4 Basin Evaluation Programs

4.1 Recharge Calculations

4.1.1 Introduction

Main Basin aquifers are recharged by partial percolation of rainfall, applied water, stream flow, and subsurface inflow. Zone 7 calculates the recharge for each of these natural, sustainable yield components as follows:

- **Stream flow recharge** includes the following components:

    - **Natural stream recharge** - rain runoff into the streams, including both urban and rural runoff from over the groundwater basin and upper watershed runoff that recharges into the streambeds downstream. This also includes the water releases into the Arroyo Valle below the Del Valle Dam to satisfy Zone 7's Water Rights requirements.

    - **Artificial stream recharge** - SBA or Lake Del Valle water that Zone 7 releases into the streams.

    - **Arroyo Valle Prior Rights Recharge** – recharge that would have occurred if Lake Del Valle had not been constructed.

    - **Gravel-mining discharge into streams** - gravel mining pit water that mining companies discharge into the streams.

    Streambed recharge is calculated from daily stream flow and stream discharge records. The three primary recharge streams (Arroyos Valle, Mocho, and Las Positas) have gages upstream and downstream of the reaches in which recharge occurs. Recharge typically is calculated as the difference between upstream inflows and downstream outflows.

- **Rainfall recharge** and **applied water recharge** are calculated monthly using results from the climatological and land use monitoring programs. The calculations include rainfall, evapotranspiration, soil moisture capacity, growing season, irrigation efficiency, runoff, and land-use characteristics.

- **Subsurface inflow**, which occurs primarily in the upper aquifer, is estimated based on gradients across the Main Basin boundaries, aquifer structure, and the hydraulic conductivities of the aquifer sediments.

4.1.2 2009 Recharge

The monthly recharge volumes for rainfall, stream, and applied water are shown on Table 4.1-1. These volumes are used to calculate the Groundwater Storage (Section 4.2). The total recharge volumes for the 2009 Water Year were:

- **Natural Stream Recharge (not including Arroyo Valle Prior Rights)**: 5,317 AF (92% of normal; compared to 5,361 AF in 2008)
- **Arroyo Valle Prior Rights:** 1,247 AF (139% of normal; compared to 306 AF in 2008)
- **Artificial Stream Recharge:** 3,984 AF (46% of normal; compared to 2,229 AF in 2008)
- **Rainfall Recharge:** 27 AF (1% of normal; compared to 1,092 AF in 2008) – only in March 2009 was there enough precipitation and simultaneous low evaporation for rainfall recharge to occur.
- **Applied Water Recharge (irrigation):** 1,720 AF (115% of normal; compared to 2,021 AF in 2008)
- **Subsurface Inflow:** 1,000 AF (assumed to be constant from year to year).

For the 2009 Water Year, total natural recharge was about 9,117 AF (8,575 AF in 2008 Water Year), approximately 74% of normal.

4.2 Groundwater Storage

4.2.1 Introduction

Zone 7 computes the end-of-water-year storage for the Main Basin using two methods:

- Nodal Groundwater Elevations (NGE, Section 4.2.2)
- Hydrologic Inventory (HI, Section 4.2.3)

The Main Basin Storage is then calculated by averaging the two storage volumes determined by the two respective methods. Starting around 2000, the difference between the storage volumes from these two methods began to increase. Since 2007 the calculations methods have been significantly changed to

improve the agreement between the NGE and HI methods. These are discussed in detail in the 2008 Annual Report for the Groundwater Management Program (*Zone 7, 2009*) and in Sections 4.2.2 and 4.2.4 below.

4.2.2 Nodal Groundwater Elevation Method

For the NGE method, the Main Basin is divided into polygonal areas referred to as nodes. Each node has its own set of hydrogeologic parameters, such as storage coefficient, nodal thickness, and nodal area (Table 4.2-1 and Figure 4.2-1). The saturated thickness of the node is calculated using the nodal thickness, average groundwater elevations from the fall semiannual measuring event, and storage coefficient. The groundwater storage of each node is then calculated by multiplying the saturated thickness by the total area of the node. The total Main Basin groundwater storage is equal to the sum of all the nodal storage values for the 22 nodes in the Main Basin.

Starting in 2007, the following revisions and recalibration techniques have been made to the NGE method because NGE storage volumes were significantly higher than those measured by the HI method:

- Nodes were split into upper and lower aquifers, each with confined (Specific Storage) and unconfined (Specific Yield) storage coefficients (Table 4.2-1).
- Elevations of the tops and bottoms of the nodes were converted from NGVD29 to NAVD88.
- The upper aquifer confining layer presented in Figure 2.2-2 was included in the calculations such that if water levels in the upper aquifer went above the bottom of the confining layer, the aquifer was assumed to be confined.
- For data from 1992 and 2006, nodal groundwater elevations were recalculated based on all water levels measured in a specific node and aquifer (previously only a few wells per node were selected). For data since 2007, GIS was used to identify the average groundwater elevations for each node.
- Zone 7's groundwater model (Section 4.4.1) was used to calibration the confined and unconfined storage coefficients.
- The nodal areas for Nodes 15 and 16 were revised due to minor adjustments made to the location of northwestern Main Basin boundary as a result of a recent study.
- Groundwater elevations from the NGE method were compared to water levels from the groundwater model, estimated water levels from the HI method, and Key Well elevations.

These revisions and recalibration techniques were used to recalculate storage volumes for all years for which adequate data for both the upper and lower aquifers was available (1992 to present). Therefore, end of Water Year groundwater elevations and nodal storage volumes are shown on two separate tables: Table 4.2-2 includes data from 1963 to 1991 and Table 4.2-3 for data from 1992 to present.

4.2.3 Hydrologic Inventory Method

The HI method for determining basin storage calculates the difference between groundwater supply and groundwater demand. The difference between supply and demand is the net recharge, which is added/subtracted to the previous year's ending storage value to arrive at the current year's ending storage value. The calculations assume 212 thousand acre-feet (TAF) of storage at the beginning of the 1974 Water Year (from *DWR, 1974*). The five groundwater supply components used to replenish the groundwater reserves are:

- Natural stream recharge;
- Artificial stream recharge;
- Rainfall recharge;
- Applied water recharge; and
- Subsurface groundwater inflow.

The four groundwater demand components which draw down the groundwater reserves are:

- Municipal pumping;
- Agricultural pumping;
- Gravel mining water use; and
- Groundwater basin overflow.

Each of the supply and demand components are monitored as part of a monitoring program or calculated using the results of a monitoring program.

The results of the calculations for the 2009 Water Year are presented in Table 4.2-4 and discussed in Section 4.2.4.

4.2.4 2009 Storage Calculations

Nodal Groundwater Elevation (NGE) storage calculations before 1992 were calculated assuming a constant storage coefficient for the entire node. Table 4.2-2 shows NGE groundwater elevations and storage volumes for 1963 to 1991. Table 4.2-3 shows the groundwater elevations and storage volumes for 1992 to 2009 using the NGE method revised in 2008. Figure 4.2-1 shows the upper and lower aquifer groundwater elevations used to calculate the NGE Method storage for the 2009 Water Year and includes the mean groundwater elevations for each node as calculated by GIS (using *ArcGIS Spatial Analyst*

extension). The results of the Hydrologic Inventory (HI) method for the 2009 Water Year are shown in Table 4.2-4. Historical HI method results from 1974 to 2009 are shown on Table 4.2-5 and Figure 4.2-2.

The NGE method measured a total storage of about 215,541 AF. The HI method measured a drop in storage by 11,483 AF since 2008, resulting in a total storage of about 192,460 AF (203,943 AF in 2008). Therefore, the 2009 Water Year total groundwater storage, which is calculated as the mean of the two methods, is 204 TAF (Table 4.2-4).

One of Zone 7's groundwater basin management objectives is to maintain water levels above historical lows to minimize the risk of inducing land subsidence. Therefore, not all of the total groundwater storage is available for use. 'Operational' or 'Available' Storage (Table 4.2-4, Table 4.2-5, and Figure 4.2-2) represents the approximate amount of storage available above the historical low groundwater surface. The remainder (approximately of 128 TAF) is estimated reserves stored below historical lows. Available storage for the 2009 Water Year is about 76 TAF, which is about 60% of the historical maximum (126 TAF for the 1983 Water Year).

