CHAPTER VI
RESOURCE MANAGEMENT MEASURES

Following development of the planning objectives, constraints, conditions, and criteria for the Los Vaqueros Expansion Investigation (LVE), the next major step in formulating initial alternatives is to identify and evaluate potential resource management measures. A resource management measure is any structural or non-structural action that could address one or more of the planning objectives. This chapter provides a general description of the measures considered and reasons for either retaining or eliminating measures from further development in the LVE. The most promising resource management measures retained herein were used to formulate the initial plans described in **Chapter VII**.

MEASURE IDENTIFICATION AND SCREENING

Numerous potential resource management measures have been identified as part of previous studies, programs, and projects to address water resources and related problems and opportunities in the study area. These measures were developed and reviewed during study team meetings, field inspections, and outreach for their ability to address the planning objectives of the LVE. Because the purpose of the LVE is primarily to address problems and opportunities within the Sacramento-San Joaquin Delta (Delta) and San Francisco Bay Area (Bay Area) region, the geographic location of potential measures was limited. Therefore, whether structural (such as constructing a new pipeline) or operational (such as modifying the operation of an existing facility), all measures listed herein could be implemented within the LVE study area.

Measures are typically developed to address a specific planning objective. By combining measures, alternative plans are constructed that address all of the identified planning objectives. Because measures are not complete alternatives, the screening process for measures differs from that for alternative plans. Alternatives are evaluated according to the four standard P&G criteria for water resources (completeness, effectiveness, efficiency, and acceptability), while measures are screened based primarily on their relative ability to contribute to study goals and objectives and their consistency with study planning criteria, constraints, and principles (**Chapter V**). This includes the potential for a measure to contribute to other study objectives when part of a complete alternative plan. For example, if a measure to address a single objective could be implemented independently, and no benefit would occur in combining it with measures to address other study objectives, it would likely be dropped from further study.

Various reasons exist for retaining a measure for possible inclusion in an initial alternative plan or deleting it from further study. An important factor is the potential for a measure to directly address at least one planning objective without adversely impacting other study objectives. To directly address an LVE planning objective, measures should have a geographic, operations, or physical relationship to problems and opportunities in the LVE study area. Measures were rated on a scale of low to high based on their relative ability to address the planning objectives of the LVE. In most cases, measures that were rated as moderately or less than moderately addressing a planning objective were deleted from further consideration, while measures rating higher were

retained. Other major factors and rationale used to retain or delete a measure are included in the discussion of each resource management measure. It should be noted that measures dropped from consideration and further development as part of the LVE may be revisited at a later date. Measures that do not directly address the planning objectives may be reconsidered for inclusion in future alternative plans as mitigation elements or as part of other plan features. These elements will be identified and developed at a later time.

Measures are presented in this chapter relative to the objective they best address: measures to increase water supply reliability in the study area, measures with the potential to provide a less-costly Environmental Water Account (EWA) replacement supply, and measures to improve water quality in the study area.

MEASURES TO ADDRESS BAY AREA WATER SUPPLY RELIABILITY

Measures to address the planning objective of increasing drought-period Bay Area water supply reliability are described below and summarized in **Table VI-1**. Of the management measures identified, five were retained for possible inclusion in initial alternatives. The ensuing discussion briefly summarizes measures identified for consideration, followed by a specific description of measures retained for further study.

Measures Considered

Measures identified for this study focused on Bay Area water supply reliability are as follows.

Surface Water Storage

One very important water resources management measure to address water supply reliability in this study is surface water storage. Following is a summary of the various surface water storage options considered.

Enlarge Los Vaqueros Reservoir to Increase Conservation Storage Space - This measure includes expanding the existing conservation[1] storage space in Los Vaqueros Reservoir (**Plate 5**) by raising Los Vaqueros Dam to as high as 170 feet. Raising the dam approximately 170 feet would increase gross pool storage by 400,000 acre-feet from 100,000 acre-feet to 500,000 acre-feet, as shown in **Figure VI-1**. Because of site and foundation limitations, raises greater than 10 to 15 feet would require the construction of a new dam a short distance downstream from the existing dam. Larger dam raises also would require a new pipeline and pump station to provide up to about 430 cubic feet per second (cfs) delivery capacity from the reservoir to the South Bay Aqueduct (SBA). Some facilities associated with the existing Los Vaqueros Project would be preserved and integrated into the expanded project. For example, smaller dam raises would not require enlarging the south Delta diversion and conveyance facilities from Old River.

[1] Conservation storage space is the portion of water stored in a reservoir that can be released for useful purposes other than flood control, such as municipal water supply, power, irrigation, etc. Conservation storage is typically defined as the volume of water stored between the inactive pool elevation and the flood control stage.

TABLE VI-1
RESOURCE MANAGEMENT MEASURES TO INCREASE BAY AREA WATER SUPPLY RELIABILITY

Resource Management Measure	Potential to Address Planning Objective	Status & Considerations
Surface Water Storage		
Enlarge Los Vaqueros Reservoir to increase conservation storage space	**High –** Could provide up to 400 TAF of local storage for water supply reliability, and has potential to contribute to other LVE planning objectives	**Retained** – Specifically authorized for study and could contribute to other LVE planning objectives.
Raise Los Vaqueros Dam in place to increase conservation storage space	**Moderate –** Could provide 15 – 25 TAF of local storage for water supply reliability	**Retained –** Potentially less-costly method of providing a smaller increment of storage, and could contribute to other LVE planning objectives.
Raise Calaveras Dam to increase conservation storage space	**Low –** Could provide up to 320 TAF of local storage, but would only benefit agencies with existing SFPUC contracts (ACWD and SCVWD)	**Deleted** – Low potential to provide regional supply reliability benefits in the Bay Area.
Raise San Luis Dam to increase conservation storage space	**Low –** Could provide up to 200 TAF but would only serve one agency (SCVWD)	**Deleted** – High unit cost, low potential to contribute to increasing regional Bay Area supply reliability.
Raise Pacheco Dam to increase conservation storage space	**Low –** Could provide up to 120 TAF but would serve only one agency (SCVWD)	**Deleted** - High unit cost, low potential to contribute to increasing supply reliability in the study area, and limited potential to support other objectives.
Construct new conservation storage at Upper Del Valle Dam site	**Low –** Could capture up to 15 TAF local runoff, but effectiveness would depend on expansion of SBA by DWR	**Deleted** – Effectiveness depends on actions by others, and low potential to provide regional benefits and high unit cost compared with other measures.
Construct other local area storage facilities considered in lieu of the original Los Vaqueros Project	**Moderate –** Various sites could provide small to moderate increase in local storage	**Deleted -** Major site acquisition issues, high likelihood of local opposition, and high unit cost.
Construct new conservation storage in Sacramento/San Joaquin rivers watersheds	**Low –** Various sites could provide small to moderate storage outside the study area	**Deleted –** Low potential to address LVE planning objectives, most promising evaluated by ongoing CALFED studies.
Construct new conservation storage in the Sacramento/San Joaquin Delta	**Low –** Uncertainty regarding ability to provide water supply reliability benefits to the study area	**Deleted** – Low potential to address LVE planning objectives, most promising evaluated by ongoing CALFED studies.
Reservoir/System Reoperation		
Increase effective conservation storage space in existing Lake Del Valle Reservoir	**Low –** Small potential to provide water supply reliability benefits to study area without affecting other reservoir functions	**Deleted** - Low potential to provide regional supply reliability benefits and high unit cost compared with other measures.

Resource Management Measure	Potential to Address Planning Objective	Status & Considerations
Improve Delta export and conveyance capability through coordinated CVP and SWP operations	**Low –** Limited potential for additional reoperation benefits beyond current plans	**Deleted** – JPOD and other system efficiency improvement measures are being actively pursued in other programs. A likely without-project condition.
Groundwater Storage		
Develop additional groundwater banking in San Joaquin River Watershed	**Low –** Existing banks have sufficient capacity to store unused contract supplies; uncertainty regarding ability to secure additional supplies for banking and withdrawal limitations	**Deleted** – Existing Bay Area programs sufficient to store unused contract water, and limited available capacity in current and planned banks.
Develop additional groundwater banking in Sacramento River Watershed	**Low –** Significant physical limitations to banking in Sacramento River watersheds	**Deleted** – Low likelihood of developing a reliable conjunctive use program for Bay Area supplies in the Sacramento River basin due to significant physical, groundwater, and other related problems.
Conveyance/System Modifications		
Increase Delta diversion capacity to Bay Area water user facilities	**Moderate –** Increased export capacity could provide water supply reliability benefits, particularly in combination with storage	**Retained** – Additional Delta diversion capacity with enlarged capacity at existing site and/or new central Delta diversion likely to be effective when used in combination with reoperation and/or new storage.
Construct intertie from SFPUC to SBA	**Low –** Uncertainty regarding availability of Hetch Hetchy supplies and ability to provide regional benefits	**Deleted** – Low potential to contribute to overall supply reliability conditions in study area, can be independently implemented, and has limited contribution to other LVE planning objectives.
Expanded use of Freeport Regional Water Project	**Low –** Little potential to improve supply reliability because benefits would be limited to surplus project capacity during wet periods	**Deleted** – Very high capital and unit costs, and benefits would be limited to a single agency.
Increase Banks Pumping Plant capacity to greater than 8,500 cfs	**Low –** Limited potential to benefit supply reliability in study area due to physical and regulatory constraints on increased exports	**Deleted** – Limited potential for increased supply reliability in the study area, and limited potential to contribute to other LVE planning objectives.
Construct intertie from Los Vaqueros Reservoir to SBA at Dyer Canal Back Surge Pool	**Moderate –** Could provide supply reliability benefits to SBA agencies with reoperation or expansion of Los Vaqueros	**Retained** – Constructing a pump station and pipeline from Los Vaqueros Reservoir to the SBA would be an important component of any reservoir expansion action.
Construct intertie from Los Vaqueros Reservoir to SBA at Bethany Reservoir	**Low –** Although this measure could provide supply reliability benefits to SBA agencies similar to the Dyer Canal intertie, it would be much more costly due to increased pumping from Bethany Reservoir	**Deleted** – An SBA intertie at Bethany Reservoir was deleted as a measure for water supply reliability due to estimated high O&M costs. However, it was **retained** as a measure for plans focused on developing EWA replacement supplies.

Resource Management Measure	Potential to Address Planning Objective	Status & Considerations
Source Water Treatment Improvement		
Implement treatment/supply of agricultural drainage water	**Low –** Uncertain ability to treat agricultural runoff to a quality standard acceptable to the public	**Deleted** – Very costly, low certainty of success, and likely low acceptability to stakeholders and general public.
Construct desalination facility	**Moderate –** Potential to provide base water supply, but would require storage to provide dry year supply reliability benefits	**Retained** – Limited application as a dry-year supply, high unit cost, and potential environmental impacts from treatment byproducts, but potential to provide benefits in combination with storage.
Demineralize poor quality groundwater	**Low –** Limited groundwater resources in study area suitable for additional development; highly localized benefits	**Deleted** – High implementation costs, limited application and benefits, and potential for adverse impacts to groundwater resources.
Water Use Efficiency		
Implement additional wastewater reclamation	**Low –** Could provide localized supply reliability benefits, limited by acceptable uses of recycled water	**Deleted –** Measure being actively pursued by other CALFED Programs. Most effective elements are likely without-project condition.
Implement additional demand management facilities	**Low –** Low potential to significantly address dry year supply reliability over and above existing / planned conservation programs	**Deleted –** Does not effectively address LVE planning objectives and constraints/criteria. Features being actively pursued by other CALFED Programs. Most effective elements are likely without-project condition.
Water Transfers and Purchases		
Implement water transfers within the study area	**Low –** Highly unlikely that surplus supplies would be available in the study area during dry years	**Deleted –** Low potential to effectively address drought period water reliability through transfers within the study area because region is water-deficient (no surplus supplies available).
Increase water transfers outside the study area	**Low** – High uncertainty regarding the availability, cost, and reliability of water transfers from outside the study area in the future	**Deleted** - Does not effectively address LVE planning objectives and constraints/criteria. High uncertainty of future cost-effectiveness and will likely be implemented with or without development of new water sources.
Retire agricultural lands	**Moderate –** Uncertainty regarding ability to re-direct agricultural supplies to M&I uses	**Deleted –** Does not effectively address LVE planning objectives consistent with criteria/constraints.

KEY:
ACWD = Alameda County Water District
CALFED = CALFED Bay-Delta Program
CVP = Central Valley Project
cfs = cubic feet per second
DWR = Department of Water Resources
EWA = Environmental Water Account
JPOD = Joint Point of Diversion
LVE = Los Vaqueros Expansion Investigation
M&I = municipal and industrial
O&M = operation and maintenance
SFPUC= San Francisco Public Utilities Commission
SCVWD = Santa Clara Valley Water District
SBA = South Bay Aqueduct
SWP = State Water Project
TAF= thousand acre-feet

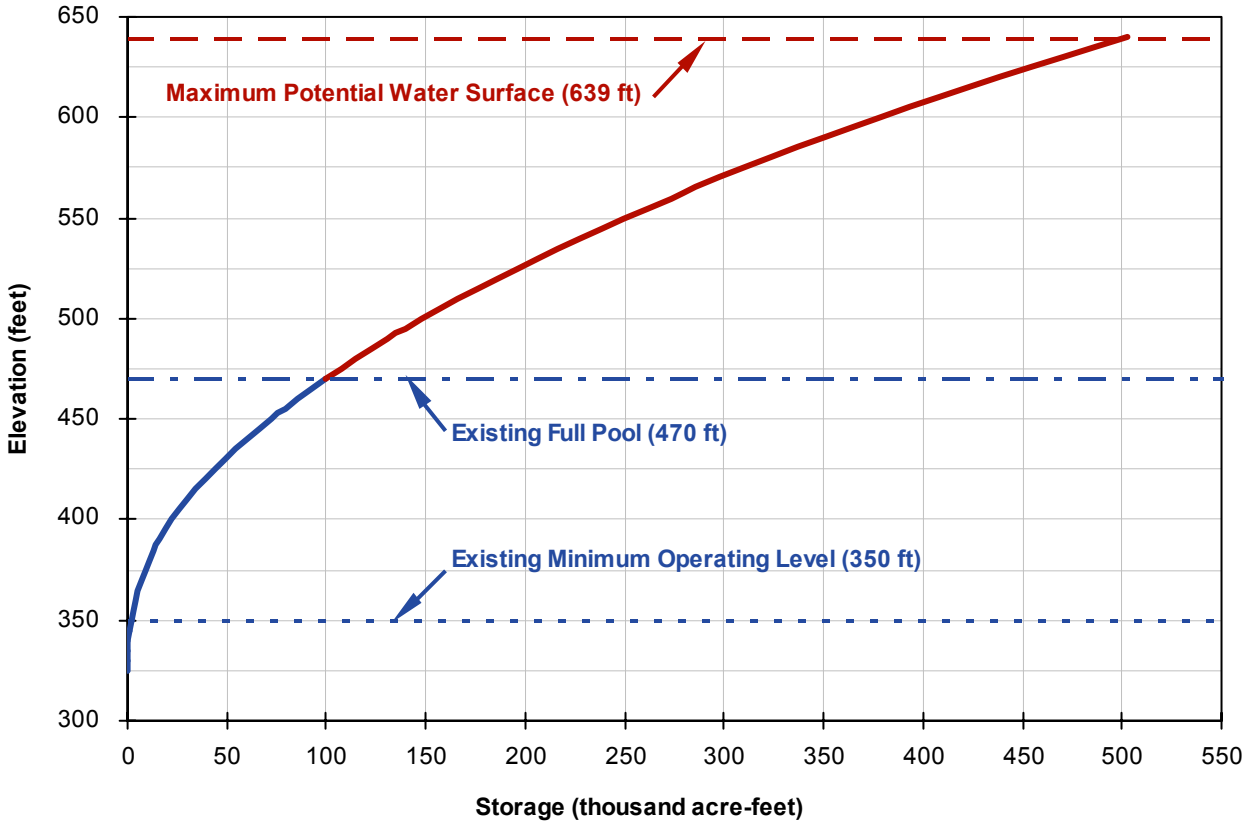

FIGURE VI-1 – POTENTIAL CAPACITY OF ENLARGED LOS VAQUEROS RESERVOIR

Larger dam raise sizes could result in a significant contribution to each of the planning objectives. Further, this measure was specifically identified in Federal authorization for the LVE. Therefore, larger dam raise sizes were retained as a measure for further development.

Raise Los Vaqueros Dam in Place to Increase Conservation Storage Space - This measure includes expanding the existing conservation water storage in Los Vaqueros Reservoir (**Plate 5**) by raising Los Vaqueros Dam in-place by 10 to 15 feet. A 10- to15-foot dam raise would result in an increase in gross pool storage of about 15,000 to 25,000 acre-feet. Because of site and foundation limitations, this represents the maximum raise that could be accomplished without moving the existing dam. Similar to the previous measure, it also would require a new pipeline and pump station to provide up to 430 cfs delivery capacity from the reservoir to the SBA. Most facilities associated with the existing Los Vaqueros Project would be preserved and integrated into the expanded project. Therefore, this measure was retained for further development.

Raise Calaveras Dam to Increase Conservation Storage Space - This measure includes expanding the conservation storage space of Calaveras Reservoir from 96,850 acre-feet to as much as 420,000 acre-feet (about a 323,000 acre-foot increase). The existing Calaveras Dam was built in 1925 in Alameda and Santa Clara counties. Calaveras Dam and Reservoir are located approximately 6 miles northwest of Milpitas in the Alameda Creek Watershed (see **Plate 4**). Calaveras Dam impounds water from Calaveras and Alameda creeks in the Sunol

Valley. Expansion of Calaveras Reservoir would require the construction of a new dam, either at the existing dam site or downstream. Other new facilities would include a pump station and conveyance facilities to store excess Hetch Hetchy water or other sources of supply in an expanded Calaveras reservoir, primarily in wet years. The expansion would provide increased dry year reliability to agencies served by the San Francisco Public Utilities Commission (SFPUC), which includes ACWD and common customers served by SFPUC, and Santa Clara Valley Water District (SCVWD). It also could contribute to improvements in water quality conditions for ACWD and SCVWD during years when Hetch Hetchy deliveries otherwise would have been reduced. An expanded Calaveras could also provide a water quality benefit in average years by transferring Calaveras water into the South Bay Aqueduct. Under this scenario, an intertie with the SBA would be required. Any adverse impacts from an expanded Calaveras, particularly on Alameda Creek, would need to be mitigated through project development and operations. Because expansion of Calaveras Reservoir would provide only incremental reliability improvements to those agencies with existing SFPUC contracts, and because major mitigation elements likely would be required, it is believed that an expanded Calaveras Reservoir would not be a viable alternative to an expanded Los Vaqueros Reservoir. Accordingly, this measure was deleted from further consideration in the LVE.

Enlarge San Luis Reservoir to Increase Conservation Storage Space – This measure includes increasing the gross pool storage space in San Luis Reservoir by raising the B.F. Sisk Dam. The existing dam is a zoned earth and rockfill embankment with a maximum height of 385 feet. San Luis Reservoir has a total capacity of 2 million acre-feet (MAF). On the basis of previous studies to assess the potential of increasing storage space in San Luis Reservoir, it is estimated that raising B.F. Sisk Dam by about 15 feet would add approximately 200,000 acre-feet of additional storage. San Luis Reservoir (shown in **Plate 2**) is a joint Federal and State facility that provides seasonal storage for project water pumped from the Tracy and Banks pumping plants in the Delta. Although some carryover storage has been provided historically, water is typically pumped into the reservoir in the fall and winter, then released in the spring and summer to south-of-Delta Central Valley Project (CVP) and State Water Project (SWP) contractors. SCVWD and other contractors in the CVP San Felipe Division receive a portion of their imported water supply from San Luis Reservoir.

This measure could improve water supply reliability primarily for SCVWD and other San Felipe Division contractors, and potentially for south-of-Delta CVP and SWP contractors. It also could provide marginal water quality benefits to SCVWD. Enlarging San Luis Reservoir could provide supplies or dedicated storage space for a long-term environmental water program, as EWA supplies are often stored in San Luis Reservoir when space is available. However, it would not increase supply reliability for Contra Costa Water District (CCWD), ACWD, or Alameda County Flood Control and Water Conservation District Zone 7 (Zone 7). Two previous studies have preliminarily estimated the first and annual costs to raise B.F. Sisk Dam about 15 feet as $1.1 billion and $77 million, respectively. The estimated increase in dry period yield would be about 30,000 acre-feet, resulting in a unit cost for the increased yield of over $2,500 per acre-foot. Because of the limited benefit to increasing water supply reliability in the study area, and high unit cost, this measure would not be a viable alternative to increasing storage space in Los Vaqueros Reservoir and was deleted from further consideration.

Raise Pacheco Dam to Increase Conservation Storage Space – This measure consists of expanding the existing 6,000-acre-foot Pacheco Reservoir to about 135,000 acre-feet by constructing a new 300-foot-high dam. Pacheco Reservoir is located on the North Fork of Pacheco Creek, approximately 6 miles west of San Luis Reservoir and ½ mile north of Highway 152 (see Plate 4). The expanded reservoir would store CVP water delivered from the Delta to San Luis Reservoir and pumped to the Pacheco Reservoir. Under this measure, water from San Luis Reservoir for the San Felipe Division contractors would be pre-delivered from about November through June, stored in an expanded reservoir, and released through the Pacheco Conduit during the dryer months (July to October). Increasing storage in Pacheco Reservoir could provide supplies to SCVWD and the other CVP San Felipe Division contractors, San Benito County Water District and in the future, potentially the Pajaro Valley Water Management Agency. The measure would include a two-way pump station to be used to lift water from the Pacheco Conduit to the expanded reservoir, or the reverse when gravity flow is not possible. The measure would not provide significant water quality benefits to SCVWD and would not benefit any of the other Bay Area water agencies in the study area. This measure could provide storage for EWA replacement supplies but its effectiveness would be limited because SCVWD is the only potential recipient. On the basis of previous preliminary studies, it is estimated the first and annual costs to enlarge Pacheco Reservoir to about 135,000 acre-feet would be about $660 million and $46 million, respectively. The estimated increase in dry period yield would be about 19,000 acre-feet, resulting in a unit cost for the increased yield of over $2,000 per acre-foot. Because this measure would benefit only one agency in the study area, and would have a high unit cost for new supplies compared with Los Vaqueros Reservoir, it was deleted from further consideration.

Construct New Conservation Storage at Upper Lake Del Valle Dam Site – This measure primarily consists of constructing a 160-foot-high roller-compacted concrete dam on Arroyo Valle (upstream from the existing Lake Del Valle Reservoir) with a capacity of approximately 15,000 acre-feet (**Plate 4**). It also includes constructing new conveyance facilities between the SBA and the new reservoir. This measure could help improve water supply reliability for SCVWD, ACWD, and Zone 7 by permitting storage of additional runoff during high flow periods in the Del Valle watershed. Because the new supplies would be low in salinity, this measure also could provide water quality benefits for these agencies. Prior studies of new storage at the site have shown strong opposition by numerous local interests and East Bay Regional Parks District that operates the recreation at Del Valle. Further, this measure would be most effective if coupled with a project underway by the California State Department of Water Resources (DWR) that includes increasing the capacity of the SBA. Because the effectiveness of this measure would depend on the completion of projects by others, the potential for local opposition, the low yield and high unit cost for new supplies, this measure was deleted from further consideration in the LVE.

Construct Other Local Area Storage Concepts Considered for the Original Los Vaqueros Project – This measure consists of the potential to develop and implement other dam and reservoir projects in the study area. Initial studies for the Los Vaqueros Project during the early 1970s, and later planning and environmental studies in the 1980s and 1990s, identified and considered numerous other potential local area dam and reservoirs sites. These sites are shown in **Figure VI-2**.

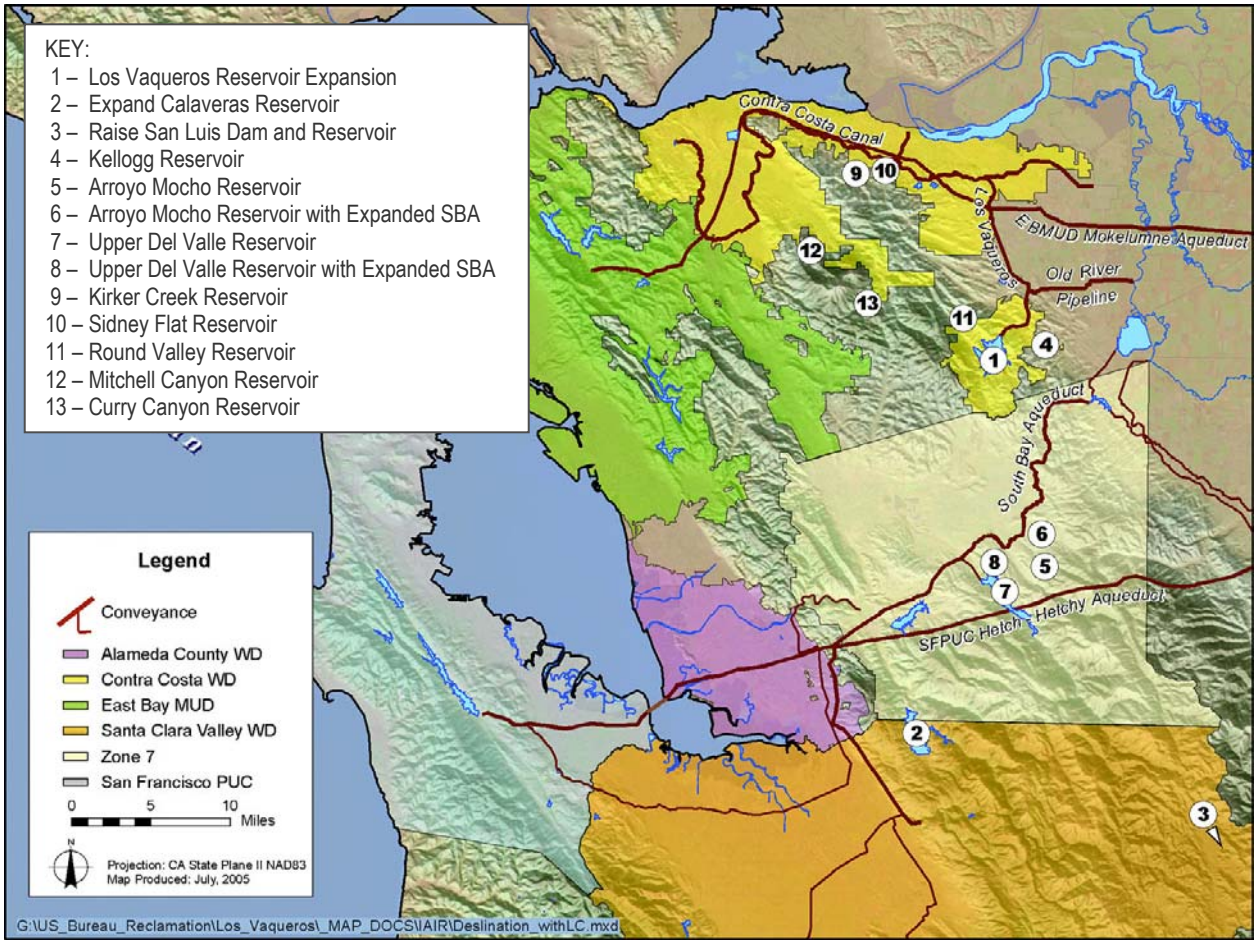

FIGURE VI-2 – LOCAL STORAGE CONCEPTS CONSIDERED FOR THE ORIGINAL LOS VAQUEROS PROJECT

Each of these new or enlarged reservoir measures would contribute, to some degree, to one or more of the study objectives. However, previous studies have shown that each would involve major land acquisition issues, possess a high likelihood for significant local opposition due to environmental and other area impacts, and result in significantly higher water costs relative to other measures. Therefore, these sites were not considered as viable alternatives to expanding Los Vaqueros Reservoir and were deleted from further consideration.

Construct New Conservation Storage in Sacramento / San Joaquin River Watersheds – Over 50 potential onstream and offstream storage projects were identified in the CALFED Bay-Delta Program's (CALFED) August 2000 *Initial Surface Water Storage Screening, Integrated Storage Investigation*, to address regional or state-wide water supply reliability issues. The general location of these storage sites is shown on **Figure VI-3**. Five of the potential storage sites were identified for further development in the CALFED Record of Decision (ROD), and seven sites were identified for further consideration but deferred from study at this time.

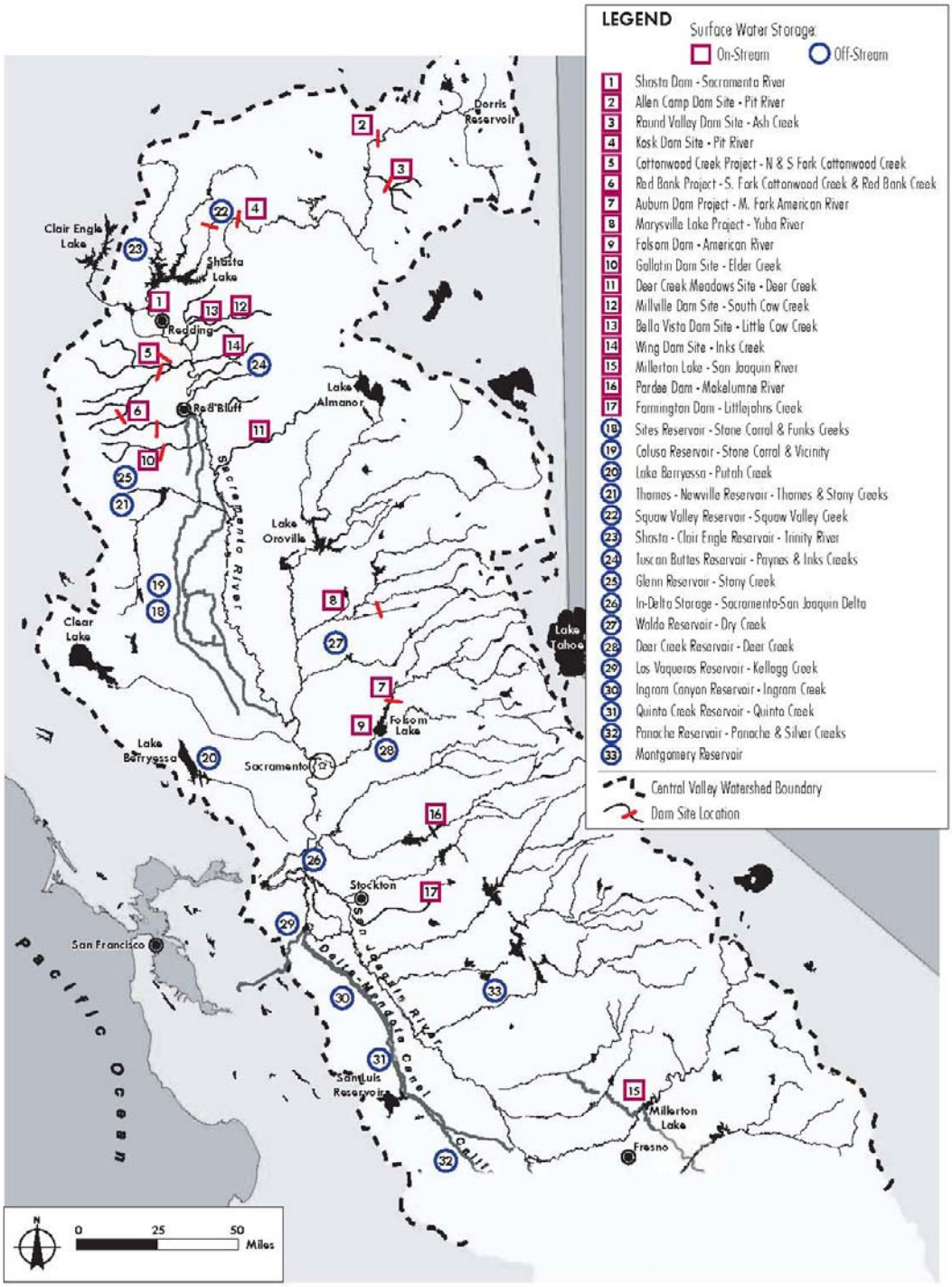

FIGURE VI-3 – INITIAL SURFACE WATER STORAGE PROJECTS IDENTIFIED BY CALFED

Feasibility studies are currently underway for each of the five potential projects: (1) Shasta Lake enlargement (Shasta Lake Water Resources Investigation), (2) In-Delta Storage (IDS), (3) Millerton Lake enlargement (Upper San Joaquin River basin Storage Investigation), (4) Sites Reservoir (North-of-Delta Offstream Storage Project), and (5) Los Vaqueros Reservoir expansion.

The remaining potential dam and reservoir sites were eliminated from further consideration primarily due to their relatively small size, potential for significant adverse environmental impacts, low potential for efficient implementation (including economic feasibility), and poor hydrologic conditions. Of the remaining sites considered in the CALFED report, none are believed to be capable of directly and significantly addressing the LVE study objectives, with the exception of a potential project to expand Los Vaqueros Dam and Reservoir, which would create opportunities for additional storage in the Delta area. Other projects are being developed to solve other regional water resource problems in separate feasibility studies, and/or lack a geographic, operations, or physical relationship to problems in the LVE study area. Accordingly, none of the sites outside the LVE study area that were considered in the CALFED ROD and supporting studies were retained for further consideration.

