Chapter 11

Salt Management Cost Allocation

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11.1 Introduction

Prior chapters of this SMP described individual and composite salt management strategies (referred as "studies" in Chapter 9) and their associated costs (tables 9.1 and 9.2). Strategy 15, a composite of increased conjunctive use and wellhead demineralization, was the only strategy that passed all the screening criteria (section 9.6). More detailed modeling (Chapter 10) confirmed that Strategy 15 would meet the proposed SMP policy goals of fully offsetting year 2010 salt loading while maintaining (and in certain geographic areas improving) delivered water quality. Strategy 15 operational costs to offset the projected 5,400 tons/year of salt loading in the year 2010 were estimated at $2.6 million/year.

This chapter describes options and a recommended approach for allocating salt management costs. The recommendations were developed in large part based on input from the Technical Advisory Group (TAG) and the Groundwater Management Advisory Group (GMAC). The focus of the evaluation is primarily on near-term cost allocation measures to offset the current 2,200 tons/year salt load (Section 11.3). The options evaluated were limited to those consistent with Zone 7's existing approach for allocating capital and operations and maintenance costs (i.e., via connection fees and water rates, respectively). These options generally assumed that a centralized approach would be adopted by the Zone 7 Board (such as Strategy 15) where the overall basin-wide salt loading would be offset via Zone 7 directed basin management actions and facilities.

This chapter also includes the results of discussions with the TAG and GMAC regarding potential cost allocation options for facilities needed to offset future salt loads resulting from new urban and agricultural development, and from recycled water irrigation (sections 11.4 – 11.6). Additional work and negotiations beyond the scope of this report will be required to determine the most equitable and appropriate approach(es) for allocating these future salt management capital and O&M costs. In the interim, staff recommends that impacts of new projects be evaluated and addressed on a case-by-case basis.

An approach for calculating salt removal costs or salt credits on a project-by-project basis was also developed in cooperation with the TAG (Section 11.7). This approach addresses the situation where individuals would seek to develop their own salt management measures for a given project independent of Zone 7.

11.2 Livermore Valley Land Use and Salt Impact Zones

The annual salt loading calculations prepared by Zone 7 (Chapter 5) require in part an estimate of the pounds of salt applied via irrigation in a given area that will impact the main basin. In these calculations, 100% of the applied salt in areas directly above the main basin is assumed to reach the main basin (see Section 3.6). Future salt loading is projected to increase from the current 2,200 tons/year to an estimated 5,400 tons/year by the year 2010 due primarily to reductions in gravel mining pumpage exports and due to increased irrigation associated with new urban and agricultural development.

Most new development will be occurring in areas outside of the main basin. In these fringe areas, local geologic conditions influence the relative percent of applied salt that will reach the main basin. The following describes the methodology used for dividing the valley into four relative salt impact zones.

Annually Zone 7 prepares a hydrologic land use study and map (Figure 11.1) of the Livermore-Amador Valley (see Reference P for the complete Land Use Memorandum Report). Land use changes are used in the computation of rainfall recharge, applied water recharge, mining area evaporative losses, and unmetered agricultural groundwater pumpage. Land is subdivided into four main categories: urban, irrigated agriculture, mining area, and unclassified. Areas are further classified by the primary irrigation source, surface water or groundwater. Current and potential recycled water irrigation sites are also tracked (see discussion and map in section 6.6).

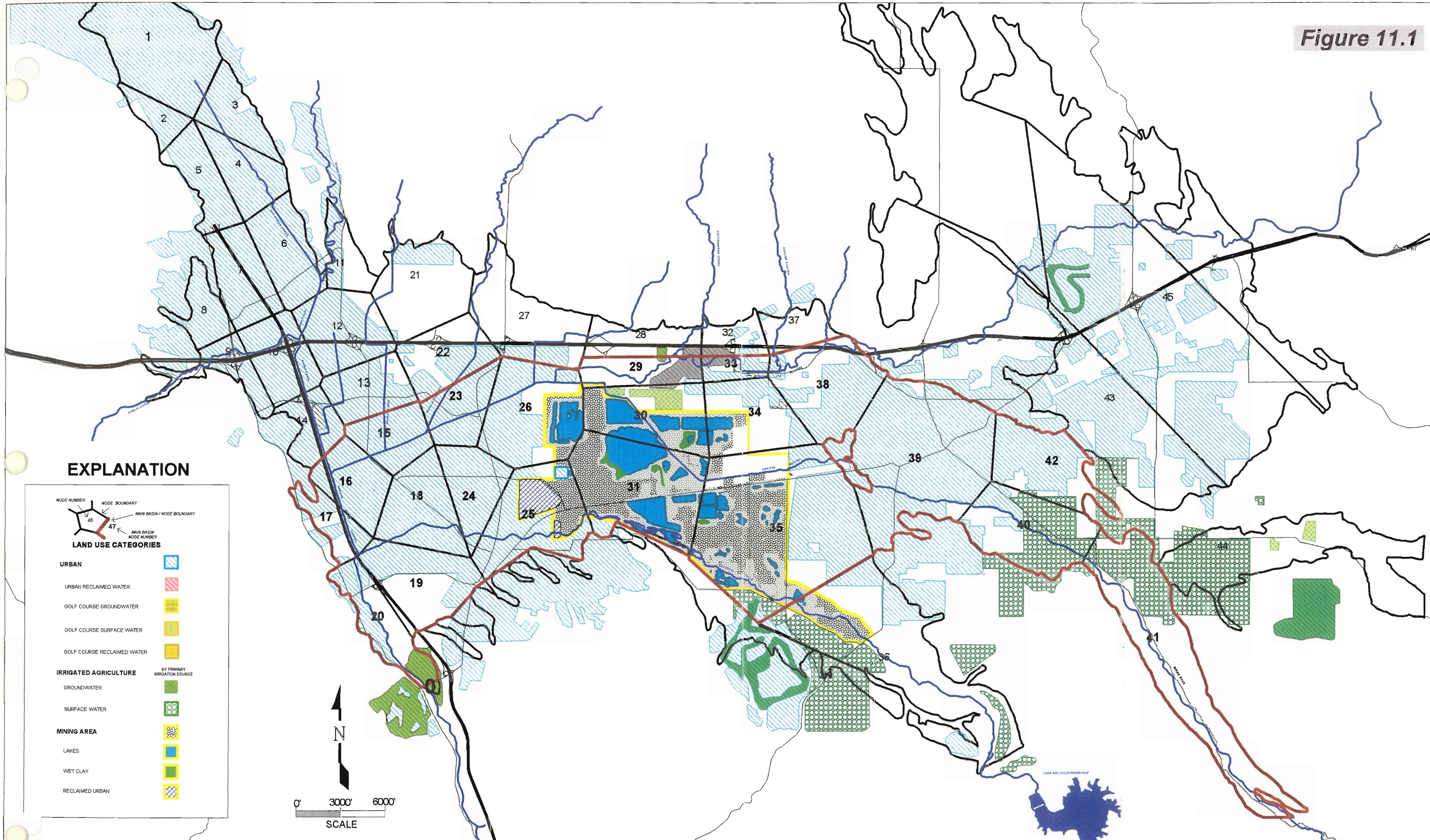
Annual changes in these various land uses affect the amount and salt content of water recharging the groundwater basin. This information is used in updating the annual salt balance calculations and in refining the Salt Management Monitoring Program (SMMP – see Chapter 6).

The runoff characteristics and hydrogeologic information about the valley (see Chapter 2) was used to prepare a map (Figure 11.2) that divided the valley into four general salt loading impact zones: 100%, 67%, 33%, and 0%. This was done to provide a reasonable method for estimating future salt impacts to main basin groundwater quality from irrigation with different quality water supplies. Following is a brief description of the various impact zones and their locations. More detailed information on individual areas on a drainage basin basis is contained in Reference G.

100% Impact Zones

Land area in the 100% impact zone (shown in white in Figure 11.2) is that located directly above the main groundwater basin. It is assumed that all the salt in recharge water due to water applied for irrigation onto this land would migrate vertically and that 100% of the associated salts would impact the main basin.

Figure 11.1



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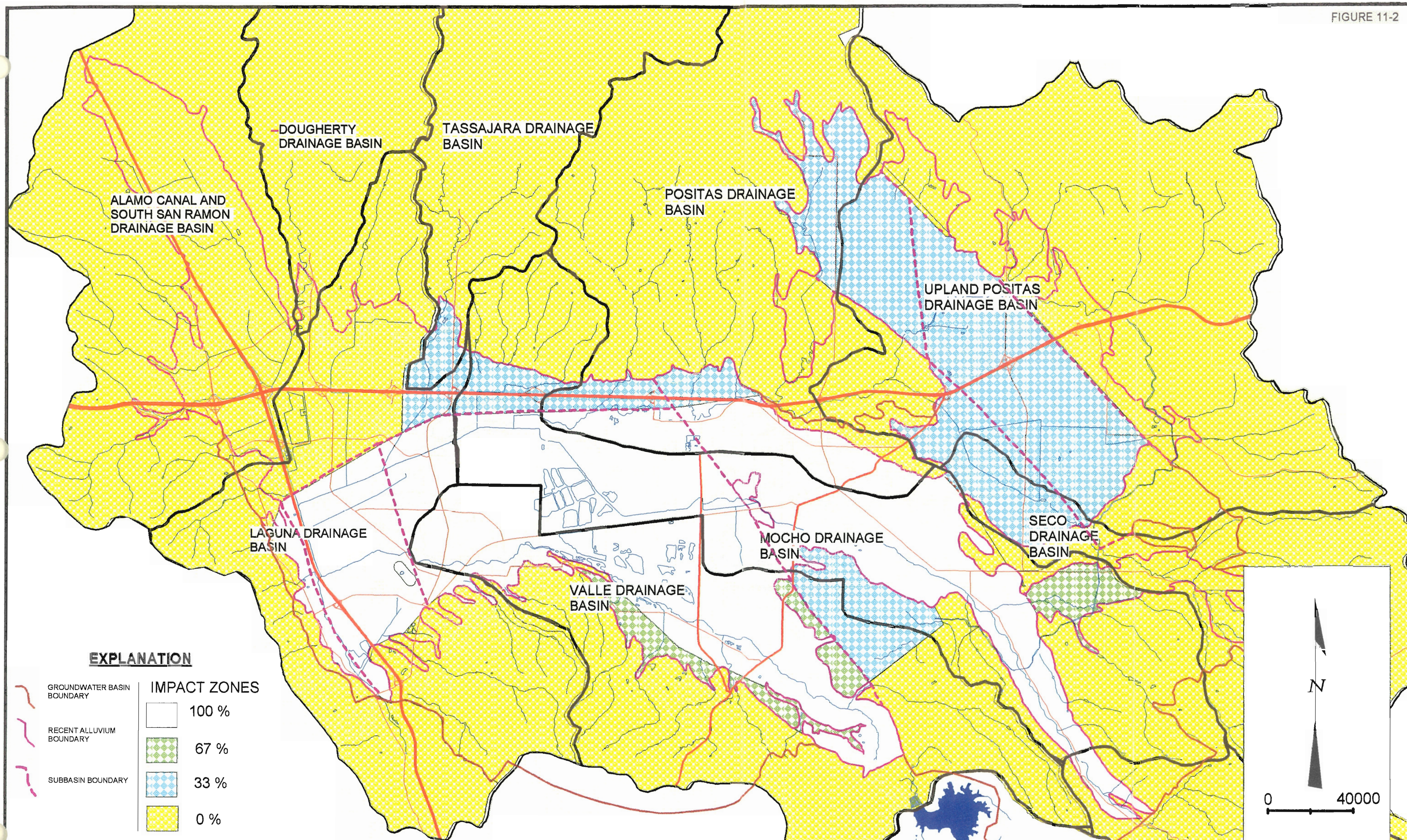
WATER RESOURCES ENGINEERING
LIVERMORE VALLEY LANDUSE
1997 WATER YEAR

SCALE	1" = 6000'
DATE	10 October 1997
FILE NO.	B-128 | LU_S97.WOR



ZONE 7 WATER AGENCY 5997 PARKSIDE DR, PLEASANTON, CA.	DRAWN BY: GERALD GATES DESIGNED BY: GERALD GATES CHECKED BY: APPROVED BY:	WATER RESOURCES ENGINEERING LIVERMORE VALLEY SALT IMPACT ZONES	SCALE: 1" = 7000' DATE: 2 JULY 1998 FILE NO: H:\SMP\IMPZONE.WOR

0% Impact Zones

Land area in the 0% impact zone (shown in yellow in Figure 11.2) is located outside of the main basin. In addition, there are physical geologic boundaries separating these land areas from the main basin. These geologic features generally prevent water from flowing from 0% impact zones into the main basin. These areas are also in watersheds from which runoff does not generally have pathway back into the main basin. Therefore, it can be assumed that none (or a negligible portion) of the salts applied to land areas in the 0% impact zones would impact the main basin.

33% Impact Zones

Springtown Area—This area is located generally northeast of downtown Livermore and straddling I-580 (33% impact zones are shown as light blue in Figure 11.2). It is above portions of the May, Spring, and Mocho I groundwater subbasins. Geologically, this area is separated from the main basin, so that there is effectively no subsurface groundwater inflow to the main basin. However, groundwater from this area may rise into the Arroyo Las Positas. A portion of this rising groundwater would recharge into the main basin during periods of low Arroyo flow (i.e., when there is excess recharge capacity available—see Chapter 3). Zone 7 estimated that during 1998 approximately 1,750 tons of salt was brought into the main basin via natural recharge from the Arroyo Las Positas. Springtown is considered a 33% impact zone due to the limited excess capacity in the Arroyo Las Positas for recharging rising groundwater from new urban or agricultural irrigation.

Arroyo Valle 33% Zone—This area in south Livermore is for the most part separated from the main basin geologically. However, some subsurface inflow to the main basin may occur. Additional monitoring wells have been proposed as part of the SMMP (Chapter 6) to further investigate the extent, if any, of subsurface inflow from this area. Increased recharge in this area may cause groundwater to rise into creeks. During periods of high flow, this rising groundwater would flow out of the watershed for the most part through the Arroyo Valle to the Arroyo de la Laguna. Given the possibility of some subsurface inflow occurring and some rising groundwater recharging in the Arroyo Valle during low flow periods, this area is considered a 33% impact zone.

North of Central Main Basin 33% Zone—This area is located straddling I-580 between East Dublin and Livermore. It is above most of the Camp sub-basin and the northwestern tip of the Mocho II sub-basin. Similar to the Arroyo Valle 33% zone described directly above, this area is generally separated geologically from the main basin with the exception of a small amount of subsurface inflow. The geologic barrier separating this area from the main basin is the Parks fault. The small amount of subsurface inflow that occurs from this area has a significant (>50 year) lag time. If there is an increase in irrigation and associated recharge in this area, the groundwater may rise into the creeks. The rising groundwater would flow out during high natural runoff periods. Given the small amount of subsurface inflow and rising groundwater that may recharge in the Arroyo Las Positas during low flow periods, this area is considered a 33% impact zone.

67% Impact Zones

Southeastern Arroyo Mocho 67% Zone—This area is located southeast of Livermore and lies above the Mocho I sub-basin (67% impact zones are shown in light green on Figure 11.2). This area generally recharges the main basin through subsurface inflow. Most of this subsurface inflow rises up into the Arroyo Mocho. During periods of high flow, some of the rising groundwater into the Arroyo Mocho flows out of the watershed, eventually reaching the Arroyo de la Laguna and the Niles Cone. Under high flow conditions (in excess of stream recharge capacity), the main groundwater basin is impacted less from salts from this land area than during other times of the year. Given the subsurface inflow and natural stream recharge that does occur and that most of the applied water does impact the main basin, this area is considered a 67% impact zone.

Southern Arroyo Valle 67% Zone—This area is located in the south central portion of the Arroyo Valle watershed, downstream from Lake del Valle. Groundwater from this area generally flows into the Arroyo Valle as subsurface inflow or rises into storm drains that flow into the Arroyo Valle. During periods of high flow, a significant portion of the rising groundwater flows through the watershed to the Arroyo de la Laguna and exits through the Niles Cone. During low flow periods, this rising groundwater recharges back into the basin in the lower reaches of the Arroyo Valle. Given the amount of rising groundwater from this area recharging in the lower reaches of the Arroyo Valle and that most of the applied water from this area indirectly impacts the main basin, this area is considered a 67% impact zone.

11.3 Current 2,200 Tons/Year Salt Management Cost Allocation

This section briefly summarizes how Zone 7 currently allocates costs for other water related facilities and then presents three options for allocating costs for facilities (such as a scaled down Strategy 15) needed to offset the current 2,200 tons/year of net salt loading.

Connection Fees

Since 1972, Zone 7 has been charging fees for new connections to its water supply system. These connection fees are used to fund expansion of and improvements to the water treatment and delivery system needed to serve new development. The program for collecting these fees was established by an ordinance, which was adopted pursuant to the District Act. The ordinance includes a schedule of charges based on the size of the connecting meter. Prior to 1994, the amount of the connection charge was based on a system whereby the new connector bought into the existing system by paying a proportionate share of the value of the existing system less accumulated depreciation.

Water supply planning reports prepared by the Zone and its consultants in 1992 through 1994 identified the need to obtain additional water supplies to meet future demands. To finance the projects needed to procure, convey, treat, and distribute these new water supplies, Zone 7 increased its water connection fees from $830 to $3,050 in 1994, to $3,250 and then again to $3,595 in 1997, to $4,915 in 1998, to $8,900 in 2000 and to $9250 in 2001. The connection fee program is reviewed annually and the fee adjusted as needed. The fee increases are calculated based on the marginal cost method. Under this method, charges are calculated by apportioning the cost of the expansion projects to the water system among the new users/connections. This method is in accordance with the Zone 7 Board policy that the burden of cost of future water supplies and associated facilities not be placed on existing water users.

To protect against future uncertainties affecting any one water source, Zone 7 has pursued a number of sources while continuing to seek sources with the highest reliability and the lowest cost. Previously identified capital projects required to meet future needs include new water treatment facilities, new wellhead demineralization facilities, new water transmission pipelines, additional injection/extraction wells and recharge facilities. Zone 7 is currently completing several studies (see Chapter 2), including a Water Facilities Master Plan and Well Master Plan to update plans and funding requirements for new water supply, treatment, distribution, storage, and water quality management facilities. These facilities are intended to maintain at least the current level of reliability and peaking ability, as well as maintain the quality of water delivered to Zone 7 customers.

As discussed in Chapter 8, the salt management alternatives considered for this SMP were primarily developed assuming use of capital facilities and/or operational strategies already included in Zone 7's Capital Improvement Program (CIP) or under evaluation in the Facilities Master Plan and Well Master Plan. A fundamental cost allocation assumption, therefore, was that previously collected connected fees were allocated and available for funding the capital facilities necessary to offset the current 2,200 tons/year salt loading.

Water Rates

The Zone 7 treated water rates are reviewed and adjusted as needed annually. Rates are set to cover system operations and maintenance (O&M) costs including such items as labor, utilities, chemicals, and repair and replacement capital costs.. The Zone7 cost of water management and water quality monitoring is generally split between treated and untreated water rates with the majority of funding from treated water rates. Table 11.1 lists the treated (Potable) and untreated (non-potable) water rates for 1998-2003.

Table 11.1

Year	Treated water rate, $/AF	Untreated Water Rate, $/AF
1998	$508	$50
1999	$528	$52
2000	$539	$52
2001	$539	$64
2002	$548	$86
2003	$562	$72

Cost Allocation Options

Various options were analyzed and presented to the GMAC and TAG groups to determine how to most equitably distribute the cost of mitigating the existing 2,200 tons/year salt loading. Initial discussions explored the feasibility and practicality of allocating costs based on each water retailer's relative percent contribution of salt to the main basin. This approach had a "first blush" appeal, similar to the "polluter-pays-principle." However, as is evident in the salt balance calculations (Table 5.2), there are numerous sources of salt, each of varying degrees of controllability, with many of them "natural" (e.g., subsurface inflow) or a function of managing the main basin water balance (i.e., artificial recharge).

There are also multiple existing salt removal mechanisms such as groundwater pumping and mining export that provide benefits versus impacts to the main basin. Therefore, an equitable pay by relative contribution cost allocation strategy would need some means to account for both impacts from those contributing to the problem and benefits to those contributing to the solution.

Relative Impact Allocation Approach—One highly simplified approach that was briefly explored was to assess the retailers for salt management costs based on the percentage of main basin salt loading occurring within their geographic service areas, assuming that all salt loading was proportional to treated water delivery volumes (which is not the case). This conceptual approach ignores actual salt sources and removal mechanisms and simply assigns responsibility based on the relative amount of water delivered, irrigated area, and the acres of different percent salt impact zones in each service area.

Table 11.2 presents the conceptual salt load impact distribution calculated in this manner by the purveyor. The 1997 land use map was used to calculate the urbanized area within each service area. The percentage of irrigated area within the urbanized areas and the TDS of the irrigation water was assumed to be the same in all four service areas.

The impact zone map (Figure 11.2) was then used to determine the percent of the total urban acreage in each service area that was in each of the percent impact zones. The overall average percent impact for each service area was then calculated based on the

Table 11.2
Existing Salt Loading Distribution
Urban Applied Salt Loading by Water Purveyor

	1997 Urban Service Area Impact Zones by Percent of Acres [1]				1997 Average	1997 Zone 7	Adjusted 100% Impact	Salt Load Impacting Main Basin by Purveyor	
	0%	33%	67%	100%	Impact	Deliveries AF	Deliveries AF	tons [2]	% of total [4]
Pleasanton	36%	4%	2%	59%	61%	13550	8246	1170	53%
CWS	20%	1%	7%	72%	77%	7400	5710	810	36%
Livermore	18%	68%	0%	13%	36%	4900	1758	250	11%
DSRSD	100%	0%	0%	0%	0%	4600	0	0	0%
Total (Acres)	7023	2299	482	8634	53%	30450	15715	2230 [3]	100%

1. Based on "Salt Impact Zone" map (Figure 11.2)
2. Estimated tons of salt from each purveyor impacting main basin assuming that demand is similar for all urban service areas
3. Total Salt loading to main basin from urban deliveries based on 1997 Main Groundwater Basin Salt Balance calcuations
4. Percent of total salt impacting main basin that each purveyor is responsible for

Note: Over time as development occurs, the percent of each purveyor's service area that is in each of the impact zones may change. As this occurs, the percent of salt that each purveyor contributes toward the total salt load impact on the main basin may also change. The values shown in this table, should be considered rough estimates for the 1997 water year.

relative number of acres overlying the four percent impact zones. Pleasanton and Cal Water show the highest average impacts (61%, 77%) since much of their service area is over the 100% impact zone (i.e., over the main basin).

The average impact percent was then multiplied by the Zone 7 deliveries to each purveyor to obtain the actual volume of water impacting the main basin in each service each. These volumes, expressed as a percentage of the total 15,715 AF calculated to be impacting the main basin, are then assumed to reflect the relative percent of the total 2230 tons of salt contributed by each purveyor.

Under this string of assumptions, Pleasanton would be viewed as responsible for the greatest proportion of existing salt loading (53% or 1170 tons). This is due to the city's 61% average impact zone acreage and to the fact that Pleasanton also delivers the most water (nearly twice that of the next largest purveyor, CWS). At the other end of the spectrum, DSRSD's deliveries would be considered as having 0% impact since all of the DSRSD service area is within the zero impact zone.

There are numerous limitations to using an approach such as this as the basis for allocating costs. As noted above, this approach does not have a linkage to the complex real world conceptual model of salt loading sources and removal mechanisms. It does not assess responsibility for "natural" salt sources. If one were to use this percent impact zone approach, should, for example, DSRSD be assessed for subsurface inflow impacts from the Dublin sub-basin since the Dublin sub-basin is in its service area? Should the mining companies be given salt credits for the salt in the mining pumpage that is exported out of the valley?

A more sophisticated geographically-based salt loading allocation approach could certainly be developed than the simple example presented here. Taken to the extreme, such an approach would require tracking loading and allocating costs on a parcel-by-parcel basis. Since land use changes every year and the above calculations would be very complex to complete more comprehensively and accurately, it would require a significant effort every year to estimate costs to allocate. This effort would add to the actual salt management cost. The TAG generally agreed that this approach to cost allocation would not only be burdensome to administer but that it would be difficult to equitably balance costs and benefits.

The Zone 7 Board Groundwater Committee indicated that they were not in favor of a cost allocation approach where water bills would become as complicated as phone bills. Allocating costs differently to different retailers would also be contrary to historic Zone 7 practices of melding most other costs and having one treated water rate for all customers.

Another limitation of this approach is that it does not reflect the fact that all parties benefit from use of the groundwater basin (particularly during drought). Thus there is value and, therefore, should be some dollar amount worth paying by all users to ensure that acceptable groundwater quality is maintained.

This approach also does not reflect the benefits to near-term delivered water quality that would result from implementation of salt management strategies such as Strategy 15 that includes wellhead demineralization (see sections 10.4 and 10.5). The candidate wellhead demineralization facilities are proposed to be located in the western portion of the valley where they would primarily benefit Pleasanton and DSRSD. Under the above cost allocation approach, DSRSD would not accrue costs, but would receive a high proportion of the near-term benefits through lower TDS delivered water quality. CWS would accrue the second highest costs (based on Zone 7 water purchases) but receive minimal benefits from the demineralization facilities. Chapter 10 presents in more detail the relative delivered water TDS impacts to each retailer under dry, average and wet year conditions assuming Strategy 15 with wellhead demineralization were to be implemented.

Melded Cost Allocation Approach—A simpler, and arguably more equitable cost allocation approach, would be to simply meld salt management O&M costs into the treated water rates. Table 11.3 and Figure 11.3 show (as an example) the components of 1998/99 treated water rates modified as if they were to include salt management as a cost component. This example assumed that a combination of increased conjunctive use and shallow groundwater wellhead demineralization would be used (similar to Strategy 15A) to offset the current 2,200 TPY salt loading. This example also assumes that costs for operating these facilities would be allocated solely to salt management (although costs could be allocated at least in part to normal operations for the lower TDS water quality benefits that would be provided). This example assumes that annual chemical, power, and labor costs would increase by $1,000,000, equivalent to about $29/AF treated water produced and a 5.7% rate increase.

Actual salt management costs would depend on annual decisions about how to operate most cost effectively to achieve the SMP goals in a given year (per the adaptive management approach described in Section 12.5).

The existing salt loading can be offset by operating the already planned and funded Zone 7 conjunctive use and demineralization facilities. Since 1994, connection fees collected by Zone 7 included monies for 18 to 20 new wells and a 3 million gallon per day wellhead demineralization facility. To ensure a high quality water supply, a groundwater demineralization project was first approved by the Zone 7 Board as part of the Water Supply and Water Quality Improvements in 1987.

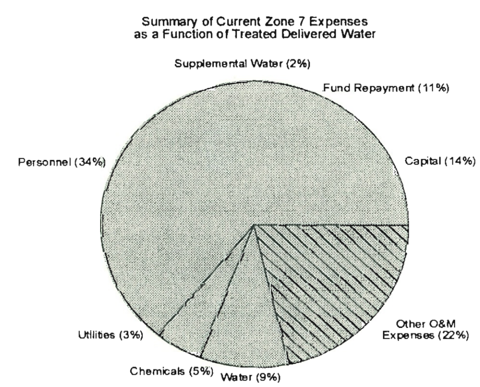
This decision was based on the knowledge that as water demands increased over time, groundwater pumpage would need to be increased, thereby reducing the ratio of surface water to groundwater and increasing the TDS in the delivered water. The demineralization facility would serve to help maintain delivered water quality and help equalize the quality of water delivered between the east and west sides of the Livermore-Amador Valley. The conjunctive use and demineralization capital facilities are planned to be constructed over the next several years as part of the Zone 7 capital improvement/expansion program.

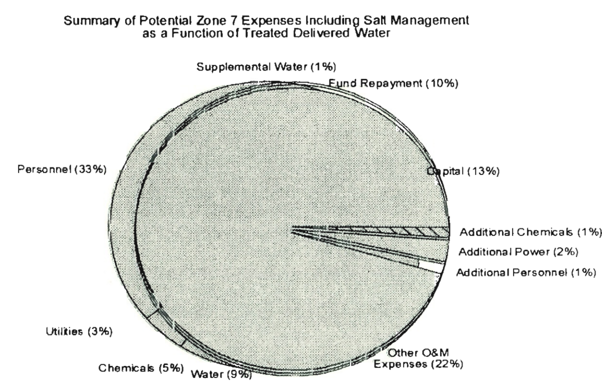
Table 11.3
Summary of Zone 7 Expenses as a
Function of Treated Delivered Water Rate

	FY98/99		
	Estimated Costs		
Expense	Millions $	$/AF Treated Water	% Treated Water Rate
Capital Projects	2.2	70	14%
Fund Repayments	1.75	56	11%
Supplemental Water	0.25	8	2%
Operating Expenses			
Personnel	5.5	175	34%
Maintenance	1	32	6%
Utilities	0.5	16	3%
Chemicals	0.8	25	5%
Water	1.5	48	9%
Professional Services	0.95	30	6%
Other Services	1	32	6%
Bonds	0.5	16	3%
Subtotal	15.95	508	100%
Salt Management[1]	1.01	29	5.7%
Total	16.96	537	

1. Example Potential Cost

Figure 11.3





GMAC and TAG Recommendations—Both the GMAC and TAG agreed that the existing 2,200 ton per year salt load could and should be handled by using currently planned and funded Zone 7 capital facilities. They also recommended that the annual operations and maintenance costs be melded into the treated water rates. The TAG supported equal instead of stratified cost increases and gradual (i.e., 1-2%/year) increases instead of a 5-7% increase in one year. Toward that end the TAG supported increasing water rates sooner rather than later, as long as the funds were dedicated to future salt management costs.

11.4 New Urban Development (M&I) Salt Loading

As discussed in Chapter 7, the recommended fundamental salt management strategy is that there be no net increase in salt loading to the main basin. This policy implies that new development will be required to fully offset any resulting salt impacts. To maintain no net increase in salt loading to the Main Basin, it is projected that approximately 3,200 tons per year of additional salts must be offset by 2010, possibly sooner. The currently planned capital facilities have some excess capacity and can be operated to mitigate some of the new development induced increase in salt loading beyond the existing 2,200 tons per year. While there would not be any additional capital costs required for this, there would be an increase in the annual operations and maintenance costs.

When the salt loading exceeds the capacity of the facilities Zone 7 is already planning to construct, additional facilities will need to be available. For example, by the time the mining companies cease operations, an estimated additional 2 mgd of demineralization capacity would need to be available to offset the increased salt loading due to the loss of the mining pumpage export of salts.

Capital facilities are funded through the connection fee program. Connection fees can be adjusted as needed, and it is assumed that they will continue to be collected to construct the required facilities. This is consistent with Zone 7 Board policy to revisit the connection fee program in accordance with new planning studies. Any new charges determined to be necessary to maintain delivered water quality beyond those currently being collected would presumably be charged based upon apportioning the cost of the expansion projects among new users. This method would be consistent with the Zone 7 Board's historic policy of not burdening existing water users with the cost of future water supplies.

Annual operations and maintenance (O&M) costs associated with future M&I salt loading were assumed to be melded into the treated water rates and paid by all treated water users. Annual wellhead demineralization costs would be primarily a function of the volume of groundwater that needs to be demineralized to meet delivered water quality and salt loading goals. During wet years the facilities may only need to be operated for limited periods, for example during groundwater pumping to meet peak summer demands. During dry years, and in future years as mining exports decrease, the facilities would need to be operated for longer periods of time and/or at higher rates. Such changes in O&M

costs were assumed to be incorporated as appropriate as part of Zone 7's annual review and adjustment of water rates.

TAG Recommendations—The TAG supported funding capital and O&M costs for facilities to offset future M&I usage derived salt loading in the same manner as funding facilities to offset existing salt loading (i.e., via connection fees and water rates, respectively). As an alternative funding mechanism, the TAG recommended considering capitalizing 10-20 years of operations and maintenance costs onto connection fees. Some members of the TAG also recommended that consideration be given to a fee structure that would ensure that connection fees and annual O&M costs be assigned equitably to all (both treated and untreated water) customers relative to their contributions to the salt loading.

11.5 New Agricultural Development (Untreated Water) Salt Loading

Limited discussions were held with the TAG regarding alternative measures to allocate capital and O&M costs associated with salt loading from potential new agricultural development. The TAG felt that Zone 7 needed to first finish its investigations into how to best meet, and the facilities needed to accommodate, future untreated water demands. However, since agricultural irrigation does contribute a (small) percentage to the existing salt loading, the TAG did recommend melding a proportionate cost (to be determined) onto the untreated water rates. Until some of these other decisions are made, the salt loading impacts of new agricultural irrigation projects will continue to be evaluated and addressed on a case-by-case basis.

11.6 Recycled Water Irrigation Salt Loading

Numerous studies of potential recycled water irrigation projects in the valley have been conduced over the years. As discussed in Section 6.6, there is a large potential demand for recycled water. However to date, very few projects have been implemented, due in part to concerns about managing the resultant salt loading. Three options were developed and reviewed with the TAG for allocating costs of managing salt loading from recycled water irrigation projects.

Option 1—The first option was based on the philosophy that "water is water and salt is salt" and, therefore, recycled water salt loading should be treated the same as M&I salt loading. Under this approach, recycled water would be viewed simply as another source of supply and used to accommodate future demand either directly or by freeing up treated water. Consistent with M&I salt management, capital and O&M costs for facilities to offset future recycled water salt loading would be funded via connection fees and treated water rates, respectively. This first approach offers some potential for economies of scale to the extent that larger centralized facilities (e.g., demineralization) could be used, assuming that Zone 7 would be responsible for all salt management activities. This approach would likely be simpler to administer with only one entity responsible for tracking and managing salt loading.

Given that wellhead demineralization is being proposed to provide the majority of salt management in this SMP, option 1 may result in better delivered water quality to the extent other approaches to salt management were implemented by others. For example, irrigation with demineralized recycled water would provide net salt removal benefits (see Section 11.7) but would not provide delivered water quality benefits. Reductions in delivered water TDS from wellhead demineralization will also result in lower recycled water TDS and resultant salt loading.

Option 2—A second option would be for the irrigation recycled water purveyors (who may be the same as the retail potable water purveyors) to pay to offset salt loading above a specified delivered water quality baseline. For example, if Zone 7 treated water has 325 mg/L TDS and recycled water has 750 mg/L TDS, then salt loading impacts from 325 mg/L treated water TDS would be assigned to the potable water purveyor while the salt loading impacts from the additional 425 mg/L TDS in the recycled water would be assigned to the recycled water purveyor.

This second option would be consistent with existing agreements between DERWA and ACWD for salt mitigation. It allocates the incremental salt loading costs to recycled water users/purveyors rather than spreading them across all treated water users as under the first option. From one standpoint this approach could be perceived as more equitable. However, that same logic could lead to the implication that Zone 7 should have different rate structures for users depending on TDS content of its other sources of supply. This would be a more administratively complex option to implement.

Option 3—A third option would be for the irrigation recycled water purveyors to pay for mitigating the full salt loading impacts (750 mg/L in the above example) of their recycled water usage. Potential demineralized recycled water injection projects would generate salt credits (see below) given that they would produce and recharge water with a TDS less than (typically in the 100 mg/L range) the treated water baseline of 325 mg/L.

Option 3 would increase the cost of non-demineralized recycled water irrigation projects and as such be a disincentive to greater recycled water use. Salt management costs would be borne by wastewater ratepayers, not all of who would necessarily be receiving the salt management program benefit of stabilized/improved groundwater quality.

Given the high costs (both actual and administrative) of offsetting salt loading on a project by project basis (see Section 11.7 below), protracted discussions could ensue on each project regarding the salt loading assumptions and calculations, the amount of salt reaching the main basin that needs to be offset, how the offset would be accomplished and tracked, and when the offset would be required to be in place. One potential positive impact of Option 3 would be that it would tend to encourage recycled water purveyors to pursue wastewater TDS reduction measures (e.g., public education about the negative impacts of regenerative water softeners) to reduce recycled water TDS levels and thus salt loading offset costs.

TAG Recommendations—The TAG opinion of recycled water salt management evolved as additional information was developed during preparation of this SMP. Initially some concerns were raised about equity and whether by melding costs into the Zone 7 water rates (Option 1) those irrigating over the fringe basins and not impacting the main basin would be subsidizing others. A counterpoint raised was that not all purveyors use or benefit from all of Zone 7's existing infrastructure. It would be a significant change in policy and administratively complex to institute a system where capital and operational costs of new facilities would be allocated on the basis of their use by, or benefit to, an individual purveyor.

Most TAG members agreed with the general principal that customers that do not share in salt management costs should not share in the benefits of the groundwater basin. Some differences remained given the precedent of the DERWA/ACWD agreement (Option 2) and the desire for flexibility and independence from Zone 7 (Option 3). There was general agreement that Option 1 would be appropriate at such time as Livermore, Pleasanton, and DSRSD were distributing similar amounts of recycled water (with similar impacts on the main basin).

The general consensus reached by the TAG was to proceed with an approach resembling a combination of Options 1 and 2. Under this scenario, Zone 7 would nominally be responsible for managing recycled water salt loading, but recycled water purveyors would have the option of opting out and implementing their own offsetting salt management measures on a project-by-project basis.

Section 11.7 below presents the conceptual approach developed with the TAG for assessing project-by-project salt loading and salt credits. This approach is based on the net difference in TDS concentration in the applied or injected water that a project causes. Any excess salt credits generated by individual projects would be available to be used/traded to offset other costs or other project's salt loading.

For non-Zone 7 sponsored salt management projects it was proposed that Zone 7 would provide a rebate/credit for tons of salt removed based on either 1) Zone 7's long-term average melded salt management costs ($/ton removed), or 2) Zone 7's annual projected salt management O&M costs (i.e., recalculated each year based on combination of available salt management strategies used).

Table 11.4 presents a summary of the proposed salt management cost allocation approach by the source water responsible for the salt loading (existing M&I, future M&I, untreated, and recycled). Additional commentary on cost allocation and related issues was provided at the September 3, 1998 workshop SMP briefing by the DSRSD, Pleasanton, Livermore, and Cal Water senior water/wastewater and public works managers. Table 12.4 summarizes the highlights from that meeting. Detailed meeting notes are included in Reference Q.

Table 11.4
FUNDING STRATEGY
FOR ZONE 7 SALT MANAGEMENT PROJECTS
BY SOURCE OF SALT LOADING

Funding Source	Existing M&I Water		New M&I Water		Untreated (non-potable) Water		Recycled Water	
	Capital Facilities	*Annual O&M*	*Capital Facilities*	*Annual O&M*	*Capital Facilities*	*Annual O&M*	*Capital Facilities*	*Annual O&M*
Treated (potable) Water Connection & Replacement Fees	X		X		X		X	
Treated (potable) Water Rates		X		X		X		X
Untreated (non-potable) Water Connection Fee					Option [1]			
Untreated (Non-Potable) Water Rates						Option [1]		
Recycled Water Purveyor Rates							Option [2]	Option [2]

1) Zone 7 has the discretion to assess.

2) Recycled Water Purveyors have the option to implement their own salt loading offset measures.

11.7 Future Individual Project Salt Loading Impact and Cost Calculation Method

This section presents an approach for assessing the salt loading and salt credits from future individual projects. The fundamental assumption underlying this approach is that existing and future salt impacts are to be fully mitigated so that there is no net increase in salt loading to the Main Basin (Fundamental Salt Management Policy Option 3 from Figure 7.1).

Method for Assessment of Salt Loading

There are four steps to assessing the salt impacts of a project:

Step 1—Identify the project type and "netting" equation. As shown in Table 11.5, there are three general project categories. The first category includes existing potable irrigation sites that would be retrofitted to use recycled water or changed over from treated water to groundwater. The second category includes new municipal or agricultural development projects that are not currently irrigated and would be irrigated with either potable, untreated, or recycled water, or possibly a combination. The third category of projects includes all salt management projects. These projects generate salt credits by operating in a manner that results in a net removal of salts from the basin.

Step 2—Determine the change in TDS concentration ("netting equation") resulting from the project. An existing irrigation site being changed from treated water (325 mg/L) to recycled water (750 mg/L) would result in a net increase in TDS of 425 mg/L. A new development irrigated with recycled water would represent a net increase of 750 mg/L since the site wasn't irrigated previously.

A shallow groundwater wellhead demineralization project would provide a net TDS decrease and salt credits of 900 mg/L since the 1,000 mg/L shallow groundwater would be demineralized to 100 mg/L. A groundwater export project pumping 1,000 mg/L TDS water from the upper aquifer of the main basin would provided 750 mg/L credits since that water has to be replaced with 250 mg/L surface water. A groundwater export project pumping 1,000 mg/L TDS water from a fringe basin that doesn't otherwise reach the main basin would provide 1,000 mg/L fringe basin credits since that water does not have to be replaced with 250 mg/L surface water. Note that this fringe basin credit cannot be used directly to offset main basin loading.

Based on the net change in TDS concentrations as shown in Table 11.5, one can calculate the concentration based gross salt loading or salt credits. These should be considered typical concentrations to be used for comparative purposes. Actual net TDS concentrations would be determined on a project-by-project basis.

Step 3—Determine the percent of salt loading from the project that impacts the Main Basin. Figure 11.1 shows the 0, 33, 67, and 100 percent impact zones mapped based on current basin knowledge. Figure 11.1 can be used to determine the appropriate factor to apply to the calculated gross salt load (from Step 2) to estimate the net salt load to the Main Basin.

Step 4—Calculate the tons of net salt loading. For irrigation projects, multiply the net concentration based impact (from Step 3) by the project irrigated acreage and estimated unit irrigation rate in AF/acre/year and appropriate conversion factors to obtain the tons/year of net salt loading (or credit). For salt credit projects such as wellhead demineralization, the net concentration based impact would be multiplied by the volume produced and conversion factors (0.00138) to obtain the tons/year of salt credit.

Table 11.5 Future Individual Project Salt Loading Impact and Cost Calculation Method

Project Type	Project Description	Source Water TDS (mg/L) Original Quality	Final Quality	Net Change
Existing Irrigation & Retrofit RW Projects	Treated to Recycled Water	325	750	425
	Groundwater to Recycled	450	750	300
	Treated to Groundwater	325	450	125
Future Irrigation Projects	New Recycled Water	0	750	750
	New Groundwater	0	450	450
	New Treated Water	0	325	325
	New Untreated Water	0	250	250
Salt Credit Projects	Wellhead Demineralization (lower aquifer)	450	100	-350
	Wellhead Demineralization (upper aquifer)	1000	100	-900
	Conjunctive Use (stream recharge)	450	250	-200
	Conjunctive Use (injection well)	250	250	0
	GW Export (upper aquifer)	1000	NA	-750
	GW Export (fringe basin)	1000	NA	-1000
	RO Recycled Water Injection	450	100	-350

Assumptions:
TW: Zone 7 treated water, 325 mg/L TDS
Untreated: SBA untreated water, 250 mg/L TDS
GW: Groundwater, 450 mg/L TDS
RW: Recycled water, 750 mg/L TDS
RO Recycled Water Injection water, 100 mg/L TDS
Wellhead Demineralization water, 100 mg/L TDS

Example Project Salt Loading Calculations—Table 11.6 below shows examples of how these four steps would be followed to assess individual irrigation project's salt loading to the Main Basin.

Table 11.6
Example Main Basin Salt Loading
Assessment Calculations

A. **Pleasanton Sports Park or Robertson Park**
   1. Convert from Zone 7 treated water to recycled water;
   2. Gross 425 mg/L increase (750 - 325 mg/L);
   3. 100% impacts main basin;100% x 425 mg/L=425 mg/L net impact;
   4. 100 acres x 2 AF/ac/yr = 200 AFY x 425 mg/L = 120 tons/yr

B. **Triad Business Park or New East Dublin Park**
   1. New development recycled water use site;
   2. Gross 750 mg/L increase (750 - 0 mg/L);
   3. 33% impacts main basin;33% x 750 mg/L = 250 mg/L net impact;
   4. 100 acres x 2 AF/ac/yr = 200 AFY x 250 mg/L = 70 tons/yr

C. **Dublin Sports Park**
   1. Convert from Zone 7 treated water to recycled water;
   2. Gross 425 mg/L increase (750 - 325 mg/L);
   3. 0% impacts main basin;0% x 425 mg/L = 0 mg/L net impact

D. **New Residential Irrigation above Main Basin**
   1. New development treated water irrigation;
   2. Gross 325 mg/L increase (325 - 0 mg/L);
   3. 100% impacts main basin; 100% x 325 mg/L = 325 mg/L net impact;
   4. 100 acres x 2 AF/ac/yr = 200 AFY x 325 mg/L = 90 tons/yr

Example Individual Project Salt Management Cost Calculation—Chapter 8 reviewed the range of salt management strategies available including conjunctive use, wellhead demineralization, and seasonal groundwater export. Table 8.14 presented the unit salt removal O&M costs for each strategy ($/ton removed). Here, once the tons of net salt loading from an individual project have been calculated and a salt management strategy selected, the cost of the offset can be determined. In example D above, the net salt loading resulting from a new residential development with 100 irrigated acres located above the Main Basin was estimated to be 90 tons per year. If wellhead demineralization of shallow wells was selected as the salt management strategy, the offset cost would be 90 tons/yr x $350/ton = $31,500/yr. If wellhead demineralization of deep wells were selected instead, the unit cost would increase to $910/ton, for an offset cost of $81,900/yr.