ALAMEDA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

ZONE 7 WATER AGENCY
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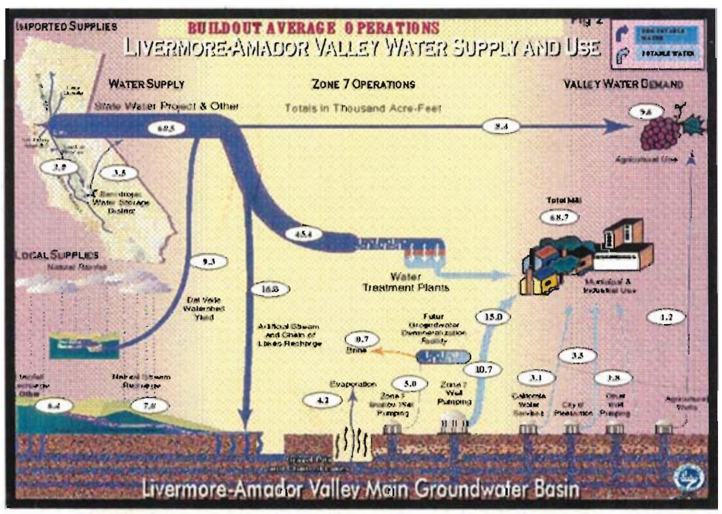
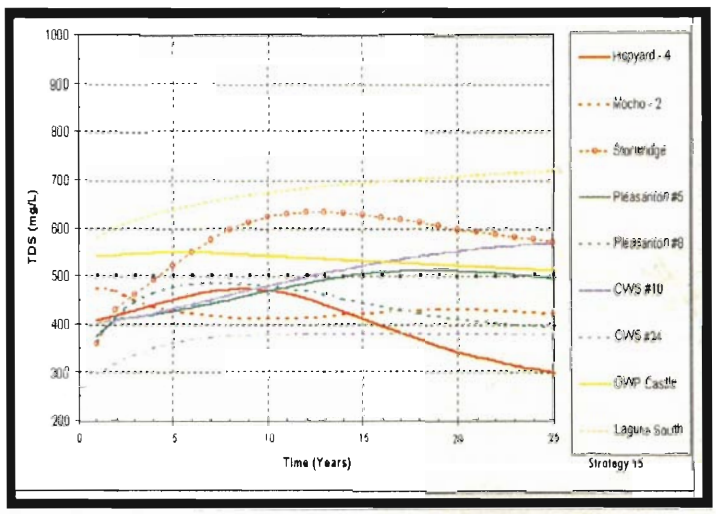
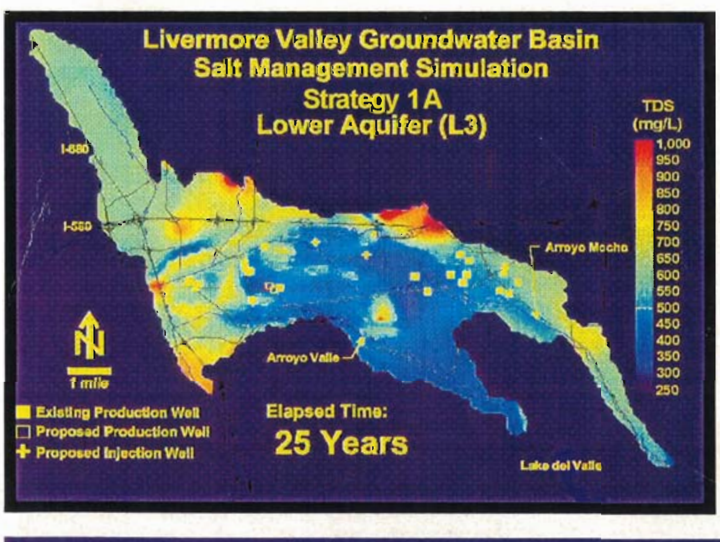
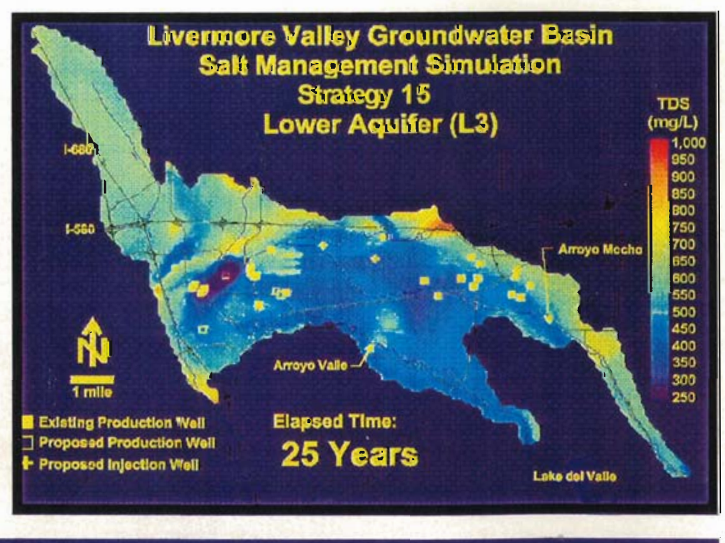
Salt Management Plan









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Salt Management Plan

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Salt Management Plan Report

ZONE 7 OF ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT – ZONE 7 WATER AGENCY

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Introduction

Contents at a Glance...

The Salt Management Plan (SMP) is a cooperative effort developed to address the increasing level of total dissolved solids in the main groundwater basin. It was developed in partnership by Zone 7 staff and consultants, a technical advisory group (TAG) composed of local water retailers, and a Zone 7 citizens committee—the Groundwater Management Advisory Committee (GMAC). In-house data compilation work began in 1994, with technical analyses and presentations continuing through 1999. This SMP report provides the technical information and analyses that support the August 1999 Zone 7 Board approved salt management strategy of using increased conjunctive use combined with shallow groundwater demineralization in the western portion of the service area to fully offset current and future sources of salt loading to the main groundwater basin (Main Basin). This strategy was designed to also maintain or improve delivered water quality and to facilitate increased use of recycled water using planned Zone 7 facilities to offset salt loading. Annual Salt Management decisions are to be made via an adaptive management process integrated into Zone 7's annual water operations plan.

Chapter 1 provides a brief history of the SMP process and the regulatory framework that initiated and guided its development. It includes a summary of water recycling investigations and proposed projects in the Livermore-Amador Valley and how such projects could be implemented under the Master Water Recycling Permit and the SMP.

Chapter 2 provides an overview of both current and future Zone 7 facilities, water demands, and operations. It describes the key role of the annual operations plan in maintaining a sustainable water supply. The water system operations computer model used to project delivered water quality under alternative operating strategies is also described.

Chapter 3 provides a condensed summary of historic information and ongoing data collection on the hydrogeology of the fringe and main groundwater basins. Connectivity and mixing, fringe to Main Basin and upper to lower aquifer are addressed. Supporting information is presented from the enhanced Visual Modflow computer groundwater flow and MT3D solute transport model developed for the SMP.

Chapter 4 summarizes the extensive database of surface and groundwater quantity and quality information collected and maintained by Zone 7 as part of its management of water resources in the Livermore-Amador Valley. Issues of seasonal and spatial variability are addressed in addition to the major influence that imported South Bay Aqueduct water quality has on delivered water quality.

Chapter 5 describes the methodology and extensive data required by Zone 7 to calculate the annual and steady state-based water and salt balances for the main groundwater basin. Historic and projected year 2010 salt loadings are discussed. Variations of these salt balance calculations are used in the SMP to evaluate the impacts of alternative salt management strategies.

Chapter 6 presents Zone 7's existing monitoring programs, as well as additional surface and groundwater monitoring implemented to track current and future sources of salt loading in the watershed and to address areas of hydrogeological uncertainties. The surface and groundwater monitoring networks for each drainage basin are described.

Chapter 7 presents the key salt management plan policy issues and options developed through consultation with the TAG and GMAC. Key recommendations include: (1) fully offset current and future net salt loading and (2) maintaining and, where feasible, improving delivered water mineral quality. Background information is presented on consumer acceptability of varying TDS concentrations of delivered water.

Chapter 8 describes the range of individual and composite salt management strategies that are evaluated in more detail in the remaining chapters of the SMP. The focus is on strategies that use previously planned and budgeted Zone 7 facilities such as wells and groundwater demineralization facilities. Preliminary unit operations and maintenance (O&M) costs are also presented.

Chapter 9 presents the results of the salt loading calculations for 20 salt management strategies under projected year 2010 conditions. The strategies are based on the policies and options described in Chapter 7. Estimated costs and impacts on groundwater and delivered water quality TDS are included. A screening process is presented to identify the most feasible strategies for further analysis.

Chapter 10 presents the computer modeling results for four of the most promising strategies identified in the screening analysis discussed in Chapter 9. Included are computer model generated maps and graphics depicting impacts on groundwater, individual wells, and retailer turnouts under status quo operations versus SMP strategies.

Projected impacts of potential strategies using demineralized recycled water injection also are included.

Chapter 11 presents alternatives and recommended approaches for allocating the costs of salt management as a function of the salt source: existing municipal and industrial (M&I), future M&I, untreated water, or recycled water. TAG recommendations to fund capital costs through connection fees and O&M costs through water rates, similar to other Zone 7 facilities, are summarized.

Chapter 12 presents the SMP near-term implementation plan, including the most feasible salt management strategies identified in Chapter 10 scaled down to offset the current 2,200 tons/year salt loading versus the 5,400 tons/year loading projected for year 2010. These strategies include increased conjunctive use, shallow groundwater demineralization, and potential future demonstration scale stream recharge with demineralized recycled water. Chapter 12 describes the specific near-term (2000-2002) SMP implementation plan that was approved by the Zone 7 Board in August 1999 and two implementation options for 2004-08. The SMP concludes with recommended next steps to address future salt loading sources and to further investigate potential lower cost salt management strategies such as seasonal groundwater export.

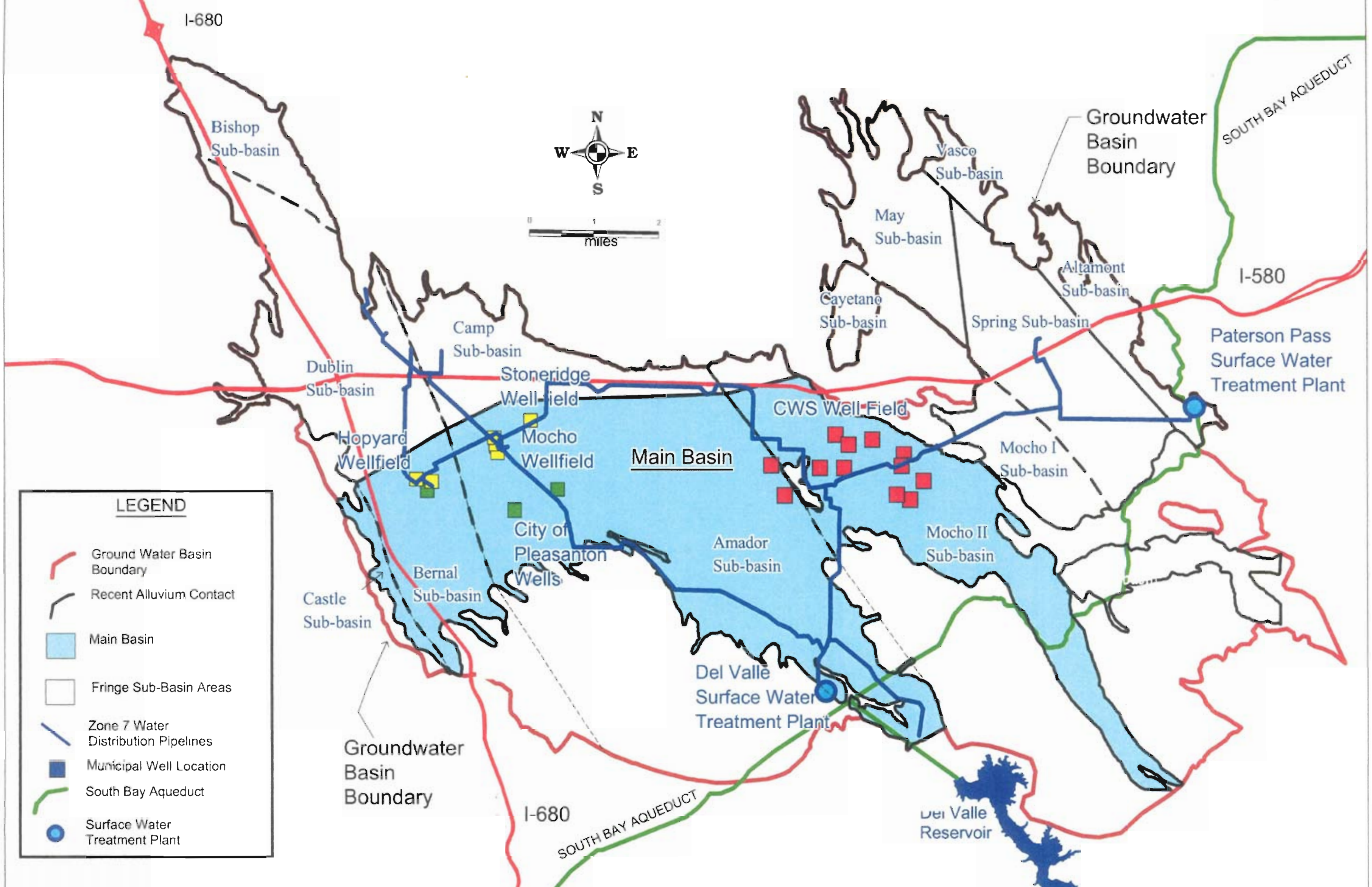
Background

Zone 7 of Alameda County Flood Control and Water Conservation District, locally known as Zone 7 Water Agency, serves as the overall water quality management agency for the Alameda Creek Watershed above Niles. Zone 7 has the primary responsibility of managing the Livermore-Amador Valley surface and groundwater resources. It has historically managed the 250,000 acre-foot capacity main groundwater basin (Figure ES-1) by maximizing lower TDS surface water deliveries, artificially recharging the Main Basin with low total dissolved solids (TDS) imported surface water, restricting groundwater pumping, and restricting wastewater disposal and water recycling within the watershed.

Studies relating to the groundwater supply of the Livermore Amador Valley were first conducted in the early 1900's. Since that time, a number of studies have been completed by entities, including the California Department of Water Resources, the U.S. Geological Survey, as well as Zone 7. To signify the area of the groundwater basin that had long been recognized as containing the majority of usable groundwater storage, the concept of a central or "main" basin was developed in the 1980's.

The Livermore-Amador groundwater basin is located in the heart of the Livermore-Amador Valley and extends into the hills south of Pleasanton and Livermore. The basin includes the areas occupied by both the Livermore Valley and Livermore uplands. The principal water-bearing units are the unconsolidated recent alluvium sands and gravels, and the tilted, semi-consolidated beds of sandstones and conglomerates of the Livermore Formation. Groundwater occurs in the aquifers under unconfined, semi-confined and

Figure ES-1



ZONE 7 WATER AGENCY 5997 PARKSIDE DRIVE PLEASANTON CA 94588	DRAWN: GERALD GATES, STEWART SMITH	SALT MANAGEMENT PLAN	SCALE: 1" = 2 Miles
	DESIGNED: GERALD GATES, STEWART SMITH	GROUNDWATER BASIN AND WATER FACILITIES MAP	DATE: 31 July 2002
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	APPROVED: DAVID LUNN		

confined conditions, depending on depth and location in the basin. Several geologic faults or linear groundwater anomalies cut across the groundwater basin. Based in large part on these fairly linear fault-related groundwater impediments, the basin has been divided into 13 sub-basins: Altamont, Amador, Bernal, Bishop, Camp, Castle, Cayetano, Dublin, May, Mocho I, Mocho II, Spring, and Vasco. Together, portions of the Castle, Bernal, Amador, and Mocho II sub-basins overlain by recent alluvium are considered the "main" basin because of their large capacity to store and transmit groundwater and their significance to the local groundwater supply. The other sub-basins are collectively called the "fringe" basins.

Groundwater in the Livermore Valley exists in a multi-layered aquifer system with the upper aquifer being unconfined and the subsequent deeper aquifers being semi-confined or leaky. Flow generally follows a westerly pattern, like the surface water streams, along the structural central axis of the valley. The majority of subsurface inflow, however, occurs across the northern boundaries of the Main Basin, in particular from the Dublin and western Camp sub-basins, and flows in a southerly direction. These sources of groundwater co-mingle in the Bernal and Amador sub-basins and generally flow towards groundwater pumping facilities in Pleasanton.

It is a common misconception that the groundwater basin is a "totally closed" basin suggesting that minerals or contaminants that enter the groundwater basin have no way of leaving the basin. In the late 1800s, pre-development groundwater levels in the basin created a gradient causing groundwater to flow from east to west and naturally exit the basin as surface flow (rising groundwater) in the Arroyo de la Laguna. In the early to mid-1900s, groundwater began to be extracted in appreciable amounts causing groundwater levels to drop throughout the basin, below the level where it would naturally rise into the Arroyo de la Laguna and exit the basin through stream flow. This was the closest the Main Basin came to being, by definition, a "closed" basin. At present, the basin cannot be considered "totally closed" since water is recharged into and exported from the basin through various means. On average, approximately 8% of the total groundwater storage exits the basin each year.

Treated water production facilities in the valley include two surface water treatment plants owned and operated by Zone 7, as well as groundwater production wells owned and operated by Zone 7, the City of Pleasanton, and California Water Service Company (CWS). Total surface water treatment design capacity is 55 mgd. Actual capacity can vary with South Bay Aqueduct flow (water elevation). Zone 7 has seven existing active production wells with a total peak production capacity of 32 million gallons per day (mgd). Pleasanton has three existing active wells with a production capacity of 11 mgd and CWS has 12 existing active wells with a production capacity of 10 mgd. Total combined groundwater capacity for Zone 7 and its retailers is approximately 53 mgd.

Zone 7's treated water distribution system conveys treated water to retailer turnouts. The system includes booster pump stations and distribution pipelines, and 13.5 million gallons of total storage capacity in three storage reservoirs that help meet hourly demand fluctuations. Water retailers own and operate their own water distribution system to serve their customers. Pleasanton and CWS both pump directly into their distribution systems to meet hourly and daily peak demands. Annual total groundwater pumping by Pleasanton and CWS is limited to their groundwater pumping quotas.

Water Quality and Variability

The historic management approach implemented by Zone 7 (i.e., maximizing surface water deliveries, artificially recharging the Main Basin with low total dissolved solids (TDS) imported surface water, restricting groundwater pumping, and restricting wastewater disposal and water recycling within the watershed) has been successful in maintaining a sustainable and reliable water supply. The valley-wide annual average delivered water blend during an average year is about 85% surface water and 15% groundwater. TDS is used as an indicator of overall mineral (salt) content in this SMP. However, Zone 7 monitors for a large suite of mineral constituents in surface and groundwater in addition to TDS. These more detailed data and TDS data are used to track sources of water and analyze water quality trends, as well as to calculate salt loading of the Main Basin.

The quality of Zone 7 potable deliveries varies seasonally as a function of both source water quality and the blend ratio of surface water to groundwater. The TDS concentrations of source water from the South Bay Aqueduct (SBA) can vary from 100 to 700 mg/l on an annual average basis depending on the wetness of the water year (climatic conditions) and seasonally, month to month depending on reservoir releases into the Delta and Delta pumping patterns. Groundwater quality changes slowly and is generally more consistent, ranging from 400 to 550 mg/L TDS. Hence, actual delivered water TDS varies from month to month and year to year. The ratio of groundwater to surface water can vary by season, by day, and by turnout depending on demand. Table ES-1 shows typical winter and summer source water quality, delivered water blend, and resultant delivered water TDS of Zone 7 deliveries under three climatic conditions: dry, average and wet years.

Table ES-1
Typical Delivered Water TDS
Under Historic Basin Management Strategy

Climatic Conditions	Source water Quality (TDS) SBA TDS (mg/L) Winter	Summer	GW TDS
Dry	500	500	450
Average	270	220	450
Wet	170	150	450

Climatic Conditions	Delivered Water Blend %Surface Water Delivered Winter	Summer
Dry	30%	30%
Average	100%	90%
Wet	100%	90%

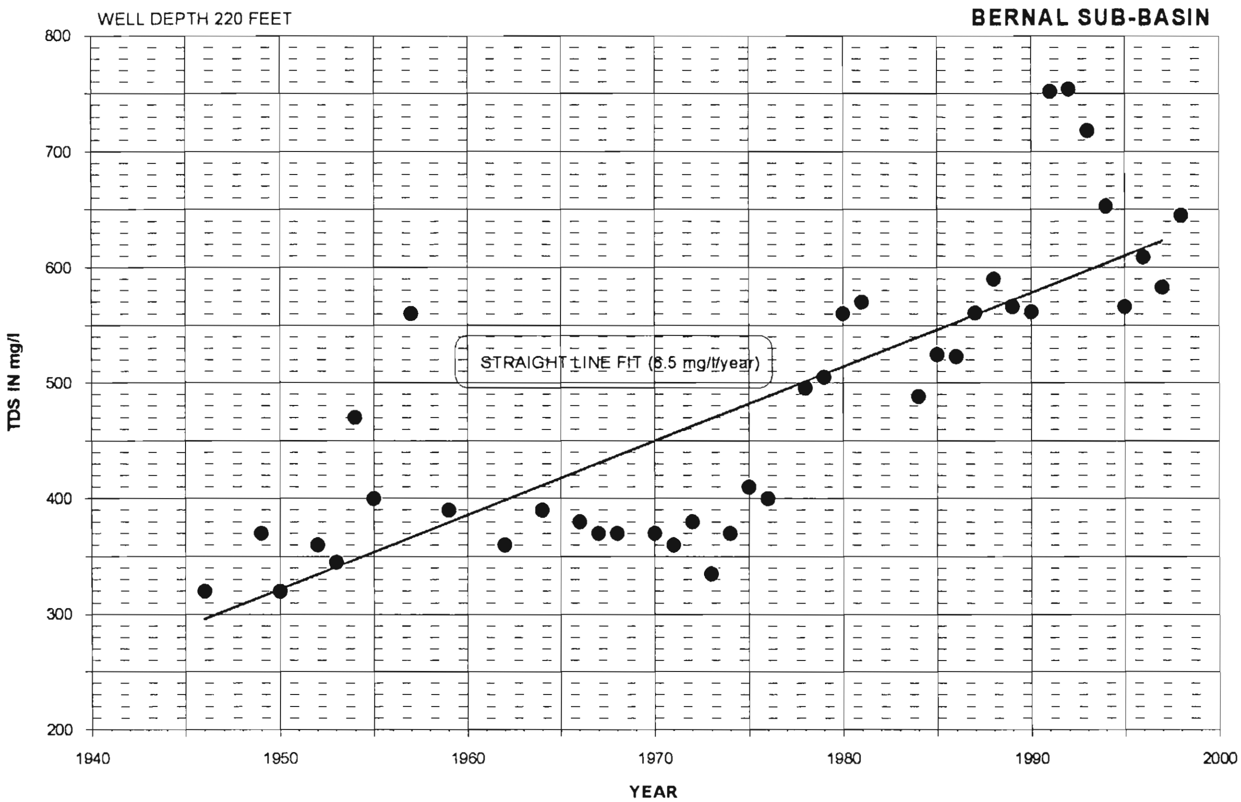
Climatic Conditions	**Delivered Water Quality, TDS (mg/L) Winter**	**Summer**
Dry	**470**	**470**
Average	**270**	**240**
Wet	**170**	**180**

Delivered water TDS also varies from east to west in the valley. The blend of surface to groundwater varies between turnouts because of the locations of the wells relative to the turnouts and because of their intermittent use. The Livermore and CWS service areas, which are closer to surface water treatment plants, typically receive a higher percentage of treated surface water, while Pleasanton and DSRSD service areas, which are closer to Zone 7 wells, receive higher percentages of groundwater (see Figure ES-1). CWS and Pleasanton also operate their own wells and blend groundwater with their Zone 7 deliveries, adding to the variability of water quality delivered to their customers.

Salt Loading, Sources, and Sinks

As in other arid areas that rely on imported water for a significant portion (75-85%) of the local supply, the historic groundwater management approach has allowed a gradual but continual degradation in groundwater mineral (salts) quality. Annual net loadings varied from about 11,800 to a negative 4,800 tons, with a 25-year average of about 2,550 tons/year. The cumulative salt loading to the Main Basin during that time period was approximately 63,500 tons and there were only six years in which there was a negative salt accumulation in the Main Basin, three of them being 1996-1998. The net steady state salt loading to the Main Basin under 1998 conditions was 2,200 tons. The 2,200 tons per year is equivalent to a TDS increase of about 10 mg/L per year in the groundwater. Figure ES-2 presents the groundwater TDS changes with time in the Bernal Sub-basin.

Figure ES-2



NOTE: ALL DATA IS FROM O-LINE (DEEP AND SHALLOW WELLS)

The main sources and removal mechanisms of salts from the groundwater basin under 1998 land use are shown schematically in Figure ES-3. The main salt sources are conveyed through natural and artificial surface water flow when the water is percolated or recharged into the Main Basin aquifers (48%). Deep percolation of urban irrigation water contributes 35% of total salt loading. Subsurface inflow of high salinity (1,000 mg/L TDS) fringe basin groundwater contributes about 13% of salt loading. Rainfall does not contribute any salt but it dilutes and transports the salts added through urban and agricultural irrigation down to the water table. Salts are removed from the Main Basin primarily as water is pumped from wells (46%) or from gravel mining pits (49%). Zone 7 manages the basin levels so that there is little or no loss of water (and salts) via subsurface outflow. However, the basin is not truly "closed" since, through recharge and pumpage, annually approximately 8% of the total basin storage and more than half of the pumped water and associated salts leave the basin.

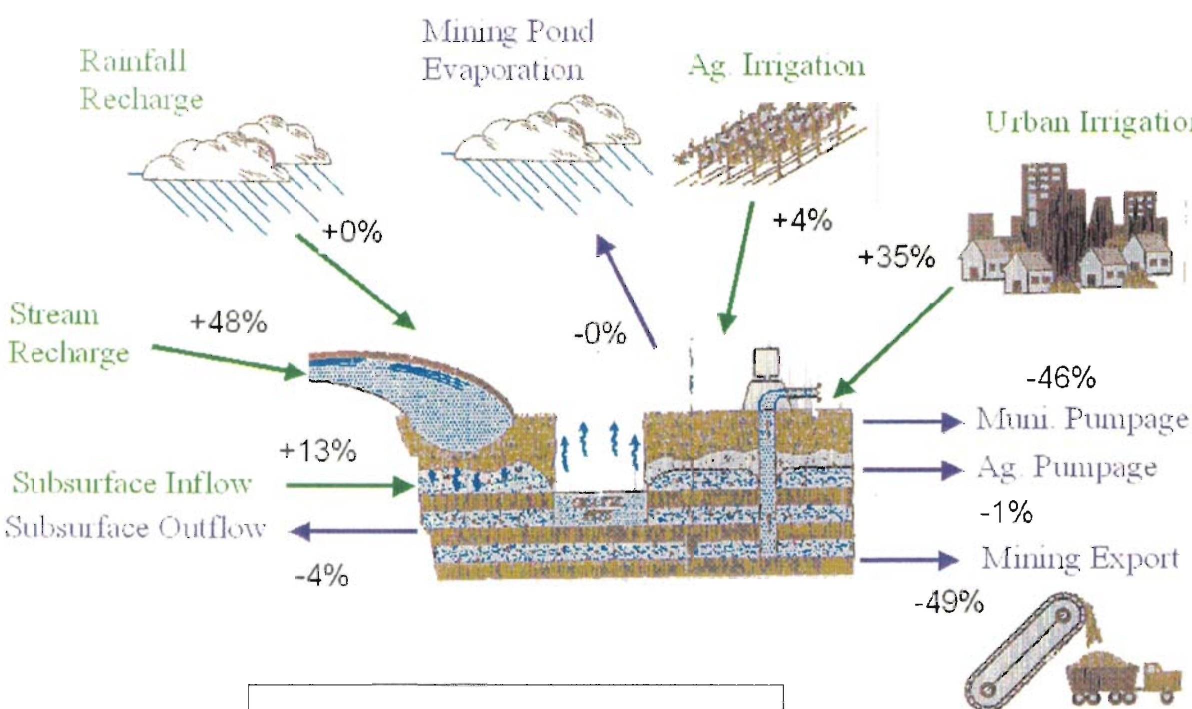
Some of the extracted municipal pumpage and associated salts (25-30%) are returned to the basin in areas where irrigation over the Main Basin takes place. The remainder of the pumpage and salts is either used inside the home and then exported as wastewater through the LAVWMA pipeline or used for irrigation in fringe basin areas where the applied salts do not impact the Main Basin. Some of the mining pumpage is returned to the Main Basin through stream recharge but most of this water, along with the salts, leaves the basin and valley via stream outflow.

The annual salt loading under 2003 land use conditions is 5,000 tons per year, an increase of 2,800 tons over the 1998 salt loading. The major cause for the increase in annual salt loading is the cessation of the majority of the gravel mining pumpage and associated salt export from the valley. Salt loading is projected to increase to 5,400 tons per year by year 2010.

Figure ES-3

Main Basin Salt Balance

Steady State Conditions at 1998 Land Use



Salt In	+ 15,800
Salt Out	-13,600
Net Salt Load	+ 2,200 Tons

Salt Management Monitoring Plan

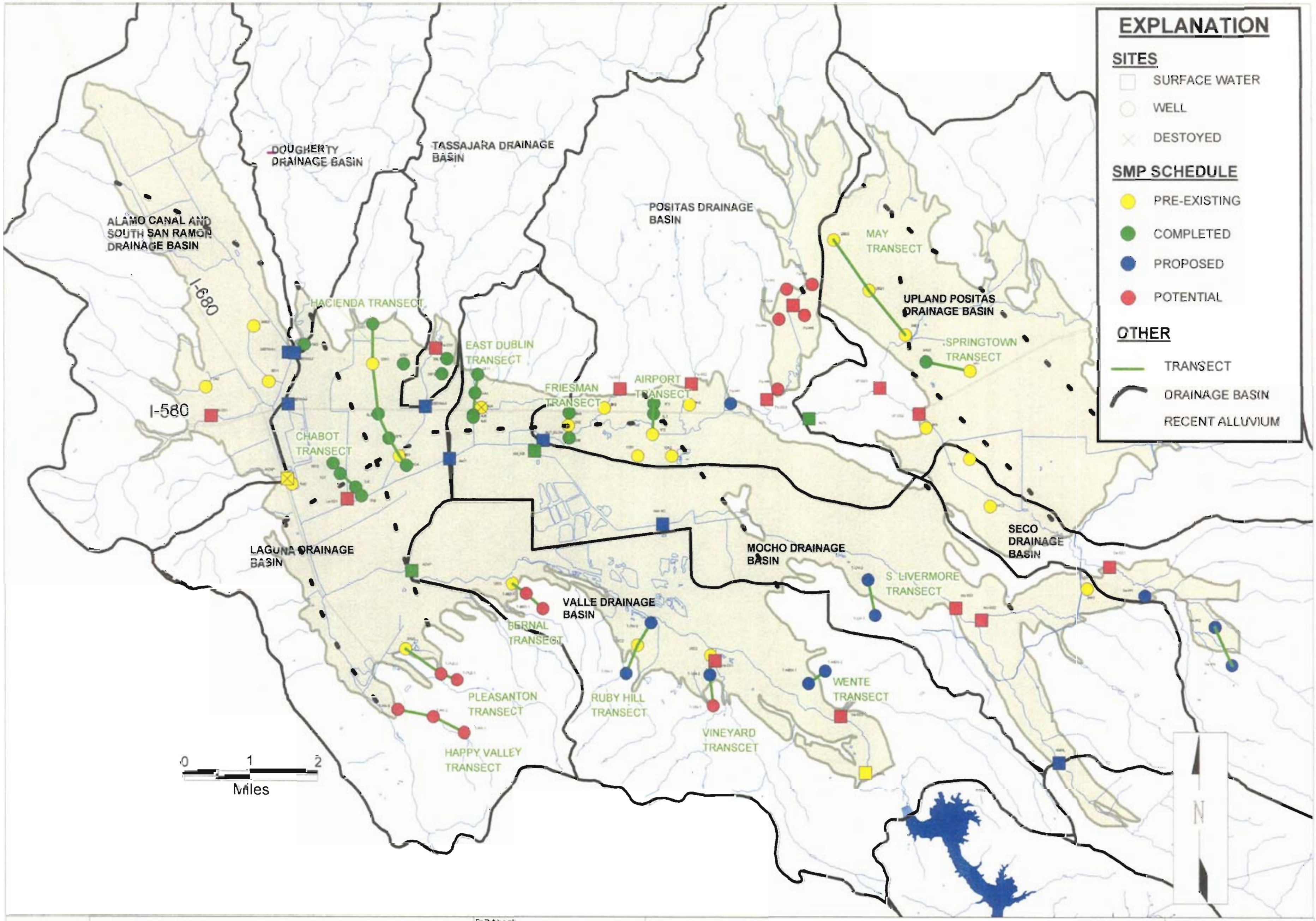
The SMP includes a Salt Management Monitoring Plan (SMMP) designed to help refine the baseline salt loading estimates, particularly from new urban and agricultural irrigation in the fringe basins. Seventeen additional monitoring wells and upgraded continuous recording surface water monitoring facilities have been identified to supplement information provided by existing monitoring program sites. Figure ES-4 shows the locations of the existing and new Salt Management Monitoring Plan monitoring sites.

Salt Loading Calculations

Since 1974, Zone 7 has computed both an annual and a long-term steady state salt balance using a fundamental salt balance equation: inflow of salts dissolved in water minus outflow of salts dissolved in water equals the change in dissolved salts in the groundwater basin. The actual balance in any one year is not indicative of long-term trends since there can be significant storage changes due to change in recharge (e.g., rainfall) and extraction components in a given year. The steady state salt balance equations are used in this SMP to track long-term expected TDS impacts on the Main Basin. They are also adjusted for future land use and operational conditions to evaluate the impacts of alternative salt management strategies under year 2010 conditions.

Supply and demand components each have associated TDS concentrations based on the given year's monitoring data, some historic data, and a few assumed (immeasurable) values. The salt balance calculations include several fundamental and intentionally simplifying assumptions as part of the screening level "spreadsheet" model of the Main Basin. Perhaps the most important simplifying assumption is that all salts applied through irrigation eventually make their way to the underlying groundwater (while in actuality vadose zone processes can delay salt transport for decades). Salts removed by plant uptake and by the application of fertilizers are considered negligible. Percolate quality is assumed to be primarily a function of the differing percentage of applied water that recharges throughout the area due to site specific variations in soil characteristics.

The calculations of main basin water quality assume that the main groundwater basin is well mixed. Monitoring and modeling information developed for and presented in this SMP support the conclusion that there is significant long-term movement from the upper to the lower aquifers in the Main Basin. High TDS (700-2,000 mg/L) irrigation percolate that accumulates in the upper (0-150 foot) aquifer and then "leaks" and mixes into the lower aquifer is a key source of the Main Basin TDS increases. This upper/lower connectivity explains in part why extraction and demineralization (or export) of this high TDS shallow groundwater can provide significant long-term salt management benefits. The same benefits would also result from extraction of high TDS shallow groundwater (e.g., Dublin Sub-basin) that would otherwise enter the Main Basin as subsurface inflow.



ZONE 7 WATER AGENCY 5997 PARKSIDE DRIVE PLEASANTON CA 94588	DRAWN: GERALD GATES DESIGNED/CHECKED: BG/TR FILE NAME: H:\SMP\Fig6a-TRUpdate.wor	SALT MANAGEMENT PROGRAM SURFACE WATER AND GROUNDWATER MONITORING SITES	SCALE: 1" = 2 miles DATE: APRIL 8, 2004 FIGURE: Fig ES-4

Recycled Water

Numerous studies of potential recycled water use have been conducted but relatively little recycled water has been used directly to date in the valley. This is due in part to concerns about potential impacts from the elevated TDS levels in recycled water (versus potable water) on groundwater TDS concentrations. Zone 7, Livermore, and Dublin San Ramon Services District (DSRSD) conducted a valley-wide water recycling study (*Livermore-Amador Valley Water Recycling Study—May 1992*) and found that properly treated recycled water can provide a safe and cost effective new source of additional water supply and wastewater disposal capacity for the valley. The study also found that use of demineralized recycled water could help improve the salt balance and groundwater quality. Zone 7 subsequently adopted Resolution No. 1548, which affirmed the conclusions of the May 1992 Water Recycling Study and stated Zone 7's intent to work cooperatively with Livermore, DSRSD, and other entities to encourage the proper and orderly development of water recycling projects in a manner that would avoid degradation of groundwater quality.

In December 1993, the Regional Water Quality Control Board (RWQCB) issued a Master Water Recycling Permit (Order No. 93-159) to Zone 7, DSRSD, and Livermore. A key permit requirement was the development and implementation of a Salt Management Plan to fully offset both current salt loading from natural sources and operations, and any future salt loading associated with new recycled water use. The permit, through the SMP, provided the framework within which local decisions could thereafter be made determining the quality, quantity and location of permitted recycled water use.

Furthermore, the RWQCB 1995 Basin Plan Implementation Plan acknowledged the balancing of uses that needs to occur in managing the Livermore-Amador Valley groundwater basin:

"*... The Regional Board supports efforts to concurrently improve the salt balance in the Main Basin, to improve the local water supply, and to reduce the need for wastewater export through recycled water irrigation, groundwater recharge, and other basin management practices.*"

The Basin Plan supported the use of a "*mass-balance approach in assessing cumulative impacts*" for the SMP. This mass-balance approach has more commonly been called the "salt bubble" approach and was fundamental to the SMP and its salt management strategies. The salt balance calculation is the mass balance calculation that determines the long-term impacts.

Salt Management Plan Goals

The SMP was developed during 1994-1999 through a cooperative effort involving Zone 7 staff, Zone 7 consultants, the Technical Advisory Group (TAG) comprised of local water retailers, and the Zone 7 Groundwater Management Advisory Committee (GMAC) comprised of local citizens. In consultation with the above advisory groups, a series of policy goals were developed for the SMP to help guide the development and refinement of various salt management strategies. The policy goals were also recommended for Zone 7 adoption and inclusion in the annual operations plan to help guide the use of available surface and groundwater supplies and treatment facilities (e.g., demineralization).

The SMP 1999 policy goals are as follows:

- Offset the current (1999) 2,200 tons per year of salt loading plus the approximately 50 tons per year of projected annual increase.
- Maintain or improve groundwater mineral quality.
- Maintain or improve delivered water quality.
- Provide comparable delivered water quality to all water retailers.
- Provide a mechanism for full mitigation of all salt loading associated with recycled water use.
- Minimize total operations and maintenance costs through an adaptive management process.

Over several years during which the SMP was being developed, the scope broadened beyond that outlined in the Master Permit. The resultant effort and product in many ways more closely resemble an overall watershed water resource management plan than simply a Main Basin salt management plan. In particular, at the request of the retailers, a considerable effort was devoted to evaluating the impacts of the salt management strategies on delivered water quality. The Visual Modflow computer groundwater model was further refined to compute future water quality at each production well. The water system operations model (WRMI) was developed and calibrated to provide better estimates of impacts on individual wells and delivered water quality at each Zone 7 turnout under alternative operational and salt management strategies. The WRMI model calculated monthly water quality at each turnout over an extensive 75-year hydrologic period.

Year 2010 Salt Management Strategies

Reducing net salt loading requires reducing the import of salts and/or increasing the export of salts. The SMP evaluates over twenty alternative individual and composite salt management strategies based on their compliance with the SMP policy goals. These include their ability to fully offset the projected year 2010 salt loading of 5,400 tons/year, operational costs, and impacts on delivered water quality.

The SMP focuses primarily on strategies that would only require use, or increased use of, existing and already planned Zone 7 facilities. Among the key individual conceptual salt management strategies are:

- **Conjunctive use via stream recharge**—Contrary to historic basin management, this strategy would maximize the amount of groundwater delivered to customers and, to the extent practicable, allocate more local and imported surface water for stream recharge, thereby "flushing" the basin with lower TDS water.

- **Conjunctive use with ASR wells**—Aquifer storage and recovery (ASR) wells are capable of pumping groundwater from and injecting surface water into the groundwater basin. Under this strategy, low TDS treated surface water would be injected for about six months (winter) and subsequently extracted for six months (summer). This strategy would maintain and, in average to wet years, improve delivered water quality by creating bubbles of low TDS water around Zone 7's wells. This strategy, however, does not directly impact the salt balance. Zone 7 testing has identified potential clogging problems that may limit the feasibility of ASR operation.
- **Seasonal groundwater export**—This strategy consists of pumping high TDS shallow groundwater to the creeks during wet season periods if it did not adversely impact in-stream and downstream beneficial uses. To implement this strategy, various agency approvals and close coordination with Alameda County Water District operations would be required. Additional water would need to be procured to replace the water "lost" due to export.
- **Wellhead demineralization** — This strategy consists of groundwater demineralization at the point of extraction. For the SMP, demineralization is assumed to include a reverse osmosis membrane-based treatment system producing water in the 100 mg/L TDS range. The product water would be blended with non-demineralized groundwater and/or surface water prior to delivery to achieve a target delivered water TDS or hardness and to reduce aggressiveness to distribution pipelines. Demineralizing shallow high TDS water that could otherwise migrate vertically over time and degrade the lower aquifer would maximize salt removal benefits and minimize costs.
- **Demineralized recycled water injection**—This strategy is based on the City of Livermore's and DSRSD's potential projects as originally designed to inject demineralized recyled water into the groundwater basin. Both projects were designed to produce product water that meets all drinking water requirements and have less than 100 mg/L TDS prior to injection.
- **Conjunctive use with Chain of Lakes (2005)**—Similar to conjunctive use via stream recharge, this strategy consists of allocating local and imported surface water for recharge in the Chain of Lakes.
- **Delta fix (future)**—This strategy refers to the State and Federally sponsored CalFed Bay-Delta Program's proposed projects to solve multiple Bay-Delta water quality, quantity, resource, and environmental problems. Of interest for the SMP are options which, if implemented, would result in higher quality (lower TDS) Delta water being conveyed to the State Water Project and thus to Zone 7 and other municipalities throughout California.

A composite strategy that includes more than one strategy offers a more flexible and potentially cost-effective approach. For example, a composite strategy could be comprised of a blend of seasonal groundwater export, conjunctive use and demineralized recycled water recharge. Initially, all SMP strategies included the use of 6 TAF of Reverse Osmosis (RO) recycled water injection. Following public concerns in 1998 about the acceptability of RO recycled water injection, an additional subset of strategies was developed without RO recycled component. The current recommended strategy does not include RO recycled water injection.

Table ES-2 presents the salt management strategies evaluated for projected year 2010 land and water use conditions. Baseline conditions are established by Strategy 1A. If implemented, Strategy 1A would continue Zone 7's historical operational practice of maximizing surface water deliveries and pumping groundwater only for peaking and drought conditions. Under this "status quo" strategy and year 2010 conditions, an average salt loading of 5,400 tons/year and delivered water TDS of 275 mg/L would result.

A screening for technical feasibility, timeline, economics, delivered water quality, including public and institutional acceptance, showed that only Strategy 15 could successfully pass all feasibility screening criteria (Section 9.6). Strategy 15 consists of a combination of conjunctive use and 5,000 AF of high TDS shallow groundwater wellhead demineralization (WHD). Detailed modeling analyses (Chapter 10) confirmed that Strategy 15 would provide the projected benefits to municipal groundwater and delivered water quality, and would eliminate the positive net salt loading in the Main Basin. Delivered water quality would be maintained at the baseline level of 275 mg/L.

Table ES-3 shows the difference in municipal groundwater quality (TDS) from using Strategy 15 versus Strategy 1A. It is clear that after 25 and 50 years of operation under Strategy 15, groundwater TDS would be improved at all listed locations except at well CWS#10, which is located in the Mocho II Sub-basin. This happens because recharge and pumping conditions in the Mocho II Sub-basin remain the same under both strategies. The modeled groundwater TDS for the lower aquifer after 25 years of operating under strategies 1A and 15 are mapped in figures ES-7 and ES-8, respectively. When comparing the figures, it is clear that the area of the basin with groundwater TDS below 500 mg/L would be significantly larger under Strategy 15. The Bernal Sub-basin lower aquifer and western portion of the Amador aquifer would benefit most under Strategy 15. Most of the Main Basin lower aquifer would stabilize near or below 500 mg/L.

Table ES-2

SUMMARY OF SALT BALANCE STUDIES AT 2010 CONDITIONS

Study No.	Name	Vadose Zone Attenuation Credit	Demineralized Municipal Pumpage TAF	Salt Mgt. Conj. Use GW Pumpage TAF	LONG TERM AVERAGE Total Zone 7 GW Pumpage TAF	Net Salt Loading Tons/Yr	Net Increase In TDS mg/l/year	Projected GW TDS After 10 Years, mg/l	TDS of Zone 7 Deliveries mg/l	Incremental Operational Cost Per year	Incremental Operational Cost Per Acre-foot of TW Delivery
1	Status Quo 6 TAF RO RW INJECTION (1)	NONE	NONE	NONE	12	3100	10	Currently 450 550	300	$0	$0
1A	Status Quo NO RO RW INJECTION	NONE	NONE	NONE	7.5	5400	18	630	275	$0	$0
1B	Status Quo 3640 AF RO RW INJECTED PLUS 20% MORE GW PUMPED FOR AG	NONE	NONE	NONE	10.4	5000	17	620	270	$0	$0
2	DELTA FIX 100mg/l SBA water quality	NONE	NONE	NONE	12	0	0	450	180	$0	$0
3	15% ATTENUATION	15%	NONE	NONE	12	2000	7	520	300	$0	$0
4	30% ATTENUATION	30%	NONE	NONE	12	1000	3	480	300	$0	$0
5	INCREASED GW PUMPING FOR CONJUNCTIVE USE	NONE	NONE	16	28	800	3	480	360	$760,000	$10
6		NONE	NONE	22	34	0	0	450	390	$1,100,000	$20
7	DEMINERALIZE ZONE 7 GW PUMPAGE	NONE	13	NONE	12	1700	6	510	210	$5,473,000	$100
8	DEMINERALIZE ZONE 7, CWS & PLEASANTON GW PUMPAGE	NONE	20	NONE	12	900	3	480	210	$8,420,000	$160
9	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE	NONE	19	7	19	100	0	450	212	$8,333,000	$160
10		NONE	10	16	28	-100	0	450	250	$4,968,000	$90

Table ES-2

SUMMARY OF SALT BALANCE STUDIES AT 2010 CONDITIONS

		LONG TERM AVERAGE									
Study No.	**Name**	**Vadose Zone Attenuation Credit**	**Demineralized Municipal Pumpage TAF**	**Salt Mgt. Conj. Use GW Pumpage TAF**	**Total Zone 7 GW Pumpage TAF**	**Net Salt Loading Tons/Yr**	**Net Increase In TDS mg/l/year**	**Projected GW TDS After 10 Years, mg/l**	**TDS of Zone 7 Deliveries mg/l**	**Incremental Operational Cost: Per year**	**Incremental Operational Cost: Per Acre-foot of TW Delivery**
11	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF SHALLOW GW PUMPAGE	NONE	5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	5	17	**-2200**	**-7**	**380**	**270**	**$2,351,000**	**$40**
11A		NONE	1.5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	10	22	**0**	**0**	**450**	**320**	**$1,091,500**	**$20**
11B		NONE	3 (Demin 1000 mg/l GW pumpage to 100 mg/l)	3	15	**0**	**0**	**450**	**277**	**$1,383,000**	**$30**
12	COMPOSITE OF ATTENUATION, CONJUNCTIVE USE & GW DEMINERALIZATION	15%	1.5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	10	22	**-1200**	**-4**	**410**	**320**	**$1,077,500**	**$20**
13	ZONE 7 GW (1000TDS) PUMPAGE TO ARROYO MOCHO (EXPORT) WHEN GW STORAGE IS ABOVE 200 TAF	NONE	NONE	Average 3.6 TAF Seasonal GW Export	15.6	**0**	**0**	**450**	**300**	**$404,000**	**$8**
13A	ZONE 7 GW (1000TDS) PUMPAGE TO ARROYO MOCHO (EXPORT) WHEN GW STORAGE IS ABOVE 200 TAF	NONE	NONE	Average 1.5 TAF Seasonal GW Export	13.5	**1730**	**6**	**510**	**300**	**$169,000**	**$0**
14	COMPOSITE OF RO RW, ASR CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **ASR RO RW PUMPAGE FOR AG USE**	NONE	4.6 (Demin 1000 mg/l GW pumpage to 100 mg/l)	4	14.3	**0**	**0**	**450**	**250**	**$2,096,600**	**$40**
14A	COMPOSITE OF RO RW ASR CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **ASR RO RW PUMPAGE FOR URBAN IRRI.**	NONE	3.8 (Demin 1000 mg/l GW pumpage to 100 mg/l)	4	14.3	**0**	**0**	**450**	**255**	**$1,759,800**	**$30**
15	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **NO RECYCLED WATER INJECTION**	NONE	5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	8.5	16	**0**	**0**	**450**	**270**	**$2,607,000**	**$50**

Assumptions:

1. *All studies include 6 TAF/YEAR of RO recycled water (RW) injection except Study 1a & 15 have no RO RW water injection and studies 14 & 14a have 3640 af of demineralized RW injection.*
2. *All studies do not include salt loading due to future development outside the main basin or new recycled water irrigation water use*
3. *Incremental operational cost is based upon total treated water deliveries (45,100 AF Zone 7 plus 7,214 AF GPQ pumpage)*

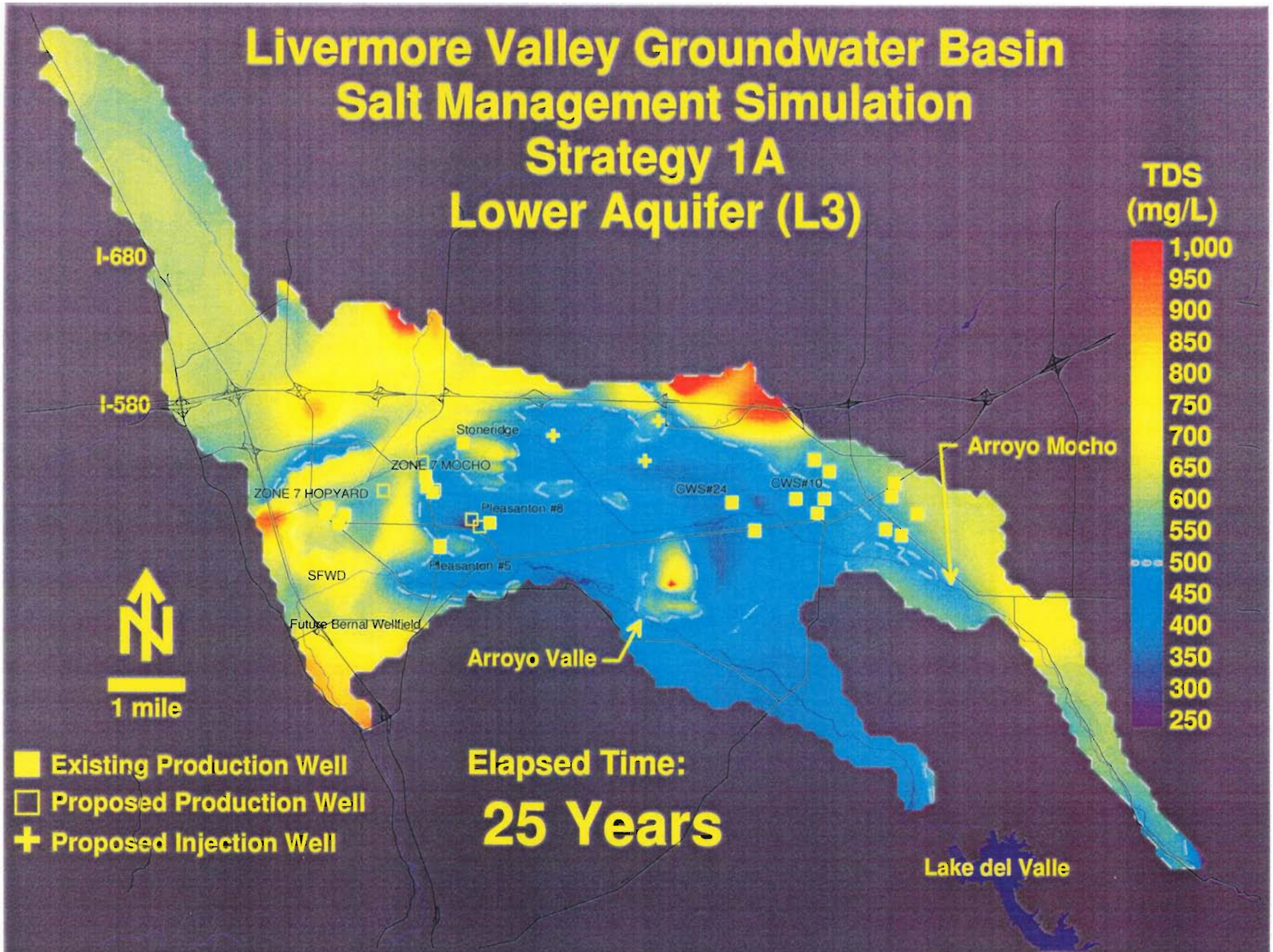

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 1A
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
CWS#24
CWS#10
SFWD
Future Bernal Wellfield
Arroyo Mocho
Arroyo Valle
Lake del Valle
1 mile
Existing Production Well
Proposed Production Well
Proposed Injection Well
Elapsed Time:
25 Years

Figure ES-7

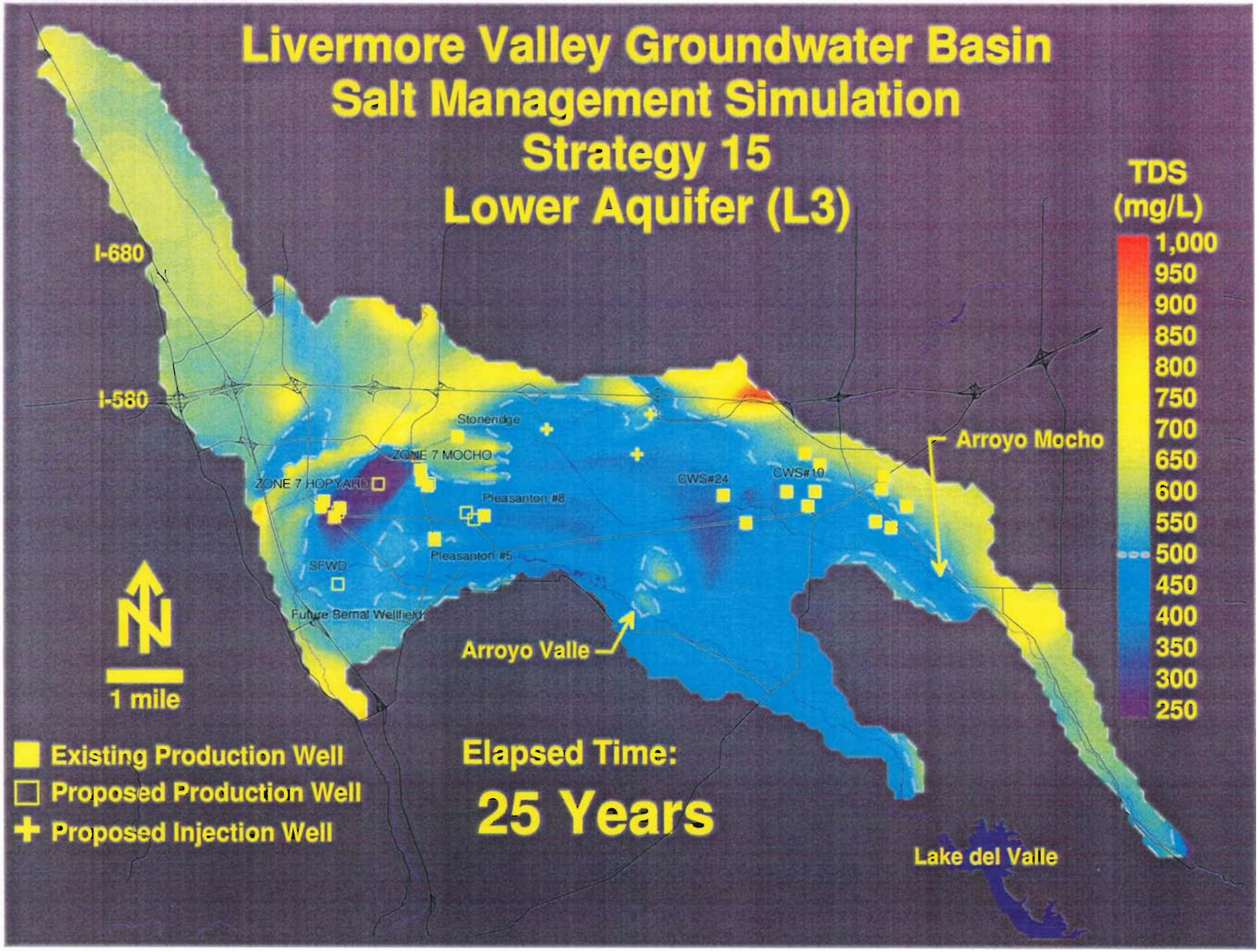

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 15
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
SFWD
Future Bernal Wellfield
CWS#24
CWS#10
Arroyo Mocho
Arroyo Valle
Lake del Valle
1 mile
Existing Production Well
Proposed Production Well
Proposed Injection Well
Elapsed Time:
25 Years

Figure ES-8

Table ES-3: Strategy 15 Versus Strategy 1A Groundwater Model Simulation Results Municipal Wellfield Groundwater Quality (TDS) at Select Locations

Wellfield or Well Name	Groundwater TDS and Change from Strategy 1A, mg/L			
	After 25 Years	Change	After 50 Years	Change
Zone 7 Hopyard Welfield (Hop-9)	300	-250	260	-410
Zone 7 Mocho Wellfield (Mocho 2)	420	-60	400	-80
Zone 7 Stoneridge Wellfield	570	-10	550	-50
Pleasanton # 5	490	-10	430	-50
Pleasanton # 8	390	-50	390	-60
CWS # 10	570	50	550	10
CWS # 24	380	-20	390	-20
SFWD Wellfield	510	-130	490	-320
Future Bernal Wellfield (Laguna South - Shallow Aquifer)	720	-160	760	-220

Cost Allocation

By late 1998, the TAG and GMAC agreed to support the cost allocation approach of having Zone 7 fund annual salt management O&M costs via the treated water rates to offset the existing 2,200 tons/year salt loading (Section 11.3). The majority recommended that it made the most sense economically and administratively to not attempt to differentiate between sources of salts and let Zone 7 manage future salt loading by expanding the approach adopted to manage current salt loading. A methodology for calculating individual project salt loading was developed in the SMP. This provides the framework under which future salt loading could be determined on a project-by-project basis and/or where salt management projects can be conducted by agencies other than Zone 7 and generate salt "credits".

Near-Term Salt Management Strategies

Zone 7 staff, in consultation with the TAG and GMAC, decided in early 1999 to develop a revised set of salt management strategies that could be implemented in the near term (i.e., in 2000-2002) rather than in year 2010. These near-term strategies were the strategies previously identified and screened for year 2010 conditions (Section 9.6), but scaled down for the current 2,200-tons/year loading conditions. Letter suffixes (e.g., 15A) are variations of the same basic year 2010 strategy. The near-term salt management strategies and implementation plan are detailed in Chapter 12.

From among the 2010 strategies, seven near-term salt management strategies believed to be feasible were identified. These are listed in Table ES-4. The values in the table were calculated as if the strategies were to be implemented under year 2000 loadings, treated water deliveries, and costs. The unit O&M costs and salt removal capability assumptions used to develop these near-term strategies were the same as described in detail in Section 8.14. As previously indicated, the TAG and GMAC agreed to support the cost allocation approach of having Zone 7 fund annual salt management O&M costs via the treated water rates to offset the existing 2,200 tons/year salt loading (Section 11.3). Therefore, incremental operational costs in Table ES-4 are also expressed as a percentage increase in treated water rates, based on an assumed annual water usage of 1/2 acre-foot per household.

Table ES-4
NEAR TERM SALT MANAGEMENT STRATEGIES

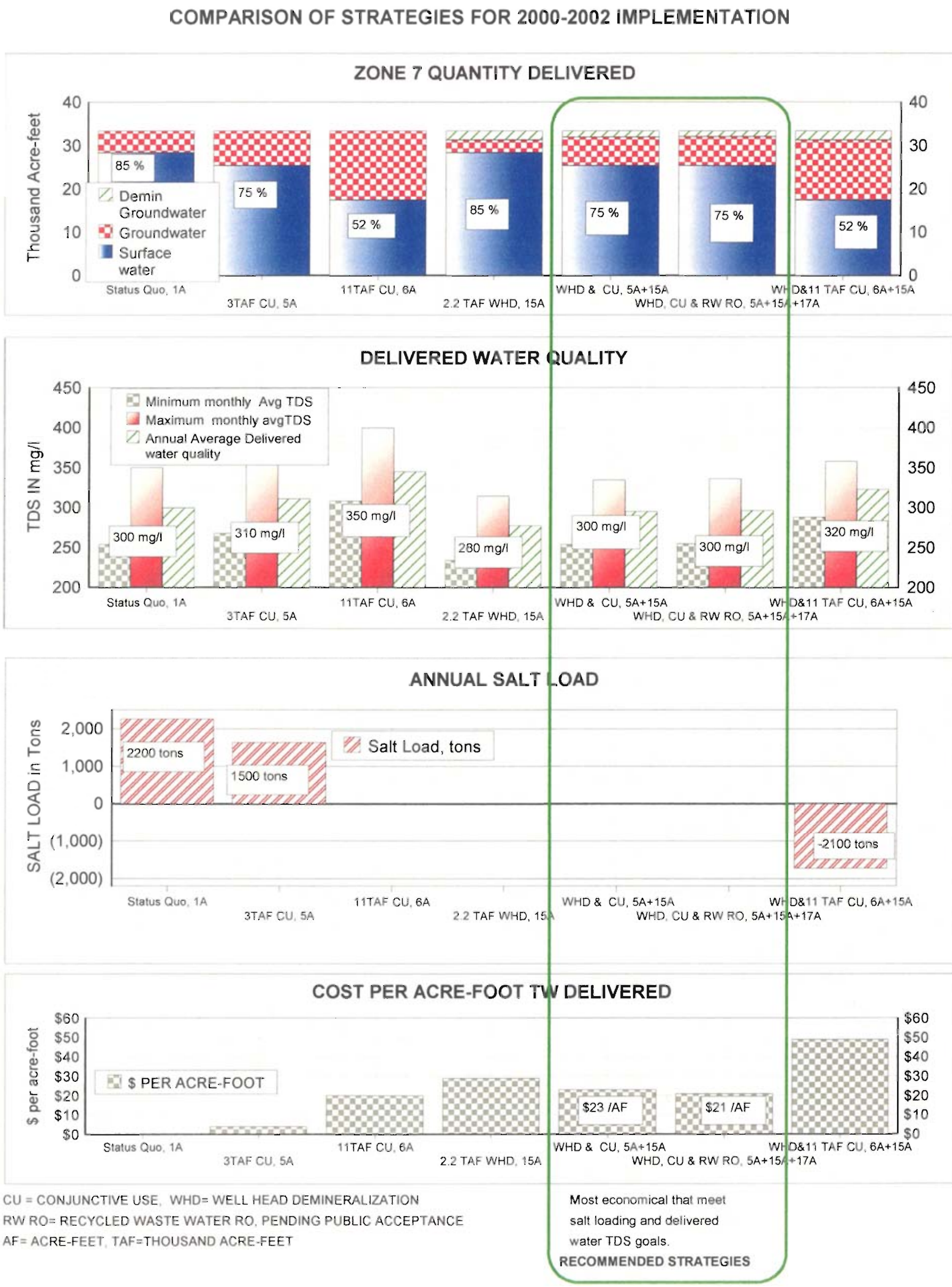
STRATEGY NO	NAME	POLICY OPTION	Long - Term Average: NET SALT LOADING TONS/YR	NET INCREASE IN GW TDS mg/l/year	Projected GW TDS after 10 yrs mg/l	TDS OF ZONE 7 DELIVERIES mg/l	ZONE 7 INCREMENTAL OPERATIONAL COSTS: PER YEAR	PER ACRE-FOOT OF TW DELIVERY	% Rate Increase
Status Quo 1A	Year 2000 Status Quo (no demineralized RW injection)	I	2200	7	520	300	$0	$0	0.0%
Conj. Use 5A	Minimum Conjunctive Use 3000 AF (Stoneridge well - no GW demin)	II	1600	5	500	310	$120,000	$4	0.8%
6A	Major Conjunctive Use 11,000 AF (zero out salt balance)	III	0	0	450	350	$680,000	$20	3.8%
Wellhead Demin 15A	2200 AF Demin GW Pumpage (1000 mg/L to 100 mg/L)	III	0	0	450	280	$976,800	$29	5.5%
COMPOSITE OF 5A AND 15A	Minimum Conjunctive Use (3000 AF/Y) and 1500 AF/Y Demin GW PUMPAGE	III	0	0	450	300	$786,000	$23	4.4%
COMPOSITE OF 5A, 15 A AND 17A (17A Ref. Table 12.2)	Minimum Conjunctive Use (3000 AF/Y) and 1300 AF/Y Demin GW PUMPAGE 840 AF (Livermore) RW RO Stream Recharge	II	0	0	450	300	$714,000	$21	4.0%
6A PLUS 15A	Major Conjunctive Use (11000 AF/Y) and 2200 AF/Y Demin GW PUMPAGE	IV	-2100	-7	380	330	$1,656,800	$49	9.3%

Assumptions:

1) *Zone 7 TW delivery of 33,500 AF and UTW of 7300 AF (Year 2000)*
2) *Base TW rate of $528 / AF for year 1999*
3) *Incremental cost spread only to Zone 7 Treated water deliveries*
4) *GW TDS of 450 mg/l and SW TDS 270 mg/l (Historic average at PPWTP)*
5) *GW Demin capacity at 2200 AF/Y (180 af/ month for 12 months)*

The above (seven) individual and composite year 2000 strategies are compared in figures ES-9 and ES-10. Figure ES-9 presents four parallel bar charts. The first (uppermost) bar chart series presents the ratio of surface water to total groundwater delivered by Zone 7 under each of the seven strategies. The second graph presents every strategy's resultant minimum and maximum monthly average TDS (12 month average), and the overall annual average TDS of Zone 7 deliveries (i.e., three bars per strategy). The third graph presents the annual average salt loading (in tons) remaining after implementation of each strategy. The fourth (bottom) graph presents the incremental O&M cost per acre-foot of

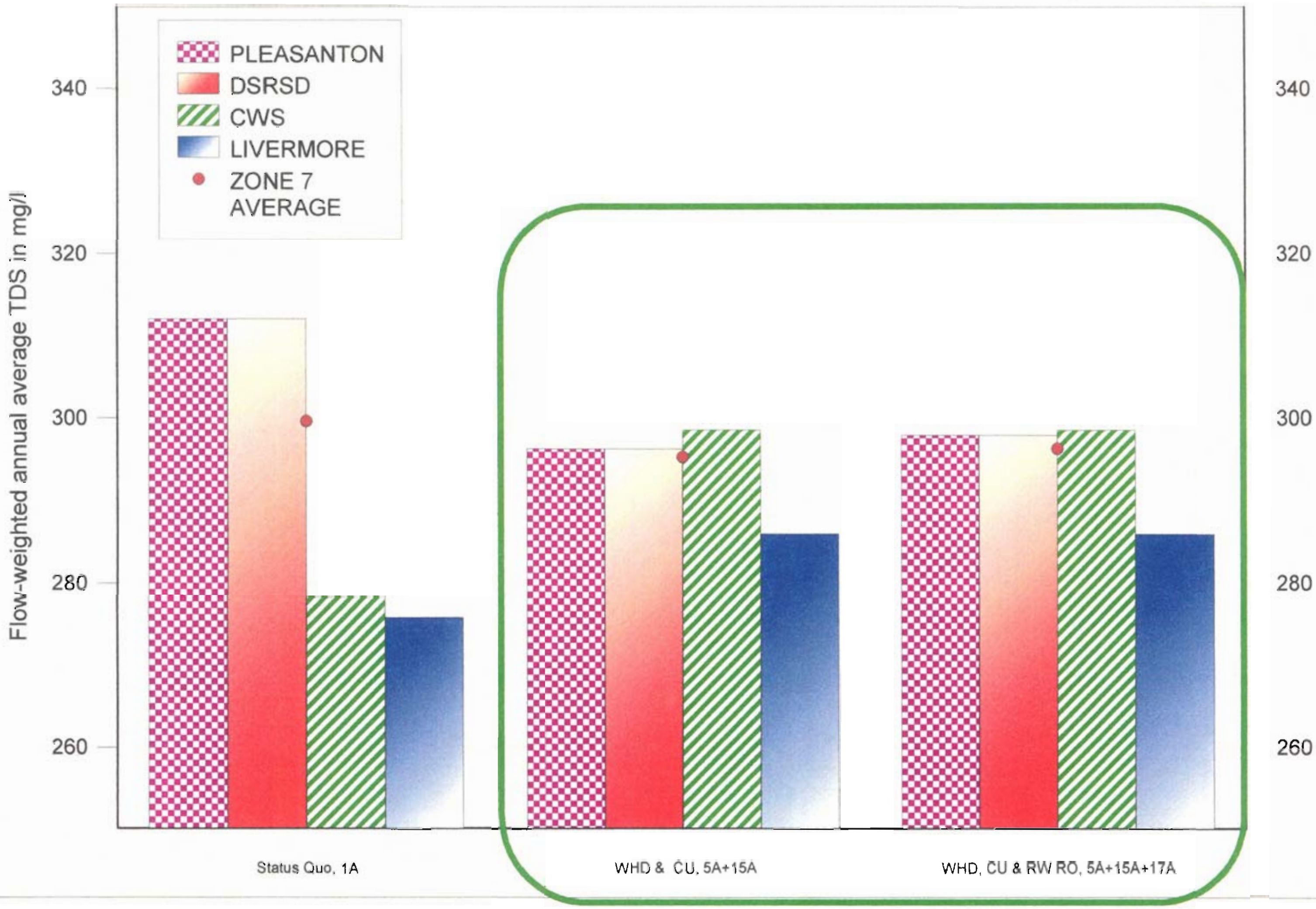
Figure ES-9



CU = CONJUNCTIVE USE, WHD= WELL HEAD DEMINERALIZATION
RW RO= RECYCLED WASTE WATER RO, PENDING PUBLIC ACCEPTANCE
AF= ACRE-FEET, TAF=THOUSAND ACRE-FEET

Figure ES-10

Annual Average TDS Delivered to Retailers Under Historic and Proposed 2000-2002 Operating Conditions



NOTE:

1) Assuming that 75% of the time the Stoneridge pumpage will be diverted to East (to CWS & Livermore) by closing rate control valve in X-valley pipeline.

2) Assuming that all the other GW pumpage (GW, WHD & ASR) is delivered to Pleasanton and DSRSD (prorated by delivery amount).

3) Assumes Stoneridge pumpage at 400 mg/l and all other Zone 7 pumpage at 450 mg/l, Well Head Demineralization to 100 mg/l.

Figure ES-10

Zone 7 deliveries (i.e., increase in treated water rates attributable to salt management). Figure ES-10 compares the annual average TDS of Zone 7 deliveries to individual retailers between status quo operation (i.e., Strategy 1A) and two composite strategies.

Comparison of the strategies indicates the following:

- Strategy 1A (Status Quo)—This strategy minimizes operational costs but fails to achieve any other SMP goals. Under this strategy, treated water rates would not increase.
- Strategy 5A (Minimum Conjunctive Use)—This reduces salt loading by about 600 tons/year (28%), but it increases the annual average TDS of Zone 7 delivered water by about 3%. Under this strategy, treated water rates would increase by 0.8%.
- Strategy 6A (Major Conjunctive Use)—This is minimum cost strategy and is salt neutral. However, it would significantly increase the TDS of Zone 7 deliveries, particularly to the west side of the valley, which contradict SMP goals. Under this strategy, treated water rates would increase by 3.8%.
- Strategy 15A (Wellhead Demineralization)—This salt neutral strategy would decrease the TDS of blended Zone 7 deliveries, particularly to the west side of the valley. However, it is the highest cost near-term salt neutral strategy. Under this strategy, treated water rates would increase by 5.5%.
- Composite of 5A and 15A (Minimum Conjunctive Use and Wellhead Demineralization)—This is the most economical near-term strategy that satisfies all salt management criteria. Under this strategy, treated water rates would increase by 4.4%.
- Composite 5A, 15A and 17A (Minimum Conjunctive Use, Wellhead Demineralization, and RO Recycled Water Stream Recharge)—This strategy could satisfy all salt management criteria and would be slightly less expensive than the composite 5A/15A strategy. Under this strategy, treated water rates would increase by 4%. If the RO recycled water stream recharge component did not occur or were postponed, wellhead demineralization would need to be increased, and it would effectively make this strategy the same as the composite 5A/15A strategy.
- Composite 6A and 15A (Major Conjunctive Use and Wellhead Demineralization)—Groundwater quality would improve most rapidly under this strategy but delivered water quality would degrade. This is the highest cost near-term strategy. Under this strategy, treated water rates would increase by 9.3%.

Several of the 2010 strategies passed the feasibility screens (technical, timeline and water quality), except for public and institutional acceptability. If regulatory and/or perception barriers are overcome, at least some of these strategies could also potentially be implemented before 2010. A select group of what appeared to be the more promising of these other strategies were scaled down to current 2,200 tons/year loading and were named potential near-term strategies. Eleven potential near-term salt management strategies were identified based on a Delta fix, RO recycled water injection, seasonal groundwater export, Lake G recycled water storage and irrigation, and RO recycled water stream recharge. These strategies are discussed in Section 12.3.

Zone 7 staff, in consultation with the TAG and GMAC, developed a recommended near-term implementation plan (Section 12.4) out of the near-term strategies evaluated. The plan included recommended policy goals and a three-year phased implementation of increased conjunctive use, wellhead demineralization with brine export, and potential demonstration scale RO recycled water stream recharge. The plan also identified how annual salt management decisions would be made via an adaptive management process and integrated into Zone 7's annual operations plans.

Adaptive Management

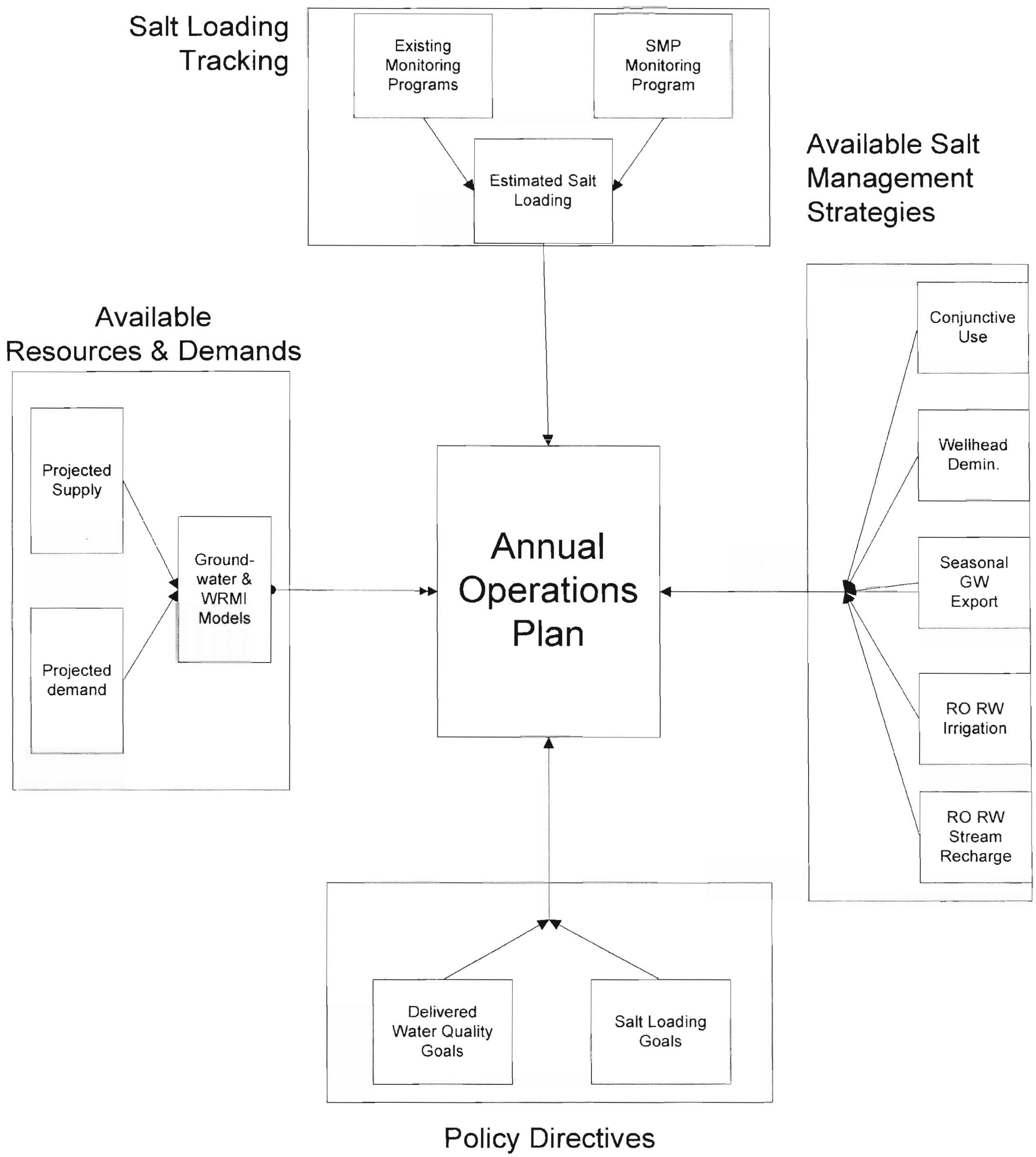
Zone 7's annual operations plan has been expanded to incorporate the SMP goals and an adaptive management process. This means that when all the facilities are in place to fully implement the SMP, each year staff will review the projected water supply forecast, retailer water demands and adopted salt management goals to select the most cost-effective combination of available salt management tools to be used during the upcoming year. Annual operational costs will be estimated and allocated as appropriate during the annual water rate setting process. Over time, it is expected that additional strategies may become available (e.g., seasonal groundwater export) and Zone 7 will re-evaluate the optimum combination of strategies for any given year. Figure ES-11 illustrates Zone 7's proposed adaptive management process through which multiple changing variables will be balanced annually to arrive at an optimal operational decision.

The adaptive management approach requires input in four major areas: policy directives, available resources and demands, salt loading tracking, and available salt management strategies.