Construct New Conservation Storage in the Sacramento/San Joaquin Delta – This measure would convert several Delta islands into water storage facilities. IDS is one of the five projects recommended for study in the CALFED Storage Program. The IDS project would incorporate two islands (Webb Tract and Bacon Island) and two habitat islands (Holland Tract and Bouldin Island), similar to a measure previously proposed by Delta Wetlands Project. The current version of the IDS project would provide capacity to store approximately 217,000 acre-feet of water in the south Delta for water supply, water quality, and ecosystem benefits. Project operations would result in additional water deliveries to in-Delta and south of Delta urban and agricultural users, and additional system-wide carryover storage could improve the reliability of other CVP and SWP deliveries. The project also could be used to facilitate water transfers from upstream areas to areas south of the Delta. Although IDS is currently formulated to provide seasonal storage in the Delta for average annual water supply reliability benefits, the project could be formulated and operated to improve dry year reliability. Seasonal filling at high flows and release during low flows could lower salinity and provide storage to help meet spring pulse flows for fisheries. Because this measure is already under study by DWR as part of the five CALFED surface water storage projects in the ROD, and because it would provide very little increase in water supply reliability to the Bay Area, it was deleted from further consideration.

Reservoir/System Reoperation

Increase Effective Conservation Storage Space in Lake Del Valle – This measure includes reoperation of the existing Lake Del Valle Reservoir (shown in Plate 4) to increase its effective water conservation storage capacity. Reoperation options are aimed at lowering the seasonal pool maintained for recreation, reducing the prescribed flood control storage space, or revising the flood control operation. The Del Valle complex is owned by DWR and operated for water conservation as part of the SWP, but also provides flood control benefits under rules prescribed by the U.S. Army Corps of Engineers, recreation, and fish and wildlife benefits. Of the 77,000 acre-foot reservoir, 39,000 acre-feet are reserved all year for flood

control. The remaining 38,000 acre-feet are operated primarily as a pumped storage facility for supplies from the SBA for water conservation. Because the East Bay Regional Parks District is the contractor for recreation at Del Valle, they have a direct interest in the reservoir levels and can influence water levels and operations. For example, it is a current goal to avoid drawing the reservoir down below 20,000 acre-feet in the summer for recreation purposes. One reoperation scenario would be to encroach a portion of this informal recreation space to provide additional reliability storage. Another reoperation scenario would be to work with the U.S. Army Corps of Engineers to develop revised operation rules for flood control that would allow encroachment into the existing flood control storage space under certain circumstances. This measure would result in a marginal increase in storage space, primarily improving the reliability of the SBA contractors. Even with additional flood control operation changes, this measure would still provide only minimal water supply reliability benefits compared with other potential measures and would negatively impact local recreation opportunities. Consequently, it was deleted from further consideration.

Improve Delta Export and Conveyance Capability Through Integrated CVP and SWP Operations – This measure primarily consists of improving Delta export and conveyance capability through a more effective integrated management of surplus flows in the Delta. A specific application of the measure would be the joint point of diversion (JPOD). JPOD operations would allow Federal and State water managers to use excess or available capacity in their respective south Delta diversion facilities at the Tracy and Banks pumping plants. Currently, little excess capacity exists in the Federal pumps at Tracy, but some additional capacity is available in the SWP pumps at Banks. The potential added benefit to the CVP through JPOD operations during average and critically dry years would be about 61,000 and 32,000 acre-feet, respectively. The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and DWR are actively pursuing this measure, and it is highly likely that some form of the JPOD will be implemented in the future. This measure was deleted from further consideration because it would not effectively address the study objectives and is likely to be implemented, in some form, independent of the LVE.

Groundwater Storage

Develop Additional Groundwater Banking in the San Joaquin River Watershed - This measure consists of Bay Area water agencies acquiring additional interests in groundwater banking and storage opportunities in the San Joaquin basin (south of the Delta), beyond their current level of investment, to improve drought period supply reliability. Historical overdrafting of groundwater supplies in the San Joaquin River basin has created opportunities to develop groundwater banks in the area. Groundwater banking is an element of "conjunctive use", the coordinated management of surface and groundwater. It primarily consists of taking surplus surface water when it is available during wet years and "banking" it in an underground aquifer for later use, usually during drought periods. In addition to the physical banking opportunities caused by overdraft, the western San Joaquin River basin is also in close proximity to the California Aqueduct, which can significantly increase banking effectiveness by facilitating water exchanges with surface water storage facilities. The measure would build on existing groundwater storage banks in the San Joaquin Valley such as the Semitropic Groundwater Banking Project, the next increment of the Semitropic

Project, and the proposed Cawelo Groundwater Banking Project in Kern County. Semitropic Water Storage District and Cawelo Water District, both of which are members of the Kern County Water Agency, operate these banks. SCVWD, ACWD, and Zone 7 are already participants in the existing Semitropic Groundwater Banking and Exchange Program (GBEP), delivering their excess SWP supplies to storage when available. Under this measure, these water agencies would participate in an expansion of the San Joaquin Valley banking projects.

It is believed, however, that while additional groundwater banking south of the Delta could help improve reliability in the short-term, as water demands intensify in the future statewide, the ability of Bay Area water agencies to effectively participate in additional groundwater banking will decline. Additional participation by Bay Area water agencies would not be as effective as current banking programs because existing programs already are sufficient to store unused contract water. Accordingly, additional firm water supplies would be needed to increase participation. Further, the ability to swap supplies and compete for limited south-of-Delta groundwater storage space with other south-of-Delta water agencies will decline. Prices for water transfers will likely significantly increase as competition for available supplies becomes more intense, especially as the EWA and similar programs become more prolific. Competition will make it difficult for Bay area water agencies to purchase water as well as increase capacity in groundwater banks. In addition, infrastructure improvements would be required to overcome current conveyance limitations, particularly in dry years when groundwater bankers are calling on their supplies. Because of these factors, it is believed that increased groundwater banking in the San Joaquin basin would not be a viable alternative to increased storage in Los Vaqueros Reservoir and this measure was deleted from further consideration in this study.

Additional Groundwater Banking in the Sacramento River Watershed - This measure consists of participating in efforts to develop groundwater banking and storage in the Sacramento Basin (north of the Delta). Currently, Sacramento River basin water supplies are typically moved to Bay Area agencies through transfers or assignment of SWP contractual rights, rather than through groundwater banking. Unlike conditions in the San Joaquin River basin, groundwater overdrafting is limited to highly urbanized areas such as Sacramento, where agencies are actively engaged in conjunctive use programs. Other large aquifers in the Sacramento River basin do not appear to have the physical capacity needed for large-scale banking. Further, the institutional and scientific understanding of Sacramento Basin groundwater banking has not reached the same level as San Joaquin Basin groundwater banks. Consequently, no large groundwater banks currently exist north of the Delta. Because of the lack of fully developed and successful large-scale banking programs in the Sacramento River basin, this measure was deleted from further consideration.

Conveyance/System Modifications

Increase Delta Diversion Capacity to Bay Area Water User Facilities - This measure consists of enlarging the diversion capacity from the Delta to Bay Area water user facilities. Examples include enlarging the size of existing pumping and conveyance facilities at Old River; developing new pumping capacity at another central Delta location; or increasing the capacity of pumping to the CCWD service area or Los Vaqueros Reservoir. Other examples

include enlarging the size of these facilities and pumping directly to the SBA. However, the delivery of excess Delta flows would be limited to high-demand periods because SBA agencies lack the storage facilities necessary to carry over water for later use. Consequently, this measure by itself would not be effective in increasing water supply reliability to the study area. However, when in combination with enlarged storage in Los Vaqueros Reservoir or elsewhere in the Bay Area, this measure would allow increased volumes of water to be delivered to these facilities during periods of excess Delta outflows. Accordingly, this measure was retained for further consideration when used in combination with new storage.

Construct Intertie from SFPUC to SBA - This measure consists of connecting the SFPUC Hetch Hetchy Aqueduct or Alameda Creek watershed supply (see **Plate 4**) to the SBA to improve water supply reliability primarily for the SFPUC service area. An emergency intertie exists from the SBA to Hetch Hetchy facilities within the Sunol Valley in Alameda County, and there are several possibilities for additional connections between the two systems. This measure primarily focuses on only one entity in the study area, is physically removed from other potential actions to address study objectives, and could be implemented independently by SFPUC and DWR. Consequently, it was deleted from further consideration.

Expanded Use of Freeport Regional Water Project – This measure would expand the planned Freeport Regional Water Project (FRWP) to deliver water to Zone 7 in addition to East Bay Municipal Utility District (EBMUD). The FRWP, as described in the final Environmental Impact Statement (EIR), includes a 185 million gallon per day (mgd) turnout on the Sacramento River, and 100 mgd conveyance capacity to EBMUD's Mokelumne Aqueduct. The expanded project would primarily include constructing an increased increment to the FRWP, obtaining rights/permits for a changed point of diversion from the SWP, and constructing new conveyance facilities. The project would be limited to increasing average and wet period water supplies to Zone 7. The cost of an added increment to the Freeport Regional Water Authority (FRWA) facilities, including construction of expanded facilities, intertie facilities, and for use of FRWA facilities, is estimated to be significantly greater than for other Delta diversion opportunities. Another option would be to use an intertie between the Mokelumne Aqueduct and CCWD's Los Vaqueros Pipeline to also deliver water supplies to CCWD. Under either scenario, however, limited capacity in the Mokelumne Aqueduct would significantly limit the potential to deliver dry-period supplies to the Bay Area in excess of EBMUD demands. Further, this measure would only benefit single agencies (either Zone 7 or CCWD) and provides little improvement in dry-period supply reliability. Because of the relatively high cost, limited potential to increase drought period supplies, and various institutional issues making this measure difficult to implement, this measure was deleted from further consideration.

Expand Banks Pumping Plant Capacity (greater than 8,500 cfs) – The current allowable pumping capacity at the SWP Banks Pumping Plant is 6,680 cfs. Efforts are underway by Reclamation and DWR to construct fish protection features under the South Delta Improvements Program (SDIP) to allow increasing the allowable pumping capacity to 8,500 cfs during certain seasonal periods. The maximum installed pumping capacity at Banks is about 10,300 cfs. This measure primarily includes implementing additional physical features and operational improvements aimed at benefiting the overall water quality of the Delta to

further increase the allowable pumping capacity at Banks from 8,500 cfs to 10,300 cfs during certain seasonal periods. This increased capacity would allow more water that otherwise would flow to the Pacific Ocean to be conveyed south of the Delta. Potential benefits include the potential to refill San Luis Reservoir more quickly and increased ability to move EWA water south of the Delta. This could improve water deliveries to the SBA and/or the San Felipe Unit of the CVP (including SCVWD) but would provide little or no water quality benefits. In addition, this project would have only a limited potential to improve dry-year water supply reliability conditions in the study area, and only then in conjunction with new storage south of the Delta. Consequently, it was not considered a viable alternative to new storage in Los Vaqueros Reservoir and this measure was therefore deleted from further consideration.

Construct Intertie from Los Vaqueros Reservoir to the SBA at Dyer Canal Back Surge Pool – This measure consists of constructing a new conveyance system from Los Vaqueros Reservoir to the SBA. By delivering water to the SBA via Los Vaqueros Reservoir, it has been suggested that potential exists to increase the efficiency of Los Vaqueros Reservoir, its Delta diversion facilities, and Banks pumping, thereby improving water supply reliability for SBA water agencies. A likely location to intertie with the SBA would be at the Dyer Canal Back Surge Pool. By itself, this measure has little potential to significantly increase water supply reliability, but the measure was retained because preliminary system operation analyses show that this measure would be important in conjunction with the enlargement of Los Vaqueros Reservoir.

Construct Intertie from Los Vaqueros Reservoir to the SBA at Bethany Reservoir – For the objective of improving water supply reliability to SBA water agencies, this measure would be similar to constructing an intertie from Los Vaqueros Reservoir to the SBA at Dyer Canal. With this measure, water would be diverted from Los Vaqueros by gravity to Bethany Reservoir and then pumped from Bethany Reservoir to the SBA. A connection to the South Bay Pumping Plant could be made in a way that preserves the water quality benefits of the reservoir, preventing the mixing of Los Vaqueros and Bethany reservoir supplies before delivery to SBA users.

It should be mentioned that a project including an intertie from Los Vaqueros to Bethany Reservoir would not gain local acceptability without certain operating constraints or restrictions that would satisfy the CCWD Principles of Participation (described in **Chapter II**), in particular that the project would provide for long-term environmental benefits in the Delta by supplying water for the EWA. In addition, the project could not be operated in conjunction with a peripheral canal or to increase the export of water from Northern California. Just as would be required in the case of a Dyer Canal intertie, permit terms and conditions, as well as contractual arrangements, would be required to ensure that the CCWD principles are satisfied.

Because this intertie would convey water via gravity, power generation facilities could potentially be included to help offset some of the implementation and operation costs. However, at this level of analysis, it is believed that the amount of potential power gained would not represent a significant advantage over the Dyer Canal connection described above. Accordingly, for the objective of water supply reliability, this measure was deleted from

further consideration. As described later, however, this measure was retained for the objective of developing an EWA replacement supply (described later in this chapter).

Source Water Treatment Improvement

Implement Treatment/Supply of Agricultural Drainage Water – This measure consists of collecting agricultural drainage from farms on southern and central Delta islands (Middle River and Old River region) and treating the drainage water for potable use. Major elements of this measure likely include an agricultural drainage collection system, pre-treatment of drainage water, desalination facilities, ancillary facilities associated with desalination and brine disposal, and conveyance of treated water to end users. In addition, removal of total organic carbon (TOC) and pesticides plus supplementary disinfection may also be required before municipal agencies would consider using the treated agricultural runoff as a potable supply. While this measure has the potential to provide some water supply reliability to Bay Area users, it is not judged to be a feasible alternative because it could result in reduced Delta water quality from brine disposal, would be costly and difficult to implement, and would likely be unacceptable to stakeholders and the public. Accordingly, this measure was deleted from further evaluation.

Construct Desalination Facility – This measure consists of constructing desalination plants at one or multiple locations around the Bay-Delta area to supplement existing water supplies. The EBMUD, SFPUC, CCWD, and SCVWD are jointly exploring developing a regional desalination facility. As currently envisioned, the Bay Area Regional Desalination Project (BARDP) may consist of one or more desalination facilities, with an ultimate total capacity of up to 120 million gallons per day (134,000 acre-feet per year). Studies to date have focused on assessing potential sites for desalination plants and evaluating alternative institutional and engineering arrangements to meet the needs of the project partners. One potential site in the San Francisco Bay area would be near the Bay Bridge in Oakland (see **Figure VI-4**) where the salinity is 30,400 milligrams per liter (mg/L) total dissolved solids (TDS) (closer to salt water than freshwater). Another site nearer the Bay-Delta estuary would be along the Carquinez Straits in Pittsburg near the Mirant Power Plant. Another option under consideration is a desalination facility drawing water with a salinity of about 35,000 mg/L TDS from the Pacific Ocean near the City of San Francisco.

Primary facilities at any of the sites would include an intake, pretreatment, desalination, brine disposal, and ancillary facilities for the desalination treatment plant. In addition, a distribution system would need to be constructed to transport either desalinated water or exchange water to partner agencies throughout the region. The BARDP may consider expanding the project scope and potential project partners to include other Bay Area water agencies in future phases of the study, upon unanimous consent of the current project partners.

Desalination facilities are technically feasible, as exemplified by a number of operational facilities around the world. In California, permitting issues have slowed the application of desalination technology, particularly regarding brine disposal. Although technological advances have substantially decreased treatment costs, desalination remains costly compared with most other water sources. Initial plant construction costs are relatively high, and

ongoing operation, maintenance, and replacement needs also are higher, primarily due to the high-energy requirements. Because a portion of the water processed by a desalination plant is either returned to the source or disposed elsewhere as highly concentrated brine, there is potential for impacts on environmental resources.[2] For example, a large desalination facility at the Mirant site could require costly transport and disposal of brine waste at a suitable offsite facility due to concerns over the discharge of brine concentrate back into the sensitive estuary.

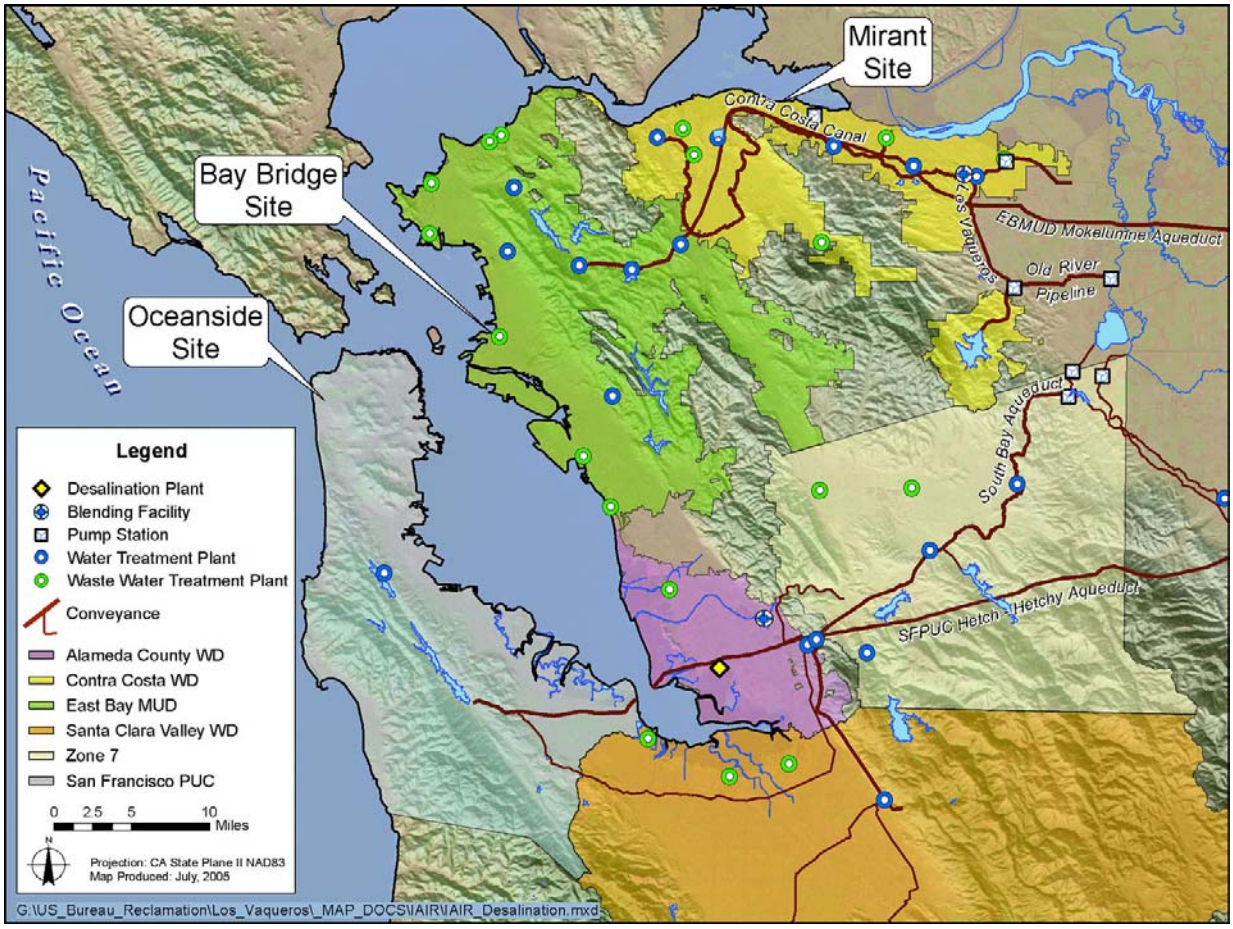

FIGURE VI-4 – POTENTIAL DESALINATION FACILITY SITES IDENTIFIED IN PREVIOUS STUDIES

[2] Depending on source water and facility design, brine waste from a desalination plant may contain high salt concentrations, chemicals used to maintain plant equipment, metals, or potentially harmful concentrations of other constituents found in the source water (*Seawater Desalination and the California Coastal Act*, California Coastal Commission, 2004). The concentration and volume of brine effluent or waste varies, depending on the source water (brackish versus ocean) and the efficiency of the treatment technology. The 2003 *Desalting Handbook for Planners* by Reclamation suggests that the water recovery efficiency of reverse osmosis desalination ranges from as low as 30 percent (70 percent as brine waste) for ocean water to as high as 85 percent (15 percent as brine waste) for brackish water; distillation processes are somewhat less efficient. Continuing advances in treatment technology will likely produce higher water recovery efficiencies, resulting in smaller volumes of more highly concentrated brine waste.

Desalination is most efficient when used as a base-supply because the plants can be better and more cost-effectively maintained if continuously operated, rather than if they are only operated during drought periods. Alternately, if desalination were operated as a base-supply in all years, reserving contract water for use during drought periods, less expensive average and wet-year contract water would be forgone in most years. Consequently, desalination by itself would be a highly inefficient option for agencies that rely on multiple water sources or only intend to use desalination as a drought or emergency supply. However, desalination in combination with new storage would provide an opportunity to continuously operate a plant, storing the treated water during average and wet years when less expensive contract supplies are available, and carry over stored supplies for use in dry periods. New storage could be accomplished with surface or groundwater facilities, which could be located either near the plant or at the point(s) of use. Desalination also could contribute to the water quality objective of the LVE.

With improvements in treatment technology, the cost of desalination has significantly decreased over the last decade. Depending greatly on the quality of the source water and cost of power, desalinization today can range from about $700 to several thousand dollars per acre foot.[3] As an example, the cost of a 20,000-acre-foot-per-year (17.9 mgd) desalination plant in Monterey County, California, was estimated in 2004 as about $250 million, or about $1,600 per acre-foot to construct and operate. The unit cost would likely be lower for a brackish water desalting plant in the San Francisco Bay area. However, desalinization is energy intensive and, with rising power costs, it is expected to continue to be relatively expensive. Even if the unit cost for a base-supply plant were measurably reduced, desalination by itself would likely not be superior to other potential water sources to meet future supply reliability needs in the primary study, such as enlarging Los Vaqueros Reservoir. Accordingly, this measure was deleted from further evaluation as a stand-alone means for improving water supply reliability, but was retained for use in combination with new storage.

Demineralize Poor Quality Groundwater - This measure consists of increasing Bay Area water supply reliability by extracting and demineralizing poor quality groundwater. Various candidate locations have been identified to date. One area would be in the eastern portion of Contra Costa County, where new wells could be constructed at various locations to lessen the potential for adverse impacts on local groundwater levels. A centralized plant or group of smaller, regional plants would demineralize or soften the water to remove hardness, and a suitable site for brine disposal would need to be identified. Water quality objectives could be achieved by blending the demineralized groundwater with surface water or untreated groundwater. New wells would extract groundwater during drought periods, while treated CCWD water would be provide to local groundwater users during wet periods in lieu of their current groundwater supplies. An in-lieu or indirect recharge program would replace pumped groundwater to maintain aquifer integrity. The total quantity of water available from

[3] Sources include *Seawater Desalination and the California Coastal Act*, California Coastal Commission, March 2004; *Desalination Handbook for Planners*, Reclamation, July 2003; *Water Desalination – Findings and Recommendations* of the California Water Desalination Task Force, DWR, October 2003; and *Seawater Desalination in California*, California Coastal Commission, 1993. Values exclude delivery costs.

this measure would be limited by hydrogeologic conditions (probably less than about 5,000 acre-feet per year).

Another site identified in recent studies is in Alameda County. This measure would include further expansion of a groundwater demineralization plant at the Newark and Peralta Tyson sites. This measure would increase water supply reliability to the ACWD by building out the Newark desalter from 5 to 10 mgd and the Peralta-Tyson desalter from 4 to 14 mgd. The reliability of ACWD's groundwater supplies would be improved (providing 15 percent of total supplies), as well as overall water quality. However, no benefits would result for other Bay Area agencies.

Under either of the scenarios described, this measure would increase reliability to only one area water purveyor unless rights to use local groundwater supplies out-of-basin were acquired. Obtaining these groundwater rights would likely be difficult, with a high potential for claims of real or perceived impacts on groundwater conditions. Consequently, this measure was not viewed as a comparable alternative to new storage in Los Vaqueros Reservoir and was not carried forward for further consideration.

Water Use Efficiency

Implement Additional Wastewater Reclamation – This measure consists of the increased use of reclaimed wastewater from Bay Area wastewater treatment plants (WWTP), beyond the recycling projects that are currently planned, to offset potable water demands and to increase water supply reliability, particularly in dry years. Reclaimed wastewater is currently applied to a variety of non-potable uses such as irrigation, industrial processes, cooling tower make-up water, and aquifer recharge. This measure would include constructing new filtration and disinfection treatment systems at existing WWTPs, pump stations, distribution systems to end-users, and reservoirs (to ensure system reliability). A separate distribution system would be required because reclaimed wastewater cannot be conveyed via potable water systems.

It is expected that the use of reclaimed water will increase in the future, as indicated in various Bay Area water management plans, and some level of increased recycling will be included as a without-project future condition. Bay Area agencies that currently produce reclaimed wastewater for irrigation and industrial use include Central Contra Costa Sanitation District, cities of San Jose and Santa Clara, Dublin-San Ramon Services District, Union Sanitation District, South Central Regional Wastewater Authority, and the cities of Palo Alto and Sunnyvale. This measure would provide Bay Area users with an additional, supplemental supply for non-potable uses. The Bay Area Water Recycling Master Plan identified methods with the potential for annual recycling of up to 125,000 acre-feet in the region.

Because recycled water is limited to non-potable applications, facilities are ideally located near end-users to reduce the cost of distribution. Further, the yield of wastewater recycling is limited by the size of the WWTP with which it is associated, and facilities are most efficient when operated continuously, such as for a base-supply. To provide meaningful water supply

reliability benefits during a drought, a wastewater recycling program likely would fall under one of the following scenarios:

(1) A large recycling facility would continuously serve a consumer with a high demand for non-potable water who is willing to accept recycled water in lieu of their existing supply, which would be reserved for use during dry periods, or

(2) A smaller recycling facility would continuously deliver water to surface or groundwater storage, for later use during dry periods.

The substitution of recycled water as a base-supply would mean supplies that currently fill that need, such as less-costly SWP contract water, would be forgone in most years. It is likely that the most cost-effective recycling projects – those located at existing, large-sized WWTPs – already are planned and/or will be included as a future condition. Consequently, it is believed that volume and efficiency of wastewater recycling projects which could be implemented as part of this measure would be very low. In addition, this measure would not contribute to other study objectives, and may result in degraded water quality to some water users. It also could be implemented independently by individual utilities or agencies. Accordingly, this measure was deleted from further consideration.

Implement Additional Demand Management Facilities – For this study, water demand management is defined as improvements in urban water use efficiency through technological improvements or behavioral changes in indoor and outdoor residential, commercial, industrial and institutional water use, leading to reduced demand, and reduced per capita water use. This measure would consist of additional demand management programs beyond the current programs and plans being actively pursued by Bay Area water agencies (ACWD, CCWD, SCVWD, and Zone 7). Most of the more easily implementable and cost efficient demand management measures have either already been implemented, or are likely to be implemented under without-project conditions as part of the CALFED ROD. The degree of effectiveness for this measure would be determined in part by the state of existing water demand management programs and the types of additional programs that are currently planned. While future demand management facilities and programs including water conservation and reuse in addition to those being considered by the State would provide reliability benefits, it is likely that the economic efficiency of these facilities would be lower than previous actions. Consequently, the incremental costs to implement these facilities are expected to significantly increase. There also would be little potential to contribute to the other planning objectives of the LVE. Accordingly, demand management measures on a large scale are not believed to be a viable substitute for additional storage in Los Vaqueros Reservoir and this measure was deleted from further consideration.

Water Transfers and Land Retirement

Water Transfers Within the Study Area – This measure consists of implementing water transfers (or exchanges) within the study area to improve reliability during dry and critical years when Reclamation or DWR reduce allocations to SWP and/or CVP contractors. CCWD, Zone 7, and SCVWD have developed plans to use transfers to meet existing and

future demands. This measure would involve developing the necessary long-term implementation agreements and facilities for these and additional water transfers.

The use of water transfers has and will continue to provide Bay Area water supply reliability, with numerous agencies relying on transfers to meet portions of their current and long-term demands. However, because transfers are performed on a year-to-year basis, significant uncertainty exists regarding the availability and cost of water. In dry and critical years, the supply of water decreases while the demand increases, resulting in higher prices for water. Uncertainty is highest in dry and critical years and for transfer market-dependent agencies. Although ACWD has not used transfers in the past, it estimates it would need supplemental water from transfers about 1 year in 25, so reliance on future transfers to meet infrequent dry-year needs may be reasonable. Zone 7 and CCWD have used transfers regularly and could benefit from additional supplemental water if available in the future, depending on the cost of alternative supplies. Further, the efficiency of transfers is reduced in some cases by Delta carriage water losses.

Although the physical potential for water transfers within the study area is well established, it is believed that even if long-term enforceable agreements could be developed, they would have only a minor effect during a critical dry period or extended drought when nearly all water agencies would be in need of supplies. In addition, transfers within the study area are unlikely to contribute to improving water quality (particularly during dry periods) or providing a less-costly EWA replacement supply. Accordingly, this measure was not considered a viable alternative to new storage in Los Vaqueros Reservoir and was deleted from further consideration.

Increase Water Transfers Outside the Study Area - This measure primarily consists of transferring water between users within the Central Valley, depending on year type, agricultural water availability, storage capabilities, transmission capacity, and purchase/transfer costs to allow more efficient use of available supplies. Several potential water transfer projects were considered by CALFED, including the Semitropic Water Storage District's GBEP and Kern Water Bank. In addition, the Sacramento Valley Water Management Program (Phase 8) depends on water transfers. Both Reclamation and DWR also have active water transfer programs, and a significant number of water transfers will continue to occur in the future under without-project conditions as available supplies become scarce. Further, the future of the EWA depends on the ability to acquire and transfer water through the Delta to mitigate impacts of south Delta pumping curtailment to benefit at-risk fish. Because of these and other projects and actions, and ongoing infrastructure limitations on conveying water from north of the Delta south, it is believed that as water supply demands continue to grow and exceed developed supplies, especially during dry years, and as market conditions change, the cost of water is expected to increase significantly. It is likely that the most feasible and reliable out-of-basin water transfers will be implemented under without-project conditions. Any remaining opportunities for transfers likely would be small, include high uncertainties, be difficult to implement, and be more costly. In addition, water transfers are unlikely to contribute to improving water quality (particularly during dry periods) or provide a less-costly EWA replacement supply (transfers are a water acquisition tool already used by the EWA). Consequently, this measure was deleted from further consideration

primarily because it would not be a long-term reliable substitute for new storage in Los Vaqueros Reservoir.

Retire Agricultural Lands – This measure consists of long-term retirement of agricultural lands in the Central Valley and use of the forgone agricultural supplies in the study area. Recent studies indicate that the demand for irrigation water could be reduced by about 236,000 acre-feet per year under average conditions by retiring 200,000 acres of irrigated croplands in the San Joaquin Valley. It is estimated that in dry and critically dry years, potential savings could amount to as much as 140,000 acre-feet per year. The estimated first cost to acquire land rights to permanently retire lands from irrigated agriculture would be over $600 million, resulting in an equivalent dry-period unit water cost on the order of $300 per acre-foot. However, it is believed that there is a high degree of uncertainty regarding the institutional ability to re-dedicate those CVP supplies to urban uses in the study area, and the ability to acquire sufficient agricultural land rights in the Central Valley. Further, long-term agricultural land retirement may not be consistent with CALFED solution principles and may have local and/or regional economic effects. Accordingly, this measure was deleted from further consideration.

Measures Retained

As described above and shown in **Table VI-1**, five measures focused primarily on increasing water supply reliability in the study area were retained for further consideration for development into initial alternatives. Following is additional information on the features and potential benefits of each measure.

Enlarge Los Vaqueros Reservoir

General Description

This measure includes the expansion of the Los Vaqueros Reservoir from 100,000 acre-feet to up to 500,000 acre-feet by demolishing the existing dam and constructing a larger dam and reservoir at a nearby site with suitable foundation conditions. Some facilities associated with the existing Los Vaqueros Project would be abandoned while others would be preserved and integrated into the expanded project. The size of the expansion would be determined by future studies. Specific features and facilities associated with this measure are described in **Chapter VII**.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability -** This measure would improve water supply reliability by allowing Bay Area water agencies to store surplus Delta water during wet periods for later use during dry years when full CVP and/or SWP contract requests can not be filled. The reservoir could be enlarged by as much as 400,000 acre-feet. The measure would be most effective when combined with an enlarged Delta diversion and an intertie between Los Vaqueros and the SBA, which would enable SBA users to receive deliveries from the expanded reservoir. Storage of CVP and/or SWP contract water in an expanded reservoir, in

addition to surplus Delta water, also could provide supplemental water supplies when contract deliveries are reduced. Potential participants include ACWD, CCWD, SCVWD, Zone 7, and SFPUC.

- **Less-Costly EWA Replacement Supply –** An expanded reservoir has the potential to provide a less costly EWA water supply, which could replace a portion of the water the EWA currently acquires through short-term transfers or transfer market purchases. Water supplies stored in an expanded reservoir could be delivered to SBA users; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver EWA supplies south of the Delta or to directly accommodate EWA fish actions (pumping curtailments) at the export facilities, as determined by the EWA agencies.

- **Bay Area Water Quality** - This measure could improve water quality delivered to the SBA and to the Contra Costa Canal by capturing higher quality, surplus Delta water and storing it in the reservoir for use or blending when Delta water quality is poor. Improvements to water quality would include lower turbidity, hardness, temperature, and concentrations of TDS, chlorides, bromides, and organic carbon.

Raise Los Vaqueros Dam in Place

General Description

This measure is similar to the previous measure to enlarge Los Vaqueros Reservoir except the dam would be raised in-place by between 10 and 15 feet, as permitted by existing foundation and dam safety conditions. This could include a small, mass raise of the dam structure, or modification of the spillway to accommodate a higher water surface. This measure would result in a significantly smaller potential increase in storage in the reservoir compared with the previous measure, between about 15,000 and 25,000 acre-feet, but it would not require demolition and reconstruction of the existing dam. In addition, most facilities associated with the existing Los Vaqueros Project would be preserved and integrated into the expanded project. The allowable magnitude of the dam raise would be determined by future engineering studies. Specific features and facilities associated with this measure are described in **Chapter VII**.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** – Potential water supply reliability benefits of this measure would be similar to, although smaller than, those described previously for the enlargement of Los Vaqueros Reservoir.

- **Less-Costly EWA Replacement Supply –** Raising Los Vaqueros Dam has the potential to provide a less-costly EWA water supply, similar to the previously described measure, but the yield would be much smaller than could be provided by a larger reservoir expansion.

- **Bay Area Water Quality** - This measure could improve water quality delivered to the SBA and to the Contra Costa Canal by capturing higher quality, surplus Delta water and storing it in the reservoir for use and/or blending when Delta water quality is poor.

Increase Delta Diversion Capacity

General Description

This measure consists of increasing diversion and conveyance capacity from the Delta to local storage, such as an enlarged Los Vaqueros Reservoir. The measure would include developing between about 500 and 1,500 cfs of new diversion capability, within or near the existing Delta diversion facility on Old River or at a new location in the central Delta. This measure would include retaining the existing diversion capacity to CCWD of 250 cfs. An advantage of a new central Delta diversion would be to obtain increased volumes of water often at a higher quality which could reduce treatment costs. It also would include new conveyance facilities from the Delta to the reservoir. The new pump station would incorporate state-of-the-art fish screens to minimize impacts to Delta fisheries.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** - This measure could help increase water supply reliability for Bay Area water users primarily when combined with increased surface water storage. Water diverted during surplus flow conditions in the Delta could be stored for later use during dry periods or droughts.

- **Less-Costly EWA Replacement Supply** – This measure by itself would not directly support development of a less-costly replacement supply for a long-term EWA because it would not resolve problems related to moving and storing wet-year EWA purchases south of the Delta.

- **Bay Area Water Quality** - Depending on the size and location of the increased Delta diversion facilities, this measure could help improve Bay Area water quality. A larger intake near the existing facility could be used to divert more water to local storage during periods of good water quality, for later use when Delta water quality is poor. In addition, a diversion facility could be located further east into the central Delta to divert water of higher quality. This could result in lower costs to treat municipal supplies.

Construct Intertie from Los Vaqueros Reservoir to SBA at Dyer Canal Back Surge Pool

Preliminary studies have identified two potential intertie scenarios for conveying water from Los Vaqueros Reservoir to SBA users. The first consists of a pumped connection from Los Vaqueros Reservoir to the Dyer Canal segment of the SBA; the second consists of a gravity connection to Bethany Reservoir. Distinct differences exist between the cost and operation of these connection scenarios. As mentioned and described below, the Dyer Canal intertie was retained for further consideration for water supply reliability and is included in this measure. The Bethany Reservoir intertie is described later in this chapter.

General Description

This measure consists of constructing a pipeline from Los Vaqueros Reservoir to the Dyer Canal Back Surge Pool segment of the SBA. This measure would require a pump station to lift water from Los Vaqueros to Dyer Canal.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** - This measure could help increase dry-year reliability for SBA water users when combined with increased surface water storage.

- **Less-Costly EWA Replacement Supply** - This measure has the potential to support the development of a less-costly EWA replacement supply when combined with increased surface water storage. Water supplies stored in an expanded Los Vaqueros Reservoir, for example, could be delivered to SBA users via the intertie; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver other EWA supplies south of the Delta or to directly accommodate EWA fish actions at the export facilities, as determined by the EWA agencies.

- **Bay Area Water Quality** - This measure could improve the quality of water delivered to SBA agencies because water quality in Los Vaqueros Reservoir, which is supplied by surplus flows from the central Delta, is generally superior to that in the south Delta.

Construct Desalination Facility

This measure would include constructing a desalination plant in the Bay-Delta estuary to improve water supply reliability for CCWD, ACWD, SCVWD, and Zone 7.

General Description

Studies are ongoing for a Bay Area Regional Desalination Project under a joint effort of CCWD, SCVWD, SFPUC, and EBMUD. A number of potential sites (see **Figure VI-4**) and plant capacities have been considered. Primarily from information gathered as part of these and other studies, and to address the identified study objectives, this measure consists of constructing a brackish water desalination plant in the Bay-Delta Estuary as a supplemental water diversion and treatment facility. For efficient operation, a desalination facility needs to operate continuously, either as a base water supply or a supply stored for later use (such as during dry periods). Primarily for this reason, desalination is being considered in the LVE in combination with new storage. As envisioned, the desalination plant could be located at or near the Mirant Pittsburg plant site identified in studies to date. It would operate continuously by treating and supplying water either (1) directly to CCWD's distributions system, or (2) to storage, supplementing other Delta water supplies for later delivery to the SBA.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** – This measure could provide a high quality supplemental water to users in the study area. The direct recipient likely would be CCWD through direct pumping from the desalination plant. However, it also could help meet water needs of ACWD, SCVWD, and Zone 7.

- **Less-Costly EWA Replacement Supply** – This measure has limited potential to support development of a less-costly EWA replacement supply.

- **Bay Area Water Quality** - Desalination would reduce some of the constituents that are at issue in the Delta water supplies, namely chloride and bromide. Desalinated water could be blended with other sources to bring down the salinity of water diverted from the Delta. The product water goal at Mirant is 200-mg/L TDS and 100-mg/L hardness (as calcium carbonate).

MEASURES TO PROVIDE A LESS-COSTLY EWA REPLACEMENT SUPPLY

Three measures were identified with the potential to support development of a less-costly EWA replacement supply that also met the LVE planning criteria and constraints, as summarized in **Table VI-2** and described below. All three measures were retained for potential inclusion in initial alternatives.

TABLE VI-2
RESOURCE MANAGEMENT MEASURES WITH THE POTENTIAL TO PROVIDE A LESS-COSTLY EWA REPLACEMENT SUPPLY

Resource Management Measure	Potential to Address Planning Objective	Status & Considerations
Enlarge Los Vaqueros Reservoir to store EWA replacement supplies	**High –** Could store up to 400,000 acre-feet of surplus Delta flows or transfer water for EWA use.	**Retained –** High potential to provide a replacement supply for a portion of the EWA.
Construct an intertie from Los Vaqueros Reservoir to the SBA – Bethany Reservoir connection	**High –** Could be used to deliver replacement water supplies for the EWA. Most effective when combined with expanded storage at Los Vaqueros.	**Retained –** Connection to the SBA would be an integral component in any enlargement of Los Vaqueros to store EWA replacement supplies; an intertie to Bethany Reservoir could provide additional flexibility.
Construct an intertie from Los Vaqueros Reservoir to the SBA – Dyer Canal connection	**Moderate - High –** Could be used to provide replacement supplies for the EWA, for delivery to SBA agencies. Most effective when combined with expanded storage at Los Vaqueros Reservoir.	**Retained –** Connection to the SBA would be an integral component in any enlargement of Los Vaqueros Reservoir. Although beneficial to EWA flexibility, this measure would be limited by the existing capacity of the SBA.

KEY: EWA = Environmental Water Account SBA = South Bay Aqueduct

Enlarge Los Vaqueros Reservoir to Store EWA Replacement Supplies

As demands for water increase in the future, the ability of a long-term EWA or similar program to continue to reliably obtain affordable water also will decrease. With this measure, a portion of the storage space in an expanded Los Vaqueros Reservoir would be dedicated to EWA purposes, replacing all or a portion EWA supplies acquired through short-term transfers or transfer market purchases. Contract deliveries would be made primarily to SBA water users from the expanded reservoir; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver EWA supplies south of the Delta or to directly accommodate EWA fish actions (pumping curtailments) at the export facilities, as determined by the EWA agencies. Water supplies developed in the reservoir would effectively replace a portion of the EWA's south of Delta purchases.

General Description

This measure consists of enlarging Los Vaqueros Reservoir to develop new surface water supplies to facilitate Delta pumping curtailment impacts associated with a long-term EWA or similar program. As part of this measure, Los Vaqueros Reservoir would be enlarged by up to 400,000 acre-feet. This measure would likely be combined with a connecting pipeline or intertie between the expanded reservoir and the SBA (see below) primarily to serve SBA water users.

A new or expanded diversion facility would be constructed in the central Delta and equipped with state-of-the-art fish screens. Surplus flows in the Delta would be pumped to the enlarged Los Vaqueros Reservoir during times when Delta inflows are in excess of mandatory flow requirements and otherwise available for use. Stored water would be delivered primarily to the SBA to serve SWP customers; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver other EWA supplies south of the Delta or to directly accommodate EWA fish actions (pumping curtailments), as determined by the EWA agencies.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** – This measure would have the ability to release water from Los Vaqueros Reservoir into the SBA when deliveries would be reduced due to pumping curtailments at Banks. This measure also could be implemented in conjunction with increased storage for water supply reliability.

- **Less-Costly EWA Replacement Supply** - This measure has the potential to provide a less-costly replacement supply for the EWA, or a similar long-term program, that could offset the impacts of fisheries actions at Banks and Tracy pumping plants. Storage in the expanded reservoir would replace a portion of EWA south-of-Delta acquisitions and reduce the need to move and store EWA supplies south of the Delta.

- **Bay Area Water Quality** – As with other measures involving enlarging Los Vaqueros Reservoir, it is believed that this measure could contribute to improving the quality of municipal and industrial (M&I) water delivered to Bay Area water agencies. Water would be

diverted from the central Delta during surplus conditions when water quality is generally good, and delivered during periods when pumping curtailments are occurring, which often coincides with periods of low flow and poor quality in the south Delta.

Construct Intertie from Los Vaqueros Reservoir to SBA – Bethany Reservoir Connection

As described previously, two potential conveyance alignments / intertie locations have been identified that appear to be the most promising ways to connect Los Vaqueros Reservoir to the SBA. Because distinct differences exist between the cost and operation of these alternative connection scenarios, they are described as two separate measures, starting below with the Bethany Reservoir connection.

General Description

This measure consists of constructing a gravity pipeline from Los Vaqueros Reservoir to Bethany Reservoir that would facilitate the movement and storage of EWA supplies to offset the impacts of fisheries actions at Banks and Tracy Pumping Plants. Water delivered from Los Vaqueros Reservoir to Bethany Reservoir could be delivered to SBA users via the existing South Bay Pumping Plant; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver EWA supplies south of the Delta or to directly accommodate EWA fish actions (pumping curtailments) at the export facilities, as determined by the EWA agencies. Alternatively, water supplies delivered to Bethany could flow south via the California Aqueduct for storage or delivery. A flow separation structure would prevent higher quality Los Vaqueros supplies being delivered to SBA users from mixing with lower quality Bethany Reservoir supplies. This measure might also include hydropower generation facilities to take advantage of the elevation difference between Los Vaqueros and Bethany reservoirs.

It should be mentioned that a project including an intertie from Los Vaqueros to Bethany Reservoir would not gain local acceptability without certain operating constraints or restrictions that would satisfy the CCWD Principles of Participation (described in **Chapter II**), in particular that the project would provide for long-term environmental benefits in the Delta by supplying water for the EWA. Water could be supplied for the EWA through either reductions in Delta pumping to benefit fisheries, or replacing south of Delta EWA purchases. In addition, the project could not be operated in conjunction with a peripheral canal or to increase the export of water from Northern California. Just as would be required in the case of a Dyer Canal intertie, permit terms and conditions, as well as contractual arrangements, would be required to ensure that the CCWD principles are satisfied.

Ability to Address Study Objectives

Following is a summary of the potential ability of this measure to address the study objectives.

- **Bay Area Water Supply Reliability** - This measure could help increase dry-year reliability for SBA water users when combined with increased conservation storage in Los Vaqueros Reservoir.

- **Less-Costly EWA Replacement Supply** - This measure has the potential to support development of a less-costly EWA replacement supply when combined with increased surface water storage. Water supplies developed in an expanded reservoir could be delivered via the intertie to SBA users; the resulting pumping reduction at Banks Pumping Plant then could be used either to deliver EWA assets south of the Delta or to directly accommodate EWA fish actions (pumping curtailments) at the export facilities, as determined by the EWA agencies. The connection to Bethany Reservoir would provide greater flexibility in conveying and storing EWA assets than a connection to the SBA at Dyer Canal primarily because deliveries would not be limited by the existing capacity or demand of the SBA.

- **Bay Area Water Quality** – This measure has the potential to improve the quality of water delivered to SBA agencies when combined with an expansion of Los Vaqueros Reservoir to capture higher quality surplus flows. If necessary, a flow split could be constructed at the Bethany Reservoir connection to prevent mixing of higher quality Los Vaqueros water with lower quality Bethany water before delivery to the SBA agencies.

Construct Intertie from Los Vaqueros Reservoir to SBA – Dyer Canal Connection

As mentioned, this measure consists of constructing a pipeline from Los Vaqueros Reservoir to the Dyer Canal segment of the SBA. Unlike a gravity connection to Bethany Reservoir, this measure would require a pump station near Los Vaqueros Reservoir to lift water to the SBA. The potential ability of this measure to address study objectives would be similar to that described for the previous measure. However, it would provide somewhat less flexibility than a connection to Bethany Reservoir in terms of storing and delivering EWA water assets primarily because deliveries would be limited by the capacity of the existing SBA.

MEASURES TO ADDRESS WATER QUALITY IN THE STUDY AREA

Measures to address the planning objective of increasing water quality in the study area are described below and summarized in **Table VI-3**. Of the five measures identified, one was retained for possible inclusion in initial alternatives. Note that many of the above measures identified for water supply reliability coincidentally result in improvements to water quality. The monetary amount of this improvement is a water supply benefit and attributable to that purpose.

Measures Considered

Following is a brief description of measures identified to improve water quality in the study area.

Implement Point-of-Use Water Quality Actions - This measure consists of improving the quality of water delivered to many Bay Area residences, businesses, and public facilities through implementing point-of-use water quality concepts. As mentioned in **Chapter III,** under without-project conditions, all water delivered for ultimate domestic uses will at least meet regulatory public health and safety standards. However, often these supplies can exhibit elevated levels of minerals such as calcium and magnesium, making the water "hard."

TABLE VI-3
RESOURCE MANAGEMENT MEASURES ADDRESSING WATER QUALITY

Resource Management Measure	Potential to Address Planning Objective	Status & Considerations
Implement point-of-use water quality actions	**Low –** Difficult to implement over the entire study area	**Deleted** – Likely very high costs to implement and maintain with marginal benefits.
Rehabilitate Franks Tract for water quality improvement	**Moderate –** Some potential to improve water quality during certain periods as at some existing Delta diversions	**Deleted** – Being pursued by others and unlikely to contribute to other planning objectives.
Cover open channel sections of the SBA	**Moderate –** Would benefit SBA user agencies during certain periods	**Deleted** – Low potential to contribute to other study objectives and can be pursued independently.
Improve Bay Area water treatment plants	**High –** Potential to significantly improve treatment processes and delivered water quality	**Deleted** – While technically feasible, could be pursued independently by individual agencies and has a low potential to contribute to other study objectives.
Reoperate an enlarged Los Vaqueros Reservoir and/or other study area reservoir and system to improve water quality	**High –** Potential to improve water quality for CCWD and SBA agencies, particularly combined with enlarged reservoir and diversion capacity	**Retained** – High potential to address area water quality conditions and contribute to other LVE planning objectives.

KEY: CCWD = Contra Costa Water District LVE = Los Vaqueros Expansion Investigation SBA = South Bay Aqueduct

Hard water is not a health hazard; in fact, consuming hard water generally contributes a small amount toward total calcium and/or magnesium human dietary needs. However, hard water can be a nuisance (e.g. it can affect the amount of soap and detergent necessary for cleaning). In addition to elevated hardness, taste and odor problems are often associated with domestic supplies.

This measure would include, at those locations exhibiting higher levels of hardness or having taste and odor problems, the provision of bottled water for drinking or installing point-of-use water delivery/treatment features and devices. Primary benefits would include the aesthetics associated with softer and better tasting water, reduced use of soaps and detergents, and reduced frequency of equipment replacements. It also could include assisting the implementation of point-of-use devices primarily by commercial and industrial facilities requiring significantly elevated levels of water quality. Because this measure could be implemented independently by individual water agencies or individuals and because of the estimated high cost to install and maintain delivery/point-of-use type devices over the project life, this measure was deleted from further consideration.

Rehabilitate Franks Tract for Water Quality Improvement - This measure consists of constructing tidal gates, levee improvements, and/or other closure devices at Franks Tract to reduce tidal flows and salinity mixing. Delta water currently flows through Franks Tract on its way to Middle River, Old River, and Clifton Court Forebay, thereby influencing water

quality delivered to CVP/SWP contractors. It has been suggested through water quality modeling that closing Franks Tract could improve the quality of water exported from the central and south Delta. Franks Tract is a State Recreation Area and a protected wetland marsh, only accessible by water. The area is home to beaver, muskrat, river otter, mink, and over 70 species of birds. Currently, DWR is planning potential improvements at Franks Tract, and the California Bay-Delta Authority has identified funding to study the "Ecosystem and Water Quality Benefits Associated with Restoration of Franks Tract". Because this area is significantly important to recreation and environmental interests, is unlikely to contribute to other study objectives, and is being studied by other agencies, it was deleted from further consideration in the LVE.

Cover Open Channel Portions of the SBA - This measure consists of covering the open channel portions of the SBA to reduce the effects of temperature, sunlight, and wind on water quality delivered to SBA contractors. A concrete cap or other type of cover would be constructed along the entire length of the open channel portion. The cover would reduce the algal growth stimulated by sunlight that can cause undesirable pH and diurnal temperature fluctuations. Some improvements to SBA canal berms and relocation or reconfiguration of existing crossings may be required. Because this measure is unlikely to contribute to other study objectives, and could be pursued by others as an independent project, it was deleted from further consideration in the LVE.

Improve Bay Area Water Treatment Plants - This measure consists of making improvements to existing water treatment plants owned and operated by ACWD, CCWD, and/or Zone 7 and/or constructing new treatment facilities to improve the quality of delivered water. The additional treatment capabilities would reduce concentrations of organic carbon and salinity (TDS, chloride, and bromide), reduce hardness, and provide other water quality benefits. Because this measure could be implemented independently by individual water agencies, it would not contribute to overall regional water quality. Further, it has a very low likelihood of contributing to other LVE objectives when combined with other identified measures. For these reasons, it was deleted from further consideration in the LVE.

Reoperate Study Area Water Supply Systems to Improve Water Quality – This measure consists of reoperating local storage, such as an expanded Los Vaqueros Reservoir, and other potential system operational changes, to improve the quality of delivered water supplies. This would be accomplished primarily by changing the timing of Delta exports, or deliveries from an expanded reservoir to the study area, to improve the efficiency of blending in meeting local water quality targets. Improvements to water quality could include lower turbidity, hardness, temperature, and concentrations of TDS, chlorides, bromides, and organic carbon. Because this measure also has the potential to contribute to other study objectives when combined with new surface storage, it was retained for further consideration.

Measures Retained

As described above and shown in **Table VI-3**, one measure addressing the water quality objective of the LVE was retained for further consideration in the development of initial alternatives: reoperation of an enlarged Los Vaqueros Reservoir to improve delivered water quality. With this measure, deliveries to and from an expanded reservoir would be made in a

way that enhanced the water quality benefits of the project to CCWD and SBA users. A description of this measure is included in **Chapter VII**.

SUMMARY OF RETAINED MANAGEMENT MEASURES

Table VI-4 summarizes the water resource management measures carried forward for potential inclusion in concept plans to address the LVE planning objectives. Those measures carried forward are believed to best address the objectives of the LVE, with consideration of the planning constraints and criteria. It should be noted that measures dropped from consideration at this stage might be reconsidered in the future. Similarly, additional measures or components not considered herein may be added to alternative plans as they are formulated.

TABLE VI-4
MEASURES RETAINED TO ADDRESS THE LVE PLANNING OBJECTIVES

Planning Objective Addressed	Resource Management Measures Retained	
Bay Area Water Supply Reliability	Raise Los Vaqueros Dam In-Place	Increase storage space in Los Vaqueros Reservoir by up to 25,000 acre-feet by raising the height of the existing dam in-place
	Enlarge Los Vaqueros Dam and Reservoir	Increase storage space in Los Vaqueros Reservoir by up to 400,000 acre-feet by removing and replacing the existing dam with a substantially larger facility
	Increase Delta Diversion Capacity	Increase the capacity of Delta diversion(s) to Bay Area users
	Construct Intertie from Los Vaqueros Reservoir to the Dyer Canal	Construct a new pipeline and pump station to convey water from Los Vaqueros to the Dyer Canal segment of the South Bay Aqueduct
	Desalination	Develop desalination and associated conveyance facilities in Bay-Delta or Pacific location(s)
Less-Costly EWA Replacement Supply	Enlarge Los Vaqueros Reservoir	Enlarge Los Vaqueros Reservoir to store surplus Delta flows for EWA use
	Construct Intertie from Los Vaqueros Reservoir to Bethany Reservoir	Construct a new gravity pipeline to convey stored water from Los Vaqueros to Bethany Reservoir
	Construct Intertie from Los Vaqueros Reservoir to the Dyer Canal	Construct a new pipeline and pump station to convey stored water from Los Vaqueros to the Dyer Canal segment of the South Bay Aqueduct
Water Quality	Reservoir / Delivery System Reoperation	Reoperate an enlarged Los Vaqueros Reservoir to improve delivered water quality

KEY: Bay Area = San Francisco Bay Area
Bay-Delta = San Francisco Bay / Sacramento – San Joaquin Delta Estuary
EWA = Environmental Water Account