This year Zone 7 continued its reevaluation of both calculation methods to investigate if the NGE method was overestimating the storage, if the HI method was underestimating storage, or a combination of both. Figure 4.2-3 shows graphs of total storage for the 1974 to 2009 for both the NGE and HI methods. The graph suggests that since 1992, both methods are in relatively close agreement except for a few single years (e.g., 2002, 2008). Zone 7 staff will continue to evaluate the method calibration by focusing on possible reasons for this significant difference during these years. This evaluation may include:

- Identifying possible sources of water not included in the HI method (e.g., subsurface inflow from the northeastern or southern boundaries of the Main Basin) or existing calculations that may be under-estimating inflow (e.g., recharge calculations).

- Reviewing HI calculations for those years when the two methods do not agree.

- For those years when the two methods do not agree, comparing HI Method changes to Nodal groundwater elevations to isolate possible areas/nodes where the methods most disagree.

- Transferring previous gradient maps to *ArcGIS* and calculate average nodal groundwater elevations using the same method as that used since the 2007 Water Year.

- Revising NGE storage coefficients as new data becomes available and the groundwater model is improved.

- Reviewing the aerial recharge calculation method which may be underestimating rainfall recharge in the HI Method.

4.3 Salt Loading Calculations

4.3.1 Introduction

Zone 7's salt loading calculations take into account the addition and removal of minerals in the Main Basin by tracking the salt mass associated with the recharge and discharge components of the Hydrologic Inventory. In general, salts are added to the Main Basin through the recharge and application of water from:

- Natural stream recharge;
- Artificial supplemental stream recharge;
- Applied water (irrigation) recharge; and
- Subsurface groundwater inflow.

Salts are concentrated primarily through the evapotranspiration of irrigated waters. Salts are removed from the Main Basin through:

- Wastewater export where a portion of the export includes pumped groundwater;
- Reverse osmosis treatment of groundwater pumped from the Mocho Wellfield. This is a new feature that began in 2009 (Section 5.2.3). The salts stripped from the source water are exported from the Valley via a treated wastewater export line that discharges to the San Francisco Bay;
- Mining area discharge and export; and
- Groundwater basin overflow.

Furthermore, evaporation of groundwater in the mining area ponds has the effect of concentrating salts in the Main Basin as water is removed but the associated salts are left behind.

It is important to recognize that these salt loading calculations for the Main Basin are based on salt loading at the ground surface and expressed as a basin-wide cumulative change in salt concentration. For the salt loading calculations, salt concentrations are represented by the average Total Dissolved Solids (TDS) concentrations of each inflow and outflow component of the Hydrologic Inventory.

4.3.2 2009 Salt Loading

Hydrologic conditions and water operations in the 2009 Water Year resulted in a net calculated increase of approximately 2,608 tons of salt to the Main Basin (3,361 tons in 2008), after accounting for the 798

tons of salt removed by Zone 7's new demineralization plant (Section 5.2.3). The weighted average TDS concentration of all the waters recharging the Main Basin's aquifers in the 2009 Water Year was 837 mg/L, whereas the average TDS of the extracted groundwater was 459 mg/L. The inflow/outflow water and salt loading calculations for the 2009 Water Year are summarized on Table 4.3-1. Historical salt loading results from 1974 to 2009 are shown on Table 4.3-2. Figure 4.3-1 shows several graphs depicting the salt loading and its affect on the basin over time. It also includes a bar graph of net groundwater recharge (Graph 4) for comparison with the salt loading.

- **Graph 1** depicts the historical 1974-2009 cumulative salt load calculated in the Main Basin. Since 1973, about 85,754 tons of salt have been added to the Main Basin. This is equivalent to an average increase of about 2,400 tons of salt per year.

- **Graph 2** shows theoretical basin-wide average TDS concentrations over time starting with an initial basin storage volume of 212 TAF and a TDS concentration of 450 mg/L at the beginning of the 1974 Water Year. It also assumes that all of the subsequent net salt load impacts groundwater. Based on these assumptions, and the salt loading shown in Graph 1, the annual theoretical TDS of the groundwater basin as a whole has increased about 9.8 mg/L per year from 1974 to 2009. However, it has increased by about 42 mg/L per year over the last three years due to the reduction in recharge of lower TDS waters (i.e., rainfall recharge, and natural and artificial stream recharge waters) over this period.

- **Graph 3** presents the trend of average actual TDS concentrations in the Bernal, Amador, and Mocho II Subbasins aquifer wells. These graphs suggest that the majority of the impact of the long-term salt increase has been in the Bernal Subbasin. In the Amador and Mocho II Subbasins, where a major source of inflow is the lower TDS imported water that artificially recharges along the Arroyo Mocho and Arroyo Valle, the long-term TDS concentrations have remained relatively constant. The effects of varying artificial recharge in the Arroyo Mocho are evident over the last two years. In 2008 when there was no artificial recharge on the Arroyo Mocho, the average salt content increased significantly in both the Amador and Mocho II Subbasins. In 2009 however, there was recharge on the Arroyo Mocho, the majority of which recharged into the Mocho II Subbasin. As a result, the average salt concentration in the Mocho II Subbasin dropped sharply, while the average salt concentration in the Amador Subbasin continued to increase.

- **Graph 4** shows the net groundwater recharge/discharge for each year. When compared to Graphs 1 and 2, certain relationships between salt loading, water quality and recharge/discharge can be seen. When Main Basin storage increases over a period of several years, salt loading accelerates whereas average TDS increases slowly or reverses. This is because recharge water brings much salt to the basin; however, it comes in lower concentrations than what exists in groundwater. Therefore, it dilutes the basin's average TDS concentration. The opposite is generally true during periods of discharge because the pumped groundwater is generally of lower TDS than the basin average.

4.4 Modeling

4.4.1 Groundwater Model Overview

Zone 7 maintains a numerical groundwater model of the basin for predicting the consequences of a proposed groundwater basin management action. The model, originally created in Visual Modflow, has been converted to Groundwater Vistas and uses MODFLOW-SURFACT to perform the modeling calculations. In 2006 Zone 7 and HydroMetrics LLC (HydroMetrics) reevaluated, recalibrated, and revised the model as described in *Zone 7, 2006d*.

The active part of the groundwater model encompasses the Amador, Bernal, Bishop, Camp, Castle, Dublin, and Mocho II Subbasins of the Valley. The model consists of three layers: the upper aquifer (Layer 1), an aquitard (Layer 2), and the lower aquifer (Layer 3). Most municipal water supply production wells in the basin are screened in the lower aquifer (Layer 3). Many small private wells are screened in the upper aquifer (Layer 1).

4.4.1 2009 Groundwater Modeling

Starting in the 2009 Water Year and continuing on into the 2010 Water Year, Zone 7 is using the groundwater model to support long-term planning for the Water Systems Management Plan in an effort to identify how much groundwater Zone 7 could pump (using existing wells and the soon-to-be-completed Chain of Lakes wells) during a six year drought without going below historical lows. For this optimization exercise, the model was run using a reiterative trial-and-error approach. Staff would have liked to use an optimization software package, such as: MODOFC, or Brute Force; however, they are not compatible with Zone 7's MODFLOW-SURFACT software.

All model runs were designed with six years of drought where Zone 7 pumping was the only variable in each scenario. All other inflows and outflows were calculated as representative of near-future, six-year-drought conditions. Zone 7 ran three sets of transient model runs:

1. **Scenario Set 1** - designed to calculate the maximum volume of water that Zone 7 could constantly pump during a six year drought. The runs used a modified version of initial heads used for Zone 7's Salt Management Plan and Well Master Plan that was updated to work with the current version of Zone 7's model. These initial heads are estimated to correspond to the basin at 100% available storage.

2. **Scenario Set 2** - designed to calculate the maximum volume of water that Zone 7 could constantly pump during a six year drought with similar conditions as those in Scenario Set 1 except using initial heads that correspond to the basin at about 80% available storage.

3. **Scenario Set 3** – designed to investigate whether shifting pumping earlier or later, instead of the constant pumping used in Scenario Sets 1 and 2, would significantly alter final groundwater elevations.

The final results from these model runs will be presented as part of Zone 7's analysis of the Water Systems Management Plan.

Table 3.7-1
Groundwater Production From Municipal and Other Supply Wells
2009 Water Year (in Acre-feet)

Station ID	Well	Common Name	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY*	CY**
Owner: Zone 7																
HOP 6	3S/1E 18A 6	Hopyard 6	303.5	118.8	1.8	34.7	11.0	9.5	98.8	264.5	256.0	287.6	131.4	1.8	**1519.5**	**1143.5**
HOP 9	3S/1E 17D12	Hopyard 9	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	6.1	0.0	0.0	**8.3**	**8.3**
MOCHO 1	3S/1E 9M 2	Mocho 1	74.3	104.3	38.1	85.3	83.5	26.1	101.3	111.4	125.2	200.7	141.5	175.5	**1267.2**	**1543.4**
MOCHO 2	3S/1E 9M 3	Mocho 2	0.0	0.0	0.6	16.0	58.6	0.0	86.2	50.6	49.7	112.9	119.4	170.3	**664.4**	**855.3**
MOCHO 3	3S/1E 9M 4	Mocho 3	0.0	20.6	35.9	23.6	182.0	190.9	206.5	16.3	166.3	333.0	290.0	317.3	**1782.5**	**2716.4**
MOCHO 4	3S/1E 8H18	Mocho 4	55.5	3.7	9.5	83.2	63.8	0.6	49.7	8.3	123.4	351.4	372.0	432.7	**1553.8**	**1957.4**
STONERIDGE_1	3S/1E 9B 1	Stoneridge	297.7	217.3	190.9	188.1	112.9	146.1	295.9	400.5	448.4	460.0	236.6	170.0	**3164.4**	**2687.8**
TOTALS															**9960.1**	**10912**
Owner: Pleasanton																
PLEAS #5	3S/1E 16L 5	Pleas 5	100.0	30.9	0.4	0.0	0.0	0.0	0.0	54.6	163.0	142.5	272.0	208.6	**972.1**	**956.7**
PLEAS #6	3S/1E 16L 7	Pleas 6	105.2	31.9	0.4	0.0	0.0	0.0	0.0	55.8	167.3	145.8	278.6	212.6	**997.6**	**979.2**
PLEAS #8	3S/1E 16A 2	Pleas 8	228.6	43.6	119.8	0.0	0.0	2.8	172.0	192.9	193.9	173.5	334.5	229.1	**1690.7**	**1569.4**
TOTALS															**3660.3**	**3505.2**
Owner: Other																
GWP_3S1E1P3	3S/1E 1P 3	New airport well	0.0	0.0	0.0											
GWP_3S1E20B2	3S/1E 20B 2	Fairgrounds Potable	26.0	13.1	10.1	7.6	7.4	12.0	28.8	29.5	29.7	37.1	30.1	42.0	**273.3**	**250**
GWP_3S1E20C3	3S/1E 20C 3	Fairgrounds Potable Backup	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	19.1	18.8	18.7	0.0	**61.6**	**81.1**
TOTALS															**334.9**	**331.1**
Owner: California Water Service																
CWS# 5(16B1)	3S/2E 16B 1	CWS STA 5	6.4	0.0	0.0	0.0	0.0	0.0	0.0	17.0	19.0	19.4	11.2	0.0	**73**	**66.6**
CWS# 8(8P 1)	3S/2E 8P 1	CWS STA 8	1.6	0.0	0.0	3.8	3.5	13.0	30.5	32.1	34.4	34.0	35.2	29.3	**217.5**	**216.3**
CWS# 9(9Q 1)	3S/2E 9Q 1	CWS STA 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.7	25.5	30.8	34.4	34.9	**152.4**	**158.3**
CWS#10 (8F1)	3S/2E 8F 1	CWS STA 10	16.0	17.3	21.1	29.7	29.8	29.3	27.0	35.1	36.6	33.5	35.8	30.0	**341.3**	**301.8**
CWS#12 (9P1)	3S/2E 9P 1	CWS STA 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	13.4	45.9	45.8	41.1	**152**	**152.4**
CWS#14 (8N2)	3S/2E 8N 2	CWS STA 14	39.7	42.8	47.3	66.1	60.4	42.5	71.8	71.2	62.5	62.7	64.9	63.3	**695.3**	**759.6**
CWS#15 (16C1)	3S/2E 16C 1	CWS STA 15	0.1	0.0	0.0	0.0	0.0	0.0	0.0	41.0	47.8	45.5	42.1	39.0	**215.4**	**223.5**
CWS#17 (9L1)	3S/2E 9L 1	CWS STA 17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0**	**0**
CWS#19 (8G1)	3S/2E 8G 1	CWS STA 19; Key_Mo2_L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	**0.2**	**0.2**
CWS#20 (18B1)	3S/2E 18B 1	CWS STA 20	8.4	0.0	0.0	0.0	0.0	0.0	0.3	0.1	16.1	41.9	40.0	40.8	**147.6**	**140.4**
CWS#24 (7P3)	3S/2E 7P 3	CWS STA 24	28.2	43.4	48.1	36.8	13.0	28.6	22.2	70.8	69.6	68.8	59.9	58.7	**548.1**	**500.3**
CWS#31 (7R3)	3S/2E 7R 3	CWS STA 31	30.9	27.3	0.0	0.8	0.6	47.1	71.2	73.2	78.0	86.0	85.2	80.2	**580.5**	**545.4**
TOTALS															**3123.3**	**3064.7**

* Water Year - from October 2008 to September 2009;
** Calendar Year - from January 2009 to December 2009;
Does not include pumped volume to waste.

TABLE 4.1-1
Zone 7 Water Agency
Recharge Volumes (Acre-Feet)
2009 Water Year

Name	Site Id	Oct WY	Nov WY	Dec WY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	2009 Total	2008 Total	Normal	2009 % Norm
STREAM RECHARGE																	
AV Natural Recharge	AV_RN	11	46	96	98	2,191	111	26	123	142	83	28	-8	2,947	2,843	2,100	140%
AV Artificial Recharge	AV_RC_Z7	299	243	174	187	0	0	0	0	0	348	513	340	2,104	2,229	3,050	69%
AV Recharge Prior Rights	AV_RC_PR	0	0	0	0	65	107	231	308	470	66	0	0	1,247	306	900	139%
AM Natural Recharge	AM_RN	5	30	38	60	377	204	51	32	6	2	4	11	820	1,428	2,400	34%
AM Artificial Recharge	AM_RC	0	0	0	0	0	0	0	0	0	190	1,031	659	1,880	0	5,630	33%
Mining Area Recharge to AM	AM_RM	0	0	46	200	118	81	50	0	100	56	310	216	1,177	1,136	NA	NA
ALP Natural Recharge	ALP_RN	71	112	112	110	118	115	126	168	177	168	152	121	1,550	1,090	1,300	119%
ALP ArtificialRecharge	ALP_RC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0%
Total Natural Stream Recharge		**87**	**188**	**246**	**268**	**2,686**	**430**	**203**	**323**	**325**	**253**	**184**	**124**	**5,317**	**5,361**	**5,800**	**92%**
Total Prior Rights		**0**	**0**	**0**	**0**	**65**	**107**	**231**	**308**	**470**	**66**	**0**	**0**	**1,247**	**306**	**900**	**139%**
Total Artificial Recharge		**299**	**243**	**174**	**187**	**0**	**0**	**0**	**0**	**0**	**538**	**1,544**	**999**	**3,984**	**2,229**	**8,700**	**46%**
TOTAL STREAM RECHARGE		**386**	**431**	**420**	**455**	**2,751**	**537**	**434**	**631**	**795**	**857**	**1,728**	**1,123**	**10,548**	**7,896**	**15,400**	**68%**
RAINFALL RECHARGE																	
Rainfall Recharge	RC_RR	0	0	0	0	0	27	0	0	0	0	0	0	27	1,092	3,300	1%
APPLIED WATER RECHARGE																	
Urban	RC_AW_U	173	0	0	0	0	0	1	105	243	307	279	229	1,337	1,696	1,181	113%
Unmetered Groundwater	RC_AW_UGW	0	0	0	0	0	0	0	3	6	6	6	4	25	32	22	114%
Wente, Concannon, et.al.	RC_AW_WC_TOT	14	2	0	2	1	1	8	27	40	48	45	37	225	183	181	124%
Domestic Use	RC_AW_DOM	7	5	4	4	4	4	5	8	9	9	9	7	75	69	75	100%
LWRP	RC_AW_LWRP	3	1	1	1	1	2	5	6	10	13	9	6	58	41	49	118%
TOTAL AW RECHARGE		**197**	**8**	**5**	**7**	**6**	**7**	**19**	**149**	**308**	**383**	**348**	**283**	**1,720**	**2,021**	**1,500**	**115%**
SUBSURFACE																	
Inflow	SS_INFLOW	84	84	84	84	84	84	84	84	84	84	80	80	1,000	1,000	1,000	100%
Outflow	SS_OUTFLOW	0	0	0	0	43	80	71	0	0	0	0	0	194	1,205	100	194%
TOTAL NATURAL RECHARGE (SY)		**368**	**280**	**335**	**359**	**2,798**	**575**	**466**	**864**	**1,187**	**786**	**612**	**487**	**9,117**	**8,575**	**12,400**	**74%**

ALP = Arroyo Las Positas
AM = Arroyo Mocho
AV = Arroyo Valle
SY = Sustainable Yield

Table 4.2-1
Zone 7 Water Agency
Nodal Constants for Storage Calculations

MAIN BASIN NODE	Data from 1963 to 1992 - One Aquifer					Data from 1992 to Present - Two Aquifers											
							Upper Aquifer						Lower Aquifer				
	Area (ft^2)	Top (ft MSL)	Bottom (ft MSL)	Thick (ft)	Storage Coef	Area (ft^2)	Top (ft MSL)	Bot Conf Lyr (ft MSL)	Bottom (ft MSL)	Thick (ft)	SY	SS	Top (ft MSL)	Bottom (ft MSL)	Thick (ft)	SY	SS
NODE 15	413	325	33	292	0.08	200	329	290	243	86	0.07	0.0024	205	33	172	0.20	0.0012
NODE 16	466	321	33	288	0.08	320	325	281	235	90	0.05	0.0024	195	33	162	0.20	0.0002
NODE 17	301	363	63	300	0.06	301	336	283	222	114	0.09	0.0024	179	63	116	0.20	0.00005
NODE 18	679	337	33	304	0.08	679	334	283	228	106	0.11	0.0024	196	33	163	0.20	0.0012
NODE 19	703	323	53	270	0.08	703	328	268	222	106	0.11	0.0024	199	53	146	0.20	0.0002
NODE 20	534	333	73	260	0.06	534	332	265	229	103	0.05	0.0024	215	73	142	0.20	0.00001
NODE 23	414	340	63	277	0.11	414	340	297	243	97	0.13	0.0024	191	63	128	0.20	0.0018
NODE 24	503	343	73	270	0.08	503	343	300	230	113	0.14	0.0024	196	73	123	0.20	0.0003
NODE 25	883	343	73	270	0.075	883	360	330	242	118	0.17	0.0024	222	73	149	0.20	0.0007
NODE 26	953	348	3	345	0.1	953	353	303	226	127	0.17	0.0024	182	3	179	0.20	0.0003
NODE 29	388	365	243	122	0.05	388	363	333	278	85	0.23	0.0024	229	229	0	0.20	0.0001
NODE 30	718	363	83	280	0.08	718	369	none	259	110	0.15	0.0024	230	83	147	0.20	0.0002
NODE 31	1213	333	3	330	0.11	1213	372	none	259	113	0.12	0.0024	239	3	236	0.20	0.0003
NODE 33	165	393	253	140	0.05	165	397	374	327	70	0.09	0.0024	307	253	54	0.20	0.0008
NODE 34	683	401	123	278	0.07	683	402	none	299	103	0.08	0.0024	283	123	160	0.20	0.0003
NODE 35	2357	405	113	292	0.07	2357	422	none	310	112	0.11	0.0024	297	113	184	0.20	0.0002
NODE 36	1753	483	403	80	0.07	1753	493	none	387	106	0.09	0.0024	381	381	0	0.20	0.00001
NODE 38	867	403	303	100	0.06	867	429	none	352	77	0.13	0.0024	339	303	36	0.20	0.0008
NODE 39	1839	496	333	163	0.06	1839	484	none	395	89	0.10	0.0024	378	333	45	0.20	0.0003
NODE 40	913	553	423	130	0.06	913	566	none	487	79	0.23	0.0024	473	423	50	0.20	0.00004
NODE 41	1624	753	663	90	0.06	1624	732	none	620	112	0.10	0.0024	607	607	0	0.20	0.00003
NODE 42	686	548	403	145	0.04	686	551	none	464	87	0.18	0.0024	450	403	47	0.20	0.0001

ft MSL Top and bottom elevations are in feet above Mean Sea Level (NAVD88)
Bot Conf Lyr Bottom elevation of upper aquifer confining layer
SY Specific Yield - used for unconfined conditions
SS Specific Storage - used for confined conditions

Table 4.2-2
Groundwater Elevations (ft) and Storage (AF)
Nodal Groundwater Elevation Method
Water Years 1963 - 1991

WATER	NODE 15		NODE 16		NODE 17		NODE 18		NODE 19		NODE 20		NODE 23		NODE 24		NODE 25		NODE 26		NODE 29		NODE 30	
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag
MAX_83_SPR	305.6	9,106	307.5	10,345	300.5	4,343	309.8	15,199	313.2	14,802	308.4	7,638	307.6	11,276	304.9	9,450	324.4	16,848	306.5	29,209	353.1	2,194	330.5	14,390
MIN_62_FALL	192.6	5,372	230.6	7,478	237.0	3,197	186.1	8,479	210.1	9,004	169.2	3,178	226.3	7,573	210.0	5,634	220.6	9,973	238.0	22,681	237.8	0	237.5	9,047
MIN_66_FALL	188.6	5,240	219.6	7,068	224.3	2,967	186.9	8,523	211.9	9,105	244.0	5,575	239.4	8,170	210.6	5,658	245.3	11,609	250.1	23,835	263.6	458	253.0	9,937
1963	200.8	5,643	231.0	7,493	243.4	3,312	201.2	9,300	222.4	9,696	204.6	4,313	250.0	8,653	222.3	6,129	235.1	10,934	257.2	24,511	247.4	144	252.2	9,891
1964	179.5	4,939	219.5	7,065	232.3	3,112	188.4	8,604	210.1	9,004	230.7	5,149	238.0	8,106	207.5	5,533	227.7	10,444	246.7	23,511	253.2	256	241.9	9,300
1965	192.1	5,356	218.4	7,024	231.9	3,105	199.3	9,196	215.9	9,330	235.6	5,306	256.5	8,949	214.0	5,795	238.8	11,179	257.7	24,559	264.4	473	257.7	10,207
1968	218.5	6,228	222.1	7,161	198.2	2,496	209.4	9,745	221.0	9,617	200.5	4,181	249.6	8,634	225.1	6,241	255.8	12,305	248.4	23,673	275.8	695	247.5	9,621
1969	227.8	6,535	230.5	7,475	234.6	3,153	237.9	11,293	253.3	11,434	232.1	5,194	249.7	8,639	234.6	6,624	286.9	14,364	250.2	23,844	265.6	497	237.9	9,070
1970	241.1	6,975	232.6	7,553	231.2	3,092	240.3	11,423	252.6	11,394	251.8	5,825	250.9	8,694	229.3	6,410	240.9	11,318	244.1	23,263	253.7	266	232.5	8,760
1971	254.5	7,417	254.0	8,351	247.2	3,381	255.5	12,249	266.0	12,148	260.9	6,116	251.6	8,725	236.1	6,684	240.1	11,265	251.3	23,949	261.3	413	234.2	8,857
1972	244.9	7,100	241.9	7,900	238.0	3,215	245.4	11,701	240.6	10,719	253.4	5,876	242.7	8,320	229.8	6,430	240.2	11,271	244.4	23,291	254.6	283	238.6	9,110
1973	250.3	7,279	251.6	8,261	247.2	3,381	188.6	8,615	257.8	11,687	257.8	6,017	255.7	8,912	239.2	6,809	259.3	12,536	256.6	24,454	266.6	516	250.9	9,816
1974	254.0	7,401	255.0	8,388	255.0	3,522	257.0	12,331	258.0	11,698	267.0	6,312	266.0	9,381	246.0	7,082	265.0	12,914	247.0	23,539	247.0	136	253.0	9,937
1975	261.0	7,632	262.0	8,649	264.0	3,684	266.0	12,820	266.0	12,148	264.0	6,216	269.0	9,518	251.0	7,283	258.0	12,450	262.0	24,969	253.0	252	256.0	10,109
1976	276.0	8,128	272.0	9,022	278.0	3,937	279.0	13,526	280.0	12,935	277.0	6,632	270.0	9,563	262.0	7,726	278.0	13,775	265.0	25,255	259.0	369	266.0	10,684
1977	266.0	7,797	262.0	8,649	270.0	3,793	269.0	12,982	270.0	12,373	269.0	6,376	265.0	9,336	254.0	7,404	258.0	12,450	260.0	24,778	258.0	349	259.0	10,282
1978	256.0	7,467	259.0	8,537	259.0	3,594	259.0	12,439	262.0	11,923	267.0	6,312	263.0	9,245	246.0	7,082	240.0	11,258	257.0	24,492	252.0	233	255.0	10,052
1979	266.0	7,797	270.0	8,947	270.0	3,793	273.0	13,200	275.0	12,654	272.0	6,472	271.0	9,609	264.0	7,807	281.0	13,973	266.0	25,350	270.0	582	263.0	10,512
1980	282.0	8,326	284.0	9,469	285.0	4,064	285.0	13,852	288.0	13,385	284.0	6,857	284.0	10,201	280.0	8,450	290.0	14,570	281.0	26,779	285.0	873	282.0	11,603
1981	290.0	8,590	292.0	9,767	293.0	4,208	294.0	14,340	297.0	13,891	292.0	7,113	291.0	10,520	286.0	8,692	300.0	15,232	288.0	27,446	290.0	970	283.0	11,660
1982	289.0	8,557	291.0	9,730	292.0	4,190	293.0	14,286	295.0	13,779	291.0	7,081	290.0	10,474	282.0	8,531	296.0	14,967	286.0	27,256	285.0	873	281.0	11,545
1983	294.0	8,723	295.0	9,879	297.0	4,280	297.0	14,503	300.0	14,060	295.0	7,209	298.0	10,839	293.0	8,974	305.0	15,563	295.0	28,114	298.0	1,125	289.0	12,005
1984	297.0	8,822	297.0	9,954	298.0	4,298	298.0	14,558	301.0	14,116	297.0	7,273	299.0	10,884	298.0	9,175	311.0	15,960	298.0	28,399	297.0	1,106	292.0	12,177
1985	296.0	8,789	296.0	9,916	296.0	4,262	295.0	14,395	298.0	13,948	294.0	7,177	298.0	10,839	295.0	9,054	309.0	15,828	297.0	28,304	289.0	951	288.0	11,948
1986	286.5	8,475	287.4	9,596	288.4	4,125	288.2	14,025	291.1	13,559	286.7	6,943	285.6	10,274	284.2	8,619	295.1	14,907	283.7	27,037	282.2	819	276.2	11,270
1987	283.1	8,362	283.3	9,443	283.9	4,044	283.7	13,781	286.5	13,301	282.0	6,792	278.7	9,960	275.6	8,273	289.8	14,556	271.2	25,845	283.7	848	274.2	11,155
1988	277.0	8,161	278.4	9,260	278.9	3,953	277.6	13,450	281.5	13,020	277.3	6,642	264.8	9,327	252.9	7,360	266.6	13,020	246.7	23,511	260.8	404	252.4	9,903
1989	267.2	7,837	270.9	8,981	271.5	3,820	271.3	13,107	274.0	12,598	270.1	6,411	262.5	9,222	241.9	6,917	257.4	12,411	238.3	22,710	254.2	275	244.5	9,449
1990	256.5	7,484	262.8	8,679	262.6	3,659	261.5	12,575	264.3	12,052	265.5	6,264	262.2	9,208	238.3	6,772	253.9	12,179	238.4	22,720	250.4	202	238.6	9,110
1991	212.0	6,013	235.5	7,661	225.5	2,989	246.0	11,733	229.5	10,095	261.5	6,136	256.4	8,944	233.7	6,587	242.6	11,430	234.9	22,386	241.9	37	239.4	9,156

GWE = Groundwater elevations in feet above Mean Sea Level (NGVD29)
Groundwater elevations compiled from selected wells in each node.
Storage: (GWE - Basin Bottom) x Nodal Specific Yield x Node Area

Table 4.2-2
Groundwater Elevations (ft) and Storage (AF)
Nodal Groundwater Elevation Method
Water Years 1963 - 1991

WATER	NODE 31		NODE 33		NODE 34		NODE 35		NODE 36		NODE 38		NODE 39		NODE 40		NODE 41		NODE 42		TOTAL	TOTAL
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	w/N41	(Rounded)
MAX_83_SPR	294.9	39,349	323.3	604	327.3	9,911	360.0	41,248	-	-	420.6	6,274	446.8	12,888	567.8	8,096	680.7	2,017	423.5	645	265,833	266,000
MIN_62_FALL	226.5	30,222	272.2	183	221.7	4,862	220.1	18,165	-	-	300.3	16	353.6	2,604	530.4	6,048	685.7	2,504	388.8	0	156,222	156,000
MIN_66_FALL	262.1	34,972	232.2	0	270.5	7,195	241.5	21,696	-	-	356.0	2,913	353.0	2,538	579.6	8,743	672.1	1,179	469.3	1,902	179,283	179,000
1963	254.9	34,011	270.7	171	236.8	5,584	248.4	22,835	-	-	293.4	0	377.3	5,219	540.2	6,585	687.0	2,631	426.0	713	177,766	178,000
1964	267.1	35,639	275.2	208	230.2	5,269	246.2	22,472	-	-	349.1	2,554	343.0	1,434	571.8	8,316	685.4	2,475	427.8	763	174,151	174,000
1965	243.8	32,530	275.2	208	235.7	5,532	255.2	23,957	-	-	353.9	2,804	357.9	3,078	575.4	8,513	685.4	2,475	429.3	804	180,378	180,000
1968	300.3	40,069	274.6	203	262.2	6,799	270.2	26,431	-	-	355.0	2,861	383.9	5,947	528.1	5,922	677.9	1,742	431.9	875	191,446	191,000
1969	257.7	34,385	274.6	203	235.8	5,536	320.6	34,747	-	-	340.9	2,128	382.5	5,793	492.2	3,955	685.7	2,504	481.1	2,225	199,597	200,000
1970	270.4	36,079	274.6	203	234.5	5,474	310.9	33,146	-	-	333.2	1,727	389.5	6,565	479.7	3,270	672.9	1,257	434.3	941	193,636	194,000
1971	300.0	40,029	274.6	203	239.3	5,704	323.3	35,192	-	-	342.3	2,200	388.8	6,488	494.5	4,081	690.9	3,011	471.2	1,954	208,418	208,000
1972	278.4	37,147	274.6	203	239.8	5,728	317.6	34,252	-	-	361.2	3,184	394.7	7,139	491.4	3,911	677.8	1,734	477.2	2,118	200,633	201,000
1973	304.4	40,616	274.6	203	257.5	6,574	323.3	35,192	-	-	376.5	3,980	416.4	9,533	510.1	4,936	677.0	1,656	505.1	2,884	213,857	214,000
1974	252.0	33,624	258.0	66	257.0	6,550	294.0	30,358	-	-	390.0	4,682	451.0	13,351	541.0	6,628	680.0	1,949	517.0	3,210	213,060	213,000
1975	250.0	33,358	261.0	91	263.0	6,837	293.0	30,193	-	-	389.0	4,630	449.0	13,130	538.0	6,464	677.0	1,656	509.0	2,991	215,080	215,000
1976	268.0	35,759	274.0	198	277.0	7,506	302.0	31,678	-	-	388.0	4,578	450.0	13,241	539.0	6,519	677.0	1,656	510.0	3,018	225,705	226,000
1977	251.0	33,491	262.0	99	266.0	6,980	296.0	30,688	-	-	386.0	4,474	444.0	12,579	539.0	6,519	674.0	1,364	510.0	3,018	215,782	216,000
1978	244.0	32,557	251.0	8	249.0	6,167	295.0	30,523	-	-	384.0	4,370	446.0	12,799	540.0	6,574	671.0	1,072	507.0	2,936	209,641	210,000
1979	271.0	36,160	278.0	231	280.0	7,650	316.0	33,988	-	-	390.0	4,682	453.0	13,572	539.0	6,519	674.0	1,364	512.0	3,073	227,933	228,000
1980	280.0	37,360	291.0	338	295.0	8,367	325.0	35,473	-	-	390.0	4,682	454.0	13,682	540.0	6,574	675.0	1,462	513.0	3,101	239,466	239,000
1981	280.0	37,360	303.0	437	304.0	8,797	331.0	36,463	-	-	392.0	4,786	457.0	14,013	541.0	6,628	676.0	1,559	518.0	3,238	245,712	246,000
1982	277.0	36,960	292.0	347	295.0	8,367	323.0	35,143	-	-	390.0	4,682	454.0	13,682	535.0	6,300	674.0	1,364	514.0	3,128	241,242	241,000
1983	296.0	39,495	312.0	512	313.0	9,227	342.0	38,278	-	-	393.0	4,838	462.0	14,565	544.0	6,793	680.0	1,949	522.0	3,348	254,277	254,000
1984	301.0	40,162	312.0	512	312.0	9,180	349.0	39,433	-	-	394.0	4,890	462.0	14,565	544.0	6,793	680.0	1,949	525.0	3,430	257,635	258,000
1985	295.0	39,362	293.0	355	300.0	8,606	319.0	34,483	-	-	391.0	4,734	450.0	13,241	566.0	7,998	678.0	1,754	540.0	3,842	249,782	250,000
1986	282.9	37,747	296.2	381	295.8	8,405	330.6	36,397	-	-	391.4	4,755	424.3	10,405	551.5	7,204	678.3	1,783	530.2	3,573	240,298	240,000
1987	272.6	36,373	292.3	349	290.0	8,128	318.0	34,318	-	-	387.1	4,531	409.9	8,816	545.7	6,886	675.4	1,501	524.4	3,414	230,675	231,000
1988	266.5	35,559	266.4	135	264.5	6,909	294.7	30,468	-	-	384.4	4,390	409.3	8,750	561.6	7,757	674.0	1,364	524.3	3,411	216,752	217,000
1989	246.0	32,824	267.8	147	267.1	7,033	310.7	33,108	-	-	388.6	4,609	420.5	9,986	568.7	8,146	673.6	1,325	522.7	3,367	214,282	214,000
1990	248.8	33,197	262.8	106	261.3	6,756	300.7	31,464	-	-	388.9	4,625	419.9	9,920	569.1	8,168	672.1	1,179	525.0	3,430	209,746	210,000
1991	233.6	31,169	257.6	63	246.8	6,062	292.2	30,056	-	-	385.8	4,463	403.0	8,055	553.7	7,324	673.8	1,345	525.5	3,444	195,148	195,000

GWE = Groundwater elevations in feet above Mean Sea Level (NGVD29)
Groundwater elevations compiled from selected wells in each node.
Storage: (GWE - Basin Bottom) x Nodal Specific Yield x Node Area

Table 4.2-3
Groundwater Elevations (ft) and Storage (AF)
Nodal Groundwater Elevation Method
Water Years 1992 - 2009

UPPER AQUIFER

WATER	NODE 15		NODE 16		NODE 17		NODE 18		NODE 19		NODE 20		NODE 23		NODE 24		NODE 25		NODE 26		NODE 29		NODE 30	
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag
1992	242.0	0	258.6	386	312.4	1,686	261.4	2,365	287.9	5,620	275.6	1,553	263.8	1,146	249.1	1,289	286.7	6,914	252.6	4,439	341.8	1,069	327.8	7,935
1993	250.0	99	262.9	454	287.4	1,669	262.4	2,436	266.7	3,655	276.6	1,554	268.0	1,377	256.3	1,773	297.2	8,545	258.4	5,398	344.9	1,072	332.9	8,519
1994	268.4	357	271.6	594	292.6	1,673	271.3	3,073	275.9	5,599	276.3	1,554	273.7	1,693	261.9	2,144	295.9	8,348	259.3	5,558	343.8	1,071	333.6	8,599
1995	282.1	549	283.6	893	299.8	1,677	283.9	4,424	288.1	5,621	284.0	1,563	280.8	2,084	276.9	3,145	305.0	9,766	264.6	6,438	346.5	1,074	335.7	8,839
1996	283.3	565	284.8	893	300.5	1,678	284.9	4,425	289.7	5,624	285.0	1,564	280.8	2,081	275.4	3,049	304.2	9,631	264.6	6,430	345.4	1,073	335.2	8,776
1997	284.1	577	285.1	894	300.5	1,678	285.7	4,426	294.4	5,632	285.3	1,565	281.5	2,119	272.7	2,865	300.7	9,086	263.3	6,215	345.0	1,072	339.3	9,246
1998	286.4	609	288.2	896	302.7	1,679	288.9	4,431	295.5	5,634	287.9	1,568	283.1	2,207	272.1	2,825	305.6	9,855	266.9	6,811	346.3	1,073	325.8	7,710
1999	280.7	529	281.1	746	298.3	1,676	281.8	3,820	292.7	5,629	282.9	1,562	279.6	2,018	268.0	2,555	311.3	10,745	263.8	6,298	344.4	1,072	315.0	6,469
2000	277.6	486	279.9	726	297.5	1,676	280.2	3,710	294.4	5,632	282.0	1,561	278.3	1,946	253.3	1,570	310.6	10,629	266.6	6,761	344.0	1,071	315.8	6,565
2001	265.0	309	270.4	574	292.5	1,673	269.1	2,913	284.3	5,614	270.8	1,547	273.7	1,691	256.4	1,780	308.1	10,247	258.9	5,488	339.3	1,067	306.2	5,461
2002	286.3	608	267.6	530	290.3	1,671	265.1	2,629	287.5	5,620	269.1	1,545	271.1	1,551	260.2	2,030	284.9	6,633	260.1	5,686	338.7	1,067	313.5	6,298
2003	284.2	578	267.1	522	290.1	1,671	264.5	2,584	288.1	5,621	269.3	1,545	274.0	1,711	270.8	2,738	289.7	7,371	274.3	8,040	342.7	1,070	316.8	6,676
2004	284.4	581	265.9	502	289.1	1,670	263.8	2,536	279.7	5,606	269.2	1,545	276.0	1,819	275.0	3,019	296.2	8,394	279.3	8,856	342.2	1,070	317.6	6,770
2005	292.0	663	279.3	717	297.5	1,676	279.1	3,628	293.9	5,631	276.2	1,554	285.6	2,345	291.0	4,087	306.3	9,971	289.8	10,597	343.7	1,071	326.4	7,778
2006	301.2	667	293.7	900	315.8	1,688	294.9	4,441	297.6	5,638	291.8	1,573	297.5	2,598	305.2	4,038	315.2	11,357	300.2	12,311	344.5	1,072	328.0	7,961
2007	294.0	664	296.3	902	305.9	1,681	295.1	4,441	295.9	5,635	296.9	1,579	298.7	2,599	300.1	4,694	313.1	11,022	301.0	12,457	334.2	1,063	318.0	6,813
2008	291.7	663	290.2	898	302.5	1,679	292.0	4,436	293.2	5,630	290.0	1,571	297.6	2,598	298.3	4,575	312.4	10,916	301.5	12,534	333.2	1,062	325.6	7,683
2009	288.2	634	287.6	896	302.4	1,679	286.8	4,428	291.5	5,627	289.1	1,569	291.6	2,675	289.5	3,986	306.4	9,983	293.0	11,136	321.6	3,742	322.5	7,326

LOWER AQUIFER

WATER	NODE 15		NODE 16		NODE 17		NODE 18		NODE 19		NODE 20		NODE 23		NODE 24		NODE 25		NODE 26		NODE 29		NODE 30	
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag
1992	229.9	1,759	225.9	2,651	229.5	1,601	240.2	5,439	236.9	5,574	273.9	3,656	229.9	2,781	235.6	2,989	236.0	6,967	231.4	8,913	236.4	0	260.1	5,735
1993	252.0	1,765	252.0	2,652	249.9	1,601	253.5	5,450	256.3	5,577	275.9	3,656	251.8	2,798	255.0	2,992	263.8	6,985	251.5	8,919	261.2	1	263.7	5,735
1994	269.8	1,769	269.6	2,654	265.9	1,602	267.1	5,460	270.3	5,579	274.2	3,656	253.3	2,799	256.9	2,992	262.5	6,984	252.2	8,919	264.2	1	266.4	5,736
1995	281.7	1,772	281.6	2,654	278.2	1,602	282.0	5,472	281.8	5,581	283.2	3,656	266.4	2,809	274.6	2,994	280.8	6,995	267.6	8,924	269.8	1	295.9	5,740
1996	282.1	1,772	281.9	2,654	279.9	1,602	281.5	5,471	282.6	5,581	285.2	3,656	275.8	2,816	273.3	2,994	277.9	6,994	263.9	8,923	270.2	2	289.2	5,739
1997	283.3	1,772	281.2	2,654	281.0	1,602	283.6	5,473	283.4	5,581	285.3	3,656	264.3	2,807	262.7	2,993	265.7	6,986	259.3	8,921	281.8	2	274.7	5,737
1998	285.7	1,773	286.2	2,655	285.4	1,602	289.2	5,477	287.2	5,581	285.0	3,656	264.5	2,808	277.4	2,995	268.0	6,987	263.3	8,923	273.3	2	280.5	5,738
1999	280.7	1,772	281.7	2,654	275.6	1,602	273.7	5,465	278.7	5,580	282.9	3,656	252.0	2,798	260.3	2,992	263.5	6,984	253.9	8,920	264.1	1	269.6	5,736
2000	276.7	1,771	278.3	2,654	275.3	1,602	277.3	5,468	278.4	5,580	282.0	3,656	249.5	2,796	259.7	2,992	252.7	6,977	255.6	8,920	260.3	1	273.7	5,737
2001	265.0	1,768	266.8	2,653	269.0	1,602	265.9	5,459	267.9	5,579	270.8	3,656	222.4	2,776	249.4	2,991	233.8	6,965	241.5	8,916	242.5	0	247.0	5,733
2002	264.6	1,768	259.6	2,653	261.8	1,602	257.0	5,452	268.6	5,579	269.1	3,656	225.0	2,778	236.2	2,989	215.3	6,957	230.8	8,913	243.2	1	256.4	5,734
2003	259.9	1,767	259.9	2,653	263.4	1,602	250.8	5,447	268.0	5,579	267.1	3,656	261.0	2,805	252.9	2,991	260.8	6,983	269.4	8,924	273.8	2	283.5	5,739
2004	255.7	1,766	257.5	2,653	261.6	1,602	256.2	5,452	258.1	5,577	269.2	3,656	261.0	2,805	254.4	2,992	255.2	6,979	257.8	8,921	269.3	1	278.8	5,738
2005	270.7	1,769	277.2	2,654	281.9	1,602	274.3	5,466	275.8	5,580	277.2	3,656	275.2	2,816	281.3	2,995	279.2	6,994	283.6	8,928	292.2	2	301.9	5,741
2006	286.3	1,773	291.3	2,655	294.1	1,602	288.7	5,477	291.3	5,582	291.8	3,656	294.1	2,830	295.4	2,997	296.9	7,006	299.4	8,933	302.3	3	309.3	5,742
2007	294.9	1,775	294.3	2,655	296.2	1,602	295.8	5,483	297.0	5,583	300.9	3,656	298.0	2,833	298.7	2,998	293.7	7,004	299.5	8,933	303.9	3	303.8	5,742
2008	282.1	1,772	280.3	2,654	288.1	1,602	286.2	5,475	288.4	5,582	294.9	3,656	287.6	2,825	291.1	2,997	287.4	7,000	294.8	8,932	292.8	2	292.5	5,740
2009	286.1	1,773	284.8	2,654	288.1	1,602	283.4	5,473	285.7	5,581	283.3	3,656	278.0	2,818	276.0	2,995	266.2	6,986	277.7	8,927	278.1	2	279.4	5,738

GWE = Groundwater elevations in feet above Mean Sea Level (NAVD88)
Groundwater elevations from 1992 - 2006 compiled from program wells in each node.
Groundwater elevations after 2006 calculated using ArcGIS (created Grid representing gradient, then calculated Mean for each node)
Storage Upper = ((GWE - Bottom Confining Layer) x Specific Storage + (Bottom Confining Layer/GWE - Bottom Aquifer) x Specific Yield) x Node Area
Storage Lower = ((GWE - Top Aquifer) x Specific Storage + (Top Aquifer - Bottom Aquifer) x Specific Yield) x Node Area

Table 4.2-3
Groundwater Elevations (ft) and Storage (AF)
Nodal Groundwater Elevation Method
Water Years 1992 - 2009

UPPER AQUIFER

WATER	NODE 31		NODE 33		NODE 34		NODE 35		NODE 36		NODE 38		NODE 39		NODE 40		NODE 41		NODE 42		TOTAL	TOTAL
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	Upper	(Rounded)
1992	252.6	0	357.7	475	350.2	2,831	310.2	98	434.1	8,147	385.9	3,764	416.9	3,967	534.4	9,684	675.6	8,594	525.2	8,117	80,078	80,000
1993	268.6	1,446	363.4	564	347.9	2,705	330.9	5,639	441.5	9,435	394.0	4,672	450.4	10,139	561.4	15,176	679.6	9,214	534.7	9,371	104,913	105,000
1994	273.4	2,164	360.8	522	348.2	2,721	346.9	9,906	440.3	9,226	393.7	4,638	447.0	9,509	561.1	15,128	677.6	8,904	529.0	8,618	111,599	112,000
1995	279.5	3,076	365.4	595	354.6	3,078	343.1	8,890	440.5	9,261	399.5	5,299	454.7	10,943	563.2	15,542	680.9	9,416	537.1	9,687	121,859	122,000
1996	281.8	3,420	364.6	581	356.1	3,157	335.3	6,797	439.0	9,000	399.6	5,308	454.7	10,928	563.2	15,542	680.8	9,400	537.5	9,740	119,662	120,000
1997	276.7	2,658	367.3	623	357.1	3,215	340.8	8,275	441.2	9,383	398.4	5,176	447.1	9,544	564.0	15,711	680.0	9,276	535.8	9,516	118,751	119,000
1998	283.0	3,600	367.9	634	357.7	3,248	340.7	8,249	439.9	9,157	398.6	5,197	453.5	10,709	565.1	15,939	682.9	9,726	538.2	9,832	121,589	122,000
1999	277.9	2,837	364.8	585	354.5	3,070	343.6	9,033	439.8	9,139	398.1	5,135	456.1	11,190	562.9	15,487	679.5	9,199	536.8	9,648	118,442	118,000
2000	275.9	2,538	363.4	563	358.5	3,289	348.0	10,208	439.5	9,087	398.1	5,136	451.7	10,384	563.3	15,562	679.4	9,183	537.5	9,740	118,023	118,000
2001	252.5	0	361.8	538	352.1	2,936	311.4	419	439.7	9,122	394.0	4,676	443.7	8,909	570.2	16,976	676.9	8,795	531.5	8,948	99,685	100,000
2002	251.6	0	359.7	505	352.3	2,947	348.9	10,430	439.6	9,104	396.0	4,904	445.9	9,312	574.8	17,901	677.1	8,826	530.2	8,777	108,575	109,000
2003	276.4	2,619	362.6	550	356.2	3,162	347.5	10,057	440.3	9,226	396.5	4,960	450.2	10,098	574.9	17,921	677.6	8,904	531.4	8,935	116,560	117,000
2004	268.3	1,403	362.5	549	354.6	3,077	322.2	3,309	439.9	9,157	395.6	4,854	448.5	9,788	571.0	17,129	678.6	9,059	530.8	8,856	109,548	110,000
2005	289.7	4,606	364.8	584	358.1	3,267	358.2	12,929	440.0	9,174	398.1	5,140	452.1	10,457	574.8	17,901	679.0	9,121	533.1	9,159	132,057	132,000
2006	301.5	6,360	366.2	606	361.0	3,431	343.2	8,923	440.0	9,162	397.6	5,085	448.9	9,867	571.0	17,127	680.3	9,320	534.5	9,349	133,474	133,000
2007	323.7	9,692	366.6	613	342.7	2,419	354.2	11,863	440.2	9,197	393.9	4,661	437.9	7,832	541.1	11,062	680.0	9,273	518.4	7,220	127,383	127,000
2008	322.2	9,461	369.9	665	346.9	2,652	351.2	11,055	440.0	9,167	394.4	4,721	440.3	8,282	539.4	10,707	678.0	8,963	519.0	7,305	127,222	127,000
2009	321.6	9,377	181.4	0	316.1	956	302.5	0	448.6	10,660	355.8	382	443.8	8,929	541.3	11,099	690.4	10,881	521.1	7,578	113,543	114,000

LOWER AQUIFER

WATER	NODE 31		NODE 33		NODE 34		NODE 35		NODE 36		NODE 38		NODE 39		NODE 40		NODE 41		NODE 42		TOTAL	TOTAL
YEAR	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	GWE	Storag	Upper	(Rounded)
1992	232.9	15,003	236.9	479	234.9	5,618	250.2	22,775	409.5	1	397.9	1,649	370.1	4,233	534.4	2,268	675.6	3	492.2	1,758	101,851	102,000
1993	265.1	15,013	264.0	479	274.7	5,618	283.0	22,775	421.1	1	398.6	1,649	401.2	4,246	561.4	2,269	679.6	3	517.0	1,760	101,942	102,000
1994	267.8	15,014	269.8	479	271.0	5,618	287.1	22,775	405.2	0	397.4	1,648	381.3	4,235	561.1	2,269	677.6	3	508.9	1,759	101,950	102,000
1995	280.4	15,018	284.4	479	292.7	5,620	309.7	22,782	404.2	0	409.4	1,657	422.0	4,258	563.2	2,269	680.9	3	520.0	1,760	102,046	102,000
1996	279.3	15,018	284.7	479	287.4	5,619	302.2	22,778	407.1	1	408.3	1,656	425.8	4,260	563.2	2,269	680.8	3	522.2	1,760	102,045	102,000
1997	272.5	15,015	281.9	479	304.7	5,622	307.5	22,781	425.0	1	402.7	1,652	409.7	4,251	564.0	2,269	680.0	3	517.7	1,760	102,017	102,000
1998	274.6	15,016	279.6	479	303.4	5,622	308.7	22,781	419.5	1	404.1	1,653	404.0	4,248	562.4	2,269	682.9	4	525.7	1,760	102,028	102,000
1999	264.4	15,012	266.3	479	293.0	5,620	313.3	22,784	416.6	1	405.7	1,654	408.6	4,250	562.9	2,269	679.5	3	526.1	1,760	101,993	102,000
2000	259.6	15,010	257.7	479	288.9	5,619	306.6	22,780	405.6	0	404.8	1,653	417.2	4,255	563.3	2,269	679.4	3	526.8	1,760	101,984	102,000
2001	243.1	15,004	234.2	479	258.0	5,618	265.2	22,775	399.4	0	398.6	1,649	405.6	4,249	464.4	2,266	676.9	3	515.0	1,759	101,900	102,000
2002	244.1	15,005	216.8	479	263.4	5,618	261.3	22,775	403.1	0	399.7	1,650	414.3	4,253	574.8	2,269	677.1	3	510.0	1,759	101,892	102,000
2003	269.5	15,014	264.1	479	292.1	5,620	298.5	22,776	409.8	1	400.5	1,650	408.3	4,250	488.2	2,266	677.6	3	518.2	1,760	101,965	102,000
2004	267.3	15,013	255.5	479	285.1	5,618	284.3	22,775	410.9	1	398.1	1,649	407.1	4,249	510.3	2,267	678.6	3	516.7	1,760	101,954	102,000
2005	285.9	15,020	286.9	479	312.5	5,624	312.8	22,783	413.8	1	401.1	1,651	421.9	4,258	574.8	2,269	679.0	3	521.9	1,760	102,052	102,000
2006	297.1	15,024	307.4	479	318.7	5,625	318.4	22,786	416.0	1	403.0	1,652	415.3	4,254	516.9	2,267	680.3	3	520.4	1,760	102,108	102,000
2007	296.1	15,024	309.1	479	309.9	5,623	335.5	22,794	414.0	1	370.3	1,630	410.6	4,251	507.9	2,267	670.0	3	501.7	1,759	102,096	102,000
2008	286.6	15,021	297.7	479	293.0	5,620	318.2	22,786	412.0	1	367.8	1,628	398.3	4,244	504.6	2,267	659.6	2	502.1	1,759	102,042	102,000
2009	271.3	15,015	287.8	479	282.9	5,618	314.7	22,784	449.3	1	372.8	1,631	388.0	4,239	504.9	2,267	638.9	1	503.1	1,759	101,998	102,000

GWE = Groundwater elevations in feet above Mean Sea Level (NAVD88)
Groundwater elevations from 1992 - 2006 compiled from program wells in each node.
Groundwater elevations after 2006 calculated using ArcGIS (created Grid representing gradient, then calculated Mean for each node)
Storage Upper = ((GWE - Bottom Confining Layer) x Specific Storage + (Bottom Confining Layer/GWE - Bottom Aquifer) x Specific Yield) x Node Area
Storage Lower = ((GWE - Top Aquifer) x Specific Storage + (Top Aquifer - Bottom Aquifer) x Specific Yield) x Node Area

TABLE 4.2-4
ZONE 7 WATER AGENCY
GROUNDWATER STORAGE - HYDROLOGIC INVENTORY (HI) METHOD
2009 WATER YEAR
(ACRE-FEET except where indicated)

	WATER YEAR	NORMAL YEAR	PERCENT NORMAL
INDICES			
Rainfall at Livermore (inches)	11.39	14.52	78%
8 Station Rainfall Index (Northern CA)(inches)	46.72	49.87	94%
Evaporation at Lake Del Valle (inches)	71.57	64.85	110%
Arroyo Valle Stream flow (AF)	11,231	21,681	52%
SUPPLY TOTAL (AF)	**13,295**	**21,200**	**63%**
Stream Recharge	**10,548**	**15,400**	**68%**
[1] Natural Stream Recharge	5,317	5,800	92%
Arroyo Valle	*2,947*	*2100*	*140%*
Arroyo Mocho	*820*	*2,400*	*34%*
Arroyo Las Positas	*1,550*	*1,300*	*119%*
[1] Arroyo Valle Prior Rights	1,247	900	139%
[3] Artificial Stream Recharge	3,984	8,700	46%
Arroyo Valle	*2,104*	*3,050*	*69%*
Arroyo Mocho	*1,880*	*5,630*	*33%*
Arroyo Las Positas	*0*	*20*	*0%*
[1] **Rainfall Recharge**	**27**	**3,300**	**1%**
[1] **Applied Water Recharge**	**1,720**	**1,500**	**115%**
Urban AW	1,337	1,181	113%
Unmetered GW	25	22	114%
Wente & Concannon	225	181	124%
LWRP recycled water	58	49	118%
Domestic Wells	75	75	100%
[1] **Subsurface Inflow**	**1,000**	**1,000**	**100%**
DEMAND TