, and trying to anticipate and accommodate biological needs. While EWA strategies will be developed through a coordinated operations approach among the SWP, CVP, affected stakeholders and other agencies, final authority will rest with agencies responsible for assuring compliance with endangered species protections, including DFG, USFWS, and NMFS.

Water quality concerns must also be considered in management of an EWA. Operational changes to enhance the protection of aquatic resources and export supplies have the potential to affect water quality. Management of the EWA must be coordinated with operation of the State and Federal water projects and the CALFED Water Quality Program to provide water quality improvements for all users.

Potential Attributes of An EWA

For a given quantity of water dedicated to environmental protection, an appropriately sized EWA with the appropriate combination of assets is more protective than traditional standards and could be an important tool for restoring the ecosystem and protecting endangered species in compliance with ESA. Potential attributes of the EWA include:

1. Increased Flexibility - The flexibility to provide the greatest level of environmental protection at a time when fish are most threatened may be difficult to craft as a fixed standard. EWA operations could be a more flexible and efficient tool for providing protections for certain species.

2. Increased Protection for Species From Entrainment Even During Favorable Hydrological Conditions - As an example, delta smelt adults following a dry year are believed to be particularly vulnerable. Entrainment of such fish in January or February could be a problem, despite apparently favorable hydrologic conditions.

3. Focused Protection - It is difficult to predict which species will be at greatest risk at a given time in the future. An EWA could provide the ability to tailor operations to protect those species most at risk in a given time and situation.

4. More Efficient Use of Water - Because of the wide range of hydrologic and environmental conditions that can be encountered in the Delta, it is difficult to craft a standard that efficiently protects species under all circumstances. The EWA could allow operations to be tailored to the specific circumstances at hand.

5. Greater Opportunities to Experiment and Learn From Previous Operations - Opportunities to conduct experimental manipulations may be enhanced because an account could be used to compensate for potential impacts to other beneficial uses. An EWA will also allow rapid translation of new scientific insights into improved operations. The information provided by CMARP will be critical to successful adaptive management.

6. More Incentives for Efficiency - The incentive for getting maximum benefit from a given resource comes from having finite resources. An EWA would encourage efficient use of its assets.

7. Better Coordination of Maximum Benefits - An EWA could provide opportunity to coordinate with actions of others (CALFED habitat restoration, CVPIA actions, etc). EWA decisions can take into account diverse events taking place at the same time, such as hatchery releases, large natural production of juveniles, unexpected toxicity events, etc.

8. Potential for Reduced Conflict Between the Environment and Water Users - The EWA managers and water users would have a common interest in improving system infrastructure, system flexibility, biological monitoring and scientific analysis in order to obtain water benefits for both. With a properly sized EWA, there would be an adequate amount of water to provide the necessary species protection and reliable water supplies, thereby minimizing conflict.

Initial Evaluation of an EWA

To gain insight into whether and how an EWA could provide adequate fish protection while not adversely affecting water quality or water supply benefits, a group including CALFED Agency staff and stakeholders simulated four EWA operations scenarios. Changes in operations were simulated considering a set of assumed assets of the EWA and historic fish salvage records on top of a basic model of project operations with current regulatory conditions.

The group conducted several simulations to better understand how an Environmental Water Account (EWA) might have been operated, if it had existed during the 1991 through 1995 water years. The five years included a variable hydrologic sequence of wet years and dry years. The simulations were conducted only once each time, assuming no foresight as to hydrological or biological conditions.

In these simulations, the EWA controlled a network of high (and low) priority storage rights in surface and groundwater storage. The EWA controlled a series of contracts giving it the right to purchase water in any given year. It had the right to allow variances in application of the Export/Inflow standard in order to generate environmental water. Finally, it had an income of $30-$40 million per year for water purchase .

Using a different collection of facilities, contracts, rights, and income, for each scenario the group demonstrated that it is possible to make major shifts in Project operations to protect fish and to improve habitat conditions without reducing water supplies to the water users.

The four scenarios identified to evaluate the EWA had the same baseline condition but different assets that were assumed in place at certain periods of Stage 1. Three scenarios used the "gallon for gallon" approach with assumed assets in place at the start, middle, and end of Stage 1. The fourth scenario used a "credit" approach with assets assumed at the middle of Stage 1.

Some of the simulated potential benefits derived from the use of the EWA were:

- **Reduced loss of fish at south Delta pumping plants**. By reducing exports and/or increasing Delta inflows at key times, the loss of fish at south Delta facilities was often significantly reduced. Existing data indicated that fish salvage is seasonal and sporadic, and often unpredictable. Having the ability to adjust flows and exports offers the potential to reduce losses to exports by a large percentage for a small total adjustment in exports with minimal potential cost.

- **Improved transport of young salmon, splittail, steelhead, and delta smelt through the Delta to Suisun Bay.** Reduced exports and/or increased inflow/outflow at most beneficial times of the year improved overall survival as well as reduce vulnerability to export loss for important Delta resident and anadromous fish. For example, reduced exports and increased inflow from the Vernalis Adaptive Management Program (VAMP) is designed to help get juvenile San Joaquin salmon through the Delta to the Bay during a four week period in April and May. The EWA offered the potential to extend the VAMP period when needed to meet VAMP objectives. Similar opportunities arose for splittail that spawned in the lower San Joaquin in large numbers, wherein young returned in late spring to the Bay and Delta and were subject to high export losses.

- **Improvements in instream flow patterns upstream of the Delta.** The ability for the EWA to move (back up) its south of Delta water into upstream reservoirs allowed the EWA to later release the water to create beneficial upstream flow patterns for salmon.

- **Indirect benefits to water quality and water supply.** The availability of water in the EWA provided synergistic benefits to water quality and water supply. During the simulations the group observed that EWA often helped water supply get through the summer "low-point" in San Luis reservoir. EWA water releases and export reductions often provided ancillary benefits to water quality by increasing Delta outflow and reducing chlorides and bromides in the Delta water supply.

Conclusions Reached

This exercise of EWA simulations yielded the following insights and findings:

- A properly implemented EWA is a superior way of achieving both fish protection and water supply benefits. With an adequate amount of assets and appropriate operating rules, the flexibility provided by an EWA will provide long term benefits to fishery resources while providing improvement in water supply reliability and water quality.

- An EWA can play an important part in protecting endangered species, contributing to recovery under CALFED's Multi-species Conservation Strategy.

- Adequate EWA assets are essential: water for the EWA must be available at the beginning of Stage 1, funding must be assured through time and adequate to secure needed water through Stage 1, and any water purchases needed by the EWA must be feasible and timely.

- Experience in managing the simulated EWA will allow more efficient use of EWA assets.

- Monitoring data provided through CMARP will be essential to guide EWA decision-making. CMARP and the EWA must function together to help anticipate the impacts of project operations so these impacts can be reduced or avoided. Sufficient knowledge to allow proper assessment of conditions and needs will require more thorough monitoring of aquatic resources in the future.

- Management of the EWA must be coordinated with operation of the State and Federal water projects and the CALFED Water Quality Program to provide water quality improvements for all users.

- A key element of the EWA was access to surface storage upstream, downstream, and in the Delta. In all scenarios it was very beneficial to the EWA to use available storage in existing SWP, CVP and other reservoirs. The additional storage used in the scenarios included a two foot increase in the height of Shasta dam, increasing storage by 60,000 af, and conversion of Delta islands to reservoirs to store about 340,000 af.

- Access to groundwater storage is also important. The simulations assumed 400,000 af of groundwater storage was available to the water projects and the EWA.

- Surface storage facilities allow more flexibility than groundwater storage. Groundwater recharge rates limit opportunities to refill the account, while groundwater extraction rates limit use of the account.

- In-Delta storage provides major EWA flexibility.

- Funds for water purchase are essential to the EWA, with higher annual funding needed in the early years of implementation before additional storage might be available. The simulations assumed $40-50 million per year early in Stage 1, and $20-30 million later in Stage 1.

- A simple credit approach did not work as well as water account approach in effectively balancing benefits to water quality, water supply, and the environment. The gallon-for-gallon water account approach provided more opportunities, more synergy, and more flexibility. Both approaches offer improvements over existing prescriptive standards that have minimal flexibility to adjust to specific circumstances and needs.

- The EWA provided opportunities for synergy that would provide long-term benefits to water quality, water supply, and the environment. Each can borrow or count on the resources of the other to help meet objectives within a highly variable and unpredictable system.

- Opportunities were limited because the water supply is limited. Resources are gained by shifting water supply among years through new storage that captures water during high flow periods when the impacts of diverting or storing that water are lower, and distribution facilities that shift transfer water among facilities. Water supply for some users is also gained at the expense of other users through sharing and reimbursement.

- Because the water supply within and among years is so unpredictable and variable, an EWA approach provided a much needed buffering system not only for protection of the environment, but also for water quality and water supply. The EWA provided the collateral to take on risk. In the end, costs are lower than anticipated, because in some years things work out – rain falls. This ability to take on risk benefits everyone.

- Sharing water supply generated by new facilities and the risks associated with water supply, along with a flexible management approach like EWA, should provide for mutual incentives for long-term benefits for the environment, water quality, and water supply in the future.

Some Concerns Generated in the Simulations

Some of the concerns raised during the simulations were:

- There may be some changes in habitats from shifts in hydrology in the reservoirs, rivers, Delta, and Bay.

- Consideration must be given to how managing the EWA could affect attraction flows needed for upstream migrant salmon.

- There may be some shifts in impacts from key fish species and life stages to other species and life stages.

- Purchase of options, both stored water and exports, may reduce available water supply to other uses.

- There may be some changes in water quality from changes in the timing and magnitude of flows, as well as source (e.g., In-Delta island storage).

- In reality the ability to transfer water, obtain access to ground water, vary the application of standards may not be as expedient and available to the EWA as assumed in the simulations.

- If an EWA tool is unreliable then it must be offset with increased collateral.
- EWA tended to accumulate assets in dry years and spend them in wet years, counter to some participants' expectations.
- In these simulations EWA operations consume most of export flexibility.

Resolution of Issues in 1999 and 2000

Although an EWA has significant potential, a number of major issues and details will need to be evaluated and resolved before this approach can be fully implemented. These include:

1. Determine which environmental protections would be provided through prescriptive standards and which would be provided through an EWA.
2. Investigate various approaches for implementing an EWA.
3. Determine how much (1) existing surface and groundwater storage; (2) water purchase contract water; and (3) water generated from co-funding efficiency or reclamation projects will be needed by an EWA as of the first day of EWA operations.
4. Determine how the EWA assets will shift and grow during Stage 1.
5. Determine sharing methods of initial water export improvements (e.g., South Delta improvements).
6. Determine sharing methods of additional Stage 1 water export improvements.
7. Determine EWA rights to use existing and future storage and conveyance facilities.
8. Develop accounting methodologies.
9. Assure that water quality impacts of operational changes to protect fish are adequately dealt with within the CALFED water quality program.
10. Secure adequate, assured funding to support EWA operations at defined levels.
11. Allocate costs of this program.
12. Define institutional control of EWA, including governance, public participation, linkages to CMARP, and decision making process.

13. Determine existing and reliability of existing legal mechanisms to assure intended use of EWA water released for instream purposes.

Integration with CMARP

The usefulness of the Environmental Water Account rests on two assumptions that require EWA operations to be fully integrated with CMARP. First, the EWA responds to changing conditions in the distribution and abundance of the various species of concern and their hydrological environment. Such actions require sufficient knowledge to allow the proper assessment of condition and needs. Thus, in the EWA simulations resources were committed to protect delta smelt particularly in years when the adult population was small or when much of the spawning was restricted to the south Delta. Actions taken in the simulations were often based on the assumption that more thorough monitoring of aquatic resources would be available in the future.

Second, the EWA should be the basis for research on how changes in hydrologic conditions affect the various species of concern. VAMP and Action #8 of the CVPIA b(2) actions have required a great deal of delay and negotiation in order to implement scientific investigations into fish/flow relationships without causing undesirable impacts on water users. Management of an EWA should permit much easier investigations because the concerns of water users can be broadly covered by use of the EWA assets as collateral. Thus, all of the value of an EWA rests upon the assumption of an adequate monitoring, assessment and research program.

Integrated Storage Investigation

While some water management tools are ready for immediate implementation as parts of the CALFED Water Management Strategy, there are other tools that will require additional study and evaluation before any decision can be made on implementation. Among the topics that CALFED has identified for additional investigation is the overall role of storage as part of the Water Management Strategy, and the relationship among various types of storage. To better understand these questions CALFED proposes to carry out an Integrated Storage Investigation (ISI) as illustrated in the figure below.

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 Clean Water Act 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.

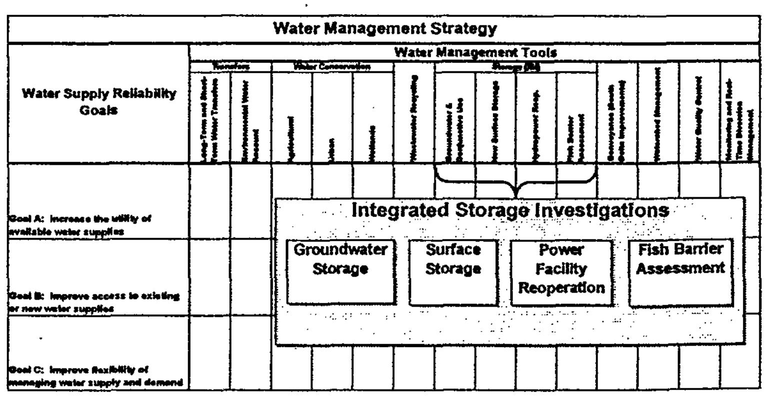
The study elements within the Integrated Storage Investigation include:

Overall Storage Strategy
Surface Storage Investigations
- Surface Storage Facilities Screening
- North of Delta Off-Stream Storage Study
- In-Delta, Adjacent to Delta 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, 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 Review 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.

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. 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 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 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 opportunities 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, changes in the timing of reservoir releases, 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.

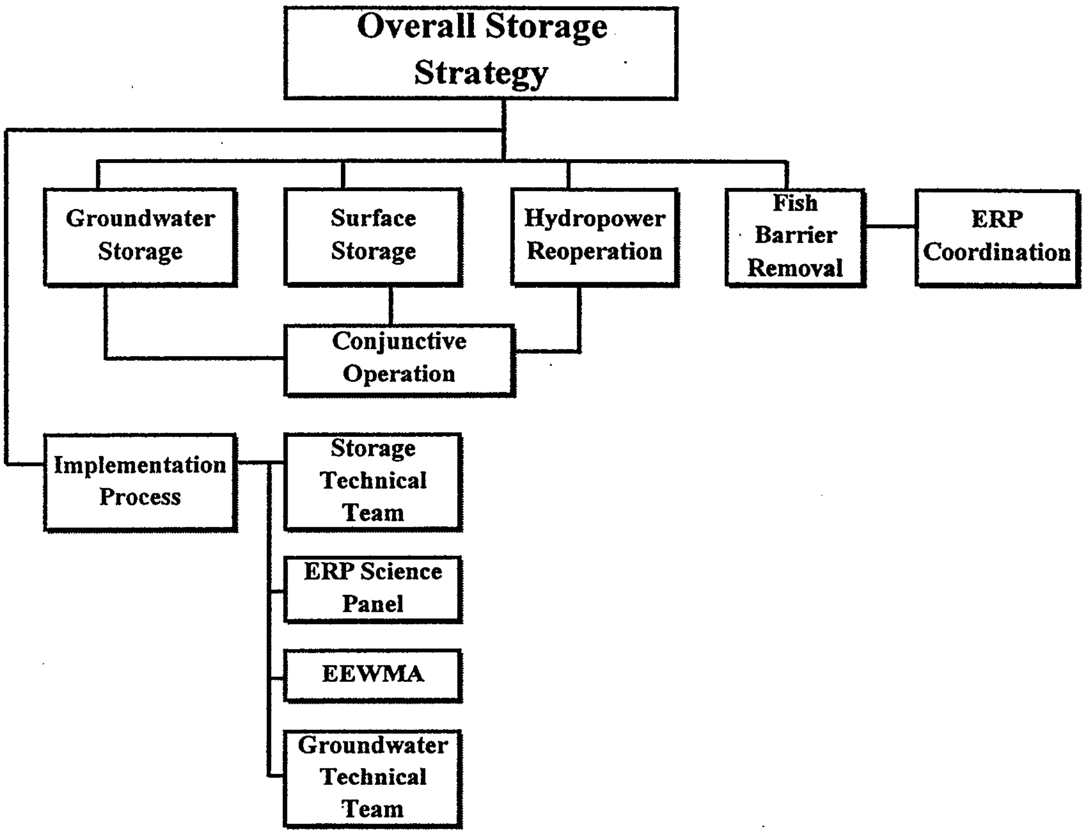
Power Facilities Reoperation Evaluation: There is existing storage capacity in the Bay-Delta system dedicated to the generation of hydroelectric power. AB 1890 (Chapter 854, Statutes of 1996, Public Utilities: electrical restructuring) has triggered an evaluation and potential divestiture of some or 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 the re-operation of existing hydroelectric facilities to help achieve CALFED water management objectives. 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 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 below). Additionally, CALFED will provide for critical peer review at key milestones of the ISI.

ISI



Overall Storage Strategy
Groundwater Storage
Surface Storage
Hydropower Reoperation
Fish Barrier Removal
ERP Coordination
Conjunctive Operation
Implementation Process
Storage Technical Team
ERP Science Panel
EEWMA
Groundwater Technical Team

5.2 Governance Plan

The governance and decision-making structure for implementation of the CALFED Preferred Alternative is a key feature in assuring successful program implementation. CALFED is in the process of developing a long-term governance plan for the CALFED Bay Delta Program and a decision on the long-term governance structure will be made by the time of the Final Programmatic EIS/EIR. Once the decision is made it is expected that it will take some time before the long term governance structure is in place because of the time required to enact legislation required to make changes to existing laws and authorities. While the long-term structure is being established, an interim governance structure will need to be in place. For the interim, CALFED proposes the continuation of essentially the current structure being used for the planning phase of the program but adapted to support the implementation phase. The interim structure will be in place only as long as it takes to establish a long-term structure; between 1and 3 years depending on the complexity of the legislative changes recommended. A basic principle of the interim governance proposal is that there would not be any new legislation or changes in existing legal authorities.

The CALFED program is complex, multi-objective, involves many agencies and programs, and covers a large geographic scope. In developing a long term-governance structure for the CALFED Program, the implementation principles, functions, and structure/form have been evaluated at two levels-- the policy oversight level and the program element level. Each of the program elements are also part of an implementation strategy that is based on the four CALFED resource areas--ecosystem restoration, water quality, water supply reliability, and levee system integrity.

The Implementation Plan Appendix to the Revised Draft EIS/R, contains the draft Governance Plan. The Governance Plan includes a description of the governance functions necessary for implementation, a recommended interim governance structure, and a discussion of the options for long-term governance. A summary of the Draft Governance Plan is provided below.

Program Principles and Functions for Implementation Phase

In developing a governance structure it is important to first identify the guiding principles and basic functions that need to be performed. The principles and functions serve as the criteria by which to evaluate the different governance structure options.

Principles for an Oversight Entity. Due to the complexity and evolving nature of the program over a long period of time, oversight and policy/program direction will be critical to the programs success. Several principles should be considered as conditions for any oversight governance structure for the CALFED program:

- State and federal partnership

- Stakeholder involvement in decision-making
- Involvement by elected officials
- No impairment of existing agency regulatory authority
- Efficient decision making
- Durability of agreements/decisions
- Accountability for agreements/ decisions

CALFED has organized the implementation functions for the program into three categories to accommodate the complexity of the program.

Oversight Functions An oversight entity for the CALFED Program will be the primary point of accountability for program implementation and for achieving program objectives. Because the program has four equal objectives , it will be important for the oversight entity to ensure balance and coordination between the programs and objectives and to provide program direction. The key functions for a CALFED oversight entity include:

- Overall program direction
- Oversight of CALFED program implementation
- Assessing CALFED progress
- Assuring balanced implementation
- Reviewing priorities and funding of programs managed by the CALFED Program and programs managed by CALFED agencies. Recommending changes and approval to the appropriate agency with program and funding authority.
- Coordination and dispute resolution between program elements
- Coordination with related programs
- Stakeholder communication
- Legislative communication

Program coordination and management functions. Program management and coordination for each program element will be critical for effective implementation. Program management and coordination functions include:

- Manage/oversee program element implementation
- Identify priorities, propose actions, develop budgets
- Assess and report on program element performance
- Coordinate with implementing agencies & stakeholders, and between program elements

Direct implementation functions have been identified separately because some agencies which may be involved in CALFED program element implementation may not have program management responsibility. For example, one entity (CALFED in the interim) may direct the Integrated Storage Investigation, while another entity (DWR or USBR) may be the lead on assessment for individual storage sites. Direct implementation functions include:

- Responsibility for direct implementation of individual programs and actions.