- Policy directives include items such as Zone 7 Board decisions/guidance that there be no long-term average net salt loading to the groundwater basin and that delivered water mineral quality be maintained or improved.
- Available water resources and demands involve assessing the new water supply, demand and groundwater storage conditions at the beginning of each year. This basically represents the information tracked and processed by the historic operations plan.
- Salt loading tracking involve collection of data and information from the various monitoring programs. The existing monitoring program is sufficient for tracking salt loading from existing sources and for existing land use conditions. Future land use changes and any increased use of recycled water will require additional monitoring to track the resultant salt loading. The Salt Management Monitoring Program will provide this new salt loading source information, facilitate tracking of salt removal, and provide the information needed to calculate the annual salt removal targets for inclusion in the annual operations plan.

Figure ES-11

Schematic of Salt Management Annual Operations Plan



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- Available salt management strategies include all the available salt removal strategies and their relative removal capacities. The number and type of strategies are expected to increase over time with the facilities owned and operated by Zone 7 and others (see tables 12.2 and 12.3).

With adaptive management, factors such as current and projected salt loading, relative salt removal costs ($/ton removed), impacts on delivered water quality, and water supply conditions, will be evaluated together and the best possible solution that balances the competing salt management goals will be incorporated into the annual operations plan. In some years, the decision-making may require groundwater modeling or other sophisticated prediction methods.

An example of a possible outcome of the adaptive management process is a decision to not implement any salt removal measures in a given year and to accrue a salt deficit recognizing that it would need to be offset in future years. This may be the case in the early years of implementing the SMP when there will be few salt management strategies to choose from (e.g., conjunctive use). This outcome could also result during a drought when demineralization facilities may not be operated to conserve the water that would otherwise be lost as salt concentrate. A similar decision to limit or not operate demineralization facilities may be made during periods of limited power supply and/or high power cost. Conversely, under very favorable water supply and water quality conditions, Zone 7 could choose to implement extra salt removal measures and thereby accrue salt credits.

Zone 7 Board's Near-Term Implementation Plan Approval

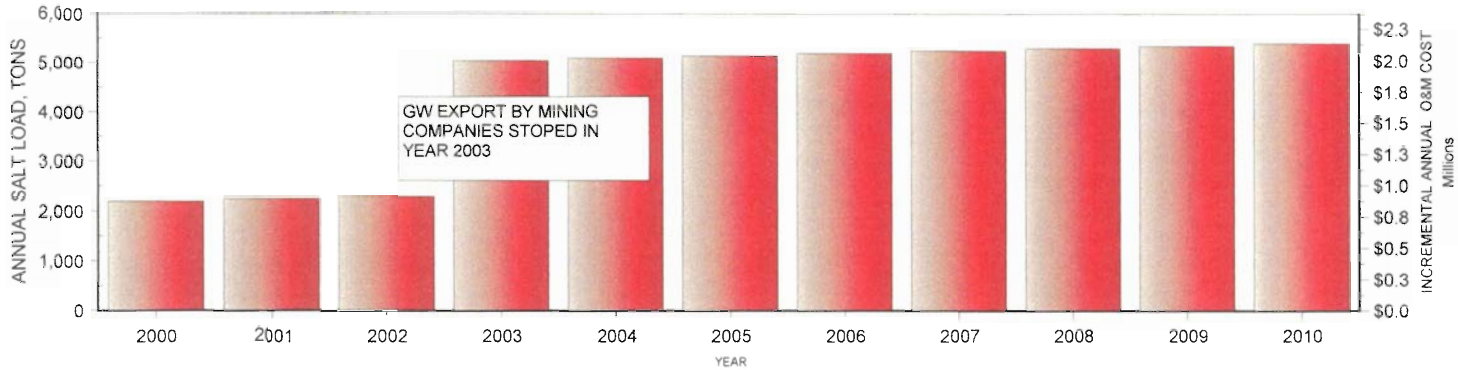
The above phased near-term implementation plan was presented to and approved by the Zone 7 Board of Directors on August 18, 1999 by Resolution No. 99-2068. The tables and figures illustrating the plan contained in Chapter 12 (ES 9-12) are essentially the same as those presented to the Board. The Resolution stated the Board's support for the proposed Salt Management Program Implementation Plan and for inclusion of the six policy goals in the Zone 7 annual operations plan. The Resolution also authorized the Zone 7 General Manager to proceed with the recommended year 2000-2002 Salt Management Implementation Plan.

Future Salt Loading

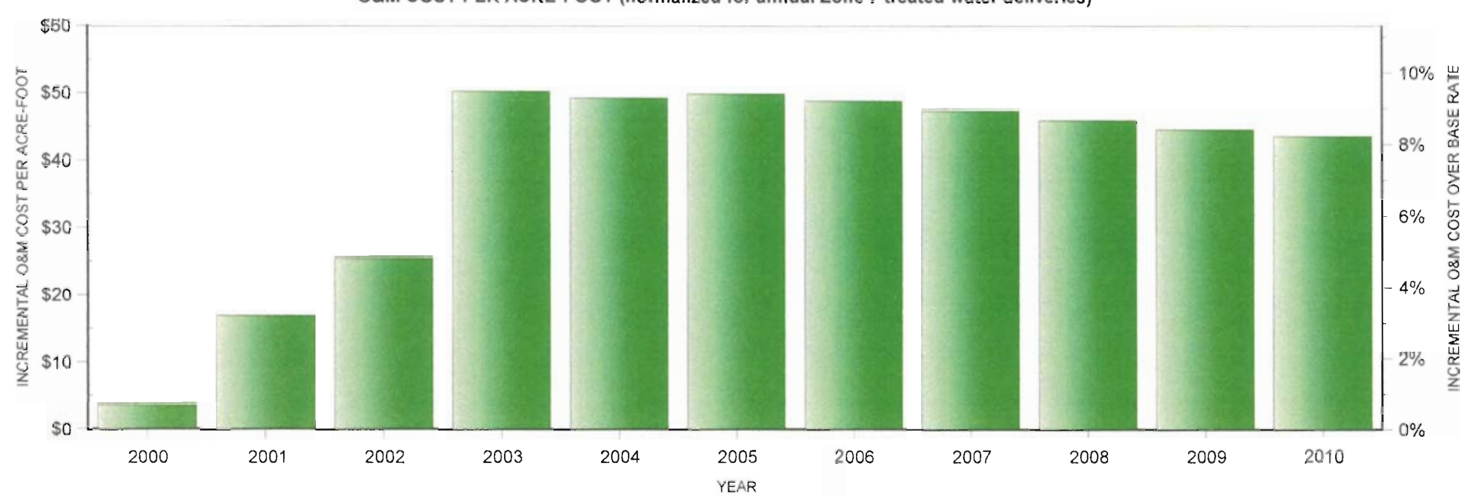
Main Basin salt loading has been projected to increase from the current (1999) 2,200 tons/year to 5,400 tons/year by year 2010 (Section 8.9). The upper graph in Figure ES-12 presents projected future annual salt loading from year 2000 through 2010. This graph shows the salt load in tons on the left y-axis and incremental annual O&M cost on the right y-axis. The costs shown are based on one strategy and reflect the potential annual operation and maintenance (O&M) costs to fully offset each year's loading, assuming the

Figure ES-12

FUTURE ANNUAL SALT LOAD & REMOVAL COST (2)



O&M COST PER ACRE-FOOT (normalized for annual Zone 7 treated water deliveries)



NOTE: *1) Salt load calculation does not include.*

a) The impacts of increased future subsurface inflows due to increased agricultural irrigation outside the main basin.

b) The incremental increase in salt loading due to recycled water irrigation over the main basin.

2) Salt removal cost is based upon removal by Shallow Well GW Demin (1 - 4 TAF/Y) and Conjunctive use (3 - 7 TAF/Y) For any other strategy or combination of strategies, the cost will change.

use of shallow well demineralization (1 to 4 TAF/Y) and conjunctive use (3 to 7 TAF/Y). Under any other strategy or composite strategies, the costs would differ.

The lower graph shows the incremental O&M cost per acre-foot of Zone 7 treated water deliveries on the left y-axis. The right y-axis shows this cost as a percentage over the base treated water rate. For years 2000–2002, the incremental cost would increase from about $3/AF/year (first bar on lower graph of Figure ES-12) or $1.50/houseold/year to about $25/AF/year (left y-axis) or $12.50/household/year. That would be an increase of about 5% (right y-axis) over the Zone 7 1998 base treated water rate ($528/AF).

A major change occurred in year 2003 with the cessation of the majority of the water and salt exports by the gravel-mining companies. To remain salt neutral, the SMP will have to be expanded to offset an additional 2,800 tons/year of salts. This will cause the incremental operational costs to increase by about $50/AF of Zone 7 treated water deliveries over base treated water rates. After 2003, the increase in salt loading is projected to be gradual, about 50 tons/year or 500 tons by 2010 primarily due to increased urban and agricultural development-related irrigation.

Zone 7 treated water deliveries are projected to increase each year successively at least through year 2010, increasing the base volume over which to distribute the increased O&M costs. Therefore, the incremental operational cost for salt management in 2010 would stabilize at around $45/AF/year. This represents about an 8% incremental cost over the Zone 7 1998 base treated water rate. If any of the other lower-cost salt removal strategies become feasible in the future, they will be integrated into the annual operations plan as part of the SMP adaptive management process and operational costs will be reduced.

These future salt loading estimates do not include impacts of potential increased future subsurface inflow or surface water runoff due to increased agricultural irrigation outside the Main Basin (to be tracked via the Salt Management Monitoring Plan). However, the potential loadings due to increases in subsurface flow are believed to be minimal and the effects of these impacts would not be seen for many decades due to the various geologic barriers between the fringe and the Main Basin (as documented in Chapter 3). The estimates shown also do not include any incremental increase in salt loading due to new or retrofit recycled water irrigation projects impacting the Main Basin. New and/or expanded salt management strategies and facilities will need to be implemented to offset these future potential salt sources to comply with the SMP goal of fully offsetting net salt loading.

SMP Next Steps

Zone 7 began implementing the SMP in the year 2000 by increasing conjunctive use (Strategy 5A). Zone 7 has wellhead demineralization facilities scheduled within its Capital Improvement Program (CIP). Further planning studies have been conducted that verified the feasibility of shallow groundwater demineralization as described in this SMP. Those studies also investigated, in more detail, alternative sites for the demineralization facilities.

A well master plan is being prepared that will in part also evaluate sites for shallow groundwater wells. Negotiations are continuing with DSRSD and Livermore on use of the LAVWMA facilities for RO concentrate disposal. Zone 7 has completed a Water Quality Master Plan. The SMP goals and operations have been integrated into and coordinated with the Water Quality Master Plan goals.

Given enough public support, Zone 7 and Livermore could begin exploring in more detail, summertime stream recharge with demineralized recycled water in the Arroyo Mocho near Isabel Avenue (strategies 17A and 17B). Zone 7 will continue discussions with Alameda County Water District on possible operational agreements that would identify conditions under which it would be acceptable for Zone 7 to conduct seasonal high TDS groundwater export (strategies 13B, 13C, and 13D). Zone 7 will contact the RWQCB to determine what type of permit, if any, is required to carry out this activity.

Zone 7's submittal of this SMP (Reference S) to RWQCB staff documents Zone 7's long-term plan and strategy for managing salts and mineral water quality within the Livermore-Amador Valley groundwater basin to promote the wise use of all water resources and to protect the long-term sustainable quality of potable water delivered within the valley.