- Report on assessment and monitoring of individual programs or actions
- Prepare environmental documentation and obtain permits
- Stakeholder and local coordination

Interim Governance Structure

To provide for the transition while a long term governance structure is established, an interim governance structure is proposed. The interim structure will be in place from the time of the ROD and possibly for several years depending on the time required to adopt recommended legislative changes and reorganize existing authorities and structures.

CALFED proposes that the interim structure essentially continue the current CALFED structure being used during the planning stage, but with modifications to ensure it is suitable for performing the implementation functions (See Figure X). The modifications would be made in revised or new agreements or contracts that will be in place by the time of the ROD to begin the implementation phase of the program. Continuing the existing structure with modifications will enable the primary focus for governance to be placed on the long-term governance structure. The current structure will provide for an efficient transition to the implementation phase with minimal program delays or disruption.

Schedule for Governance Decisions and Implementation

- Interim Governance
  --Decision in the Revised draft EIS/R, June 1999
  --Revised Agreements in place by the time of the ROD, June 2000
  --Operates until a long-term governance structure adopted (2-3 years)

- Long term governance
  --Decision by the time of the ROD, June 2000
  --Legislation expected to be needed
  --Long term governance in place in 2-3 years (2002- 2003)

Policy Group. In the interim, the oversight functions will continue to be performed by the CALFED Policy Group. A new Framework Agreement is needed and will be in place by the time of the ROD. The Framework Agreement will describe the agency membership and designated representatives, describe the meeting schedule which will be at least quarterly, identify the frequency of Policy Group public meetings, specify that require at least one meeting will be with the advisory council each year to perform a CALFED program assessment, specify decision-making procedures, and describe the oversight functions (listed above) of the Policy Group during the implementation phase.

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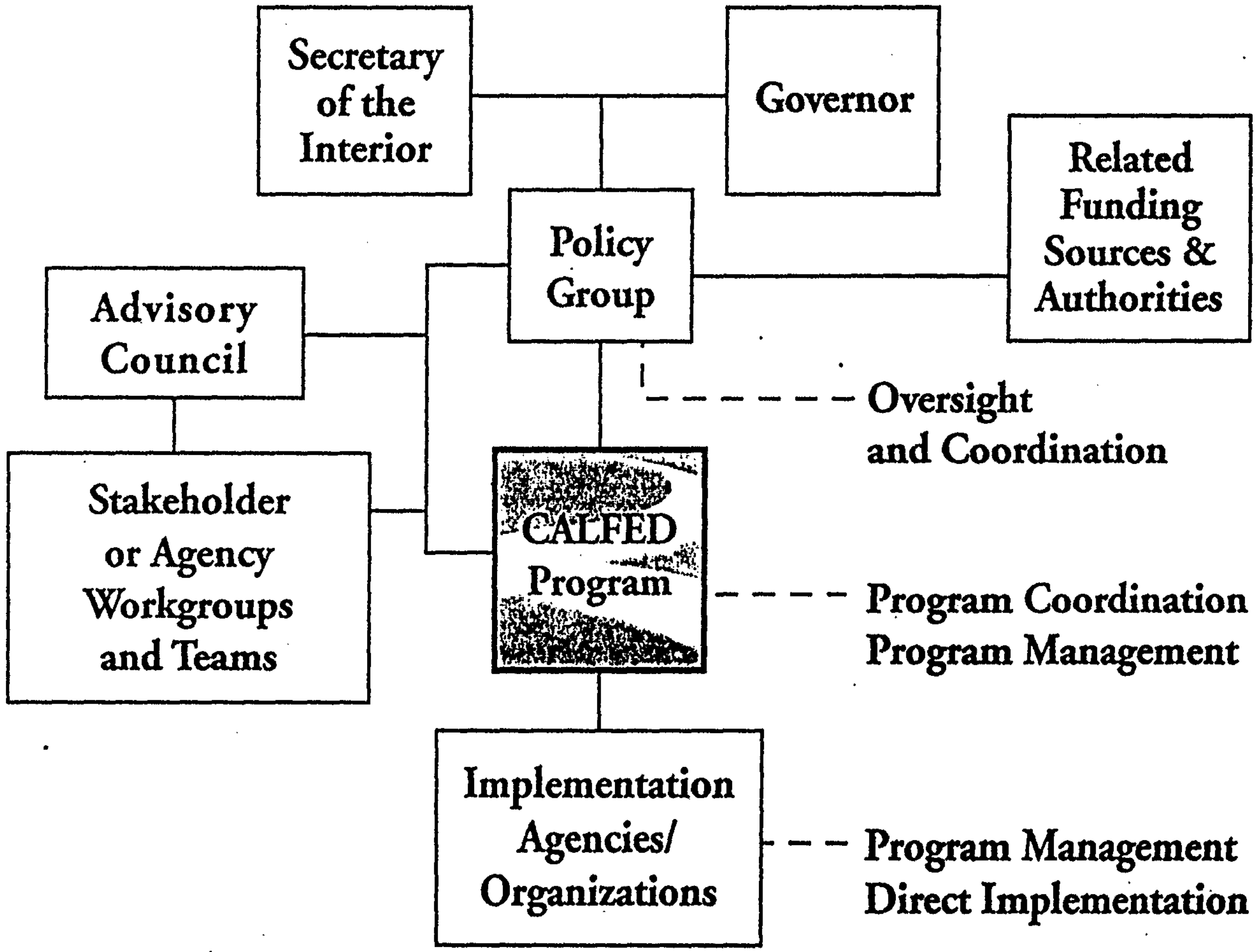
Figure ~~3~~

CALFED Interim Governance

Structure and Functions



CALFED BAY-DELTA PROGRAM

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Stakeholder Involvement. In the interim, stakeholder involvement in the decision making structure will be through an advisory council. A new or amended Federal Advisory Council Act (FACA) Charter will be prepared by the time of the ROD which will be focused on the new tasks associated with program implementation. The Charter will identify the membership and alternates, describe the new functions and tasks, identify the necessary advisory Workgroups, describe the frequency of meetings, which should be at least quarterly and specify that an annual meeting with Policy Group will be conducted for the purpose of an annual CALFED program assessment.

CALFED Program and CALFED Agencies. In the interim the CALFED Program will perform the program coordination functions and in some cases the program management functions associated with the different program elements and resource areas. A new administrative Memorandum of Understanding between the state and federal CALFED agencies will be prepared by the time of the ROD. The MOU will specify the CALFED program's functions and responsibilities, and establish the interim operating budget and necessary positions. The Draft Governance Plan included in the Implementation Plan Appendix provides a more detailed description of the interim governance structure, and in some cases the options for long term governance, for each of the program elements, the Environmental Water Account, and the Comprehensive Monitoring Assessment and Research Program.

The proposed interim governance structure for the program elements places the program coordination functions within the CALFED Program. This is because the CALFED program has knowledge of the CALFED program objectives and the experience in coordination with the agencies and stakeholders, thereby making the transition to implementation the easiest. This also avoids fragmentation of the coordination function.

In the interim, program management functions will be distributed among the State and federal agencies which currently have the program authority and funding. As new programs and funding are directed to CALFED, the CALFED program will assume additional program management functions. For example, CALFED will continue serving program management functions for the CALFED ecosystem restoration program, specifically for the funding available through the federal Bay-Delta Ecosystem Enhancement and Water Security Act and Proposition 204. CALFED will also serve the program coordination functions in the interim with the other existing ecosystem restoration programs and funding such as the CVPIA Restoration Fund. With program management distributed among many agencies in the interim, it is important that agencies closely coordinate to achieve the CALFED objectives. In the interim, direct implementation would continue to be done by existing agencies.

Pre-ROD Governance Actions

- Finalize the agreements and contracts necessary to implement the interim governance structure
- Recommend a long-term governance structure for CALFED
- Initiate steps to begin adoption of the long-term governance structure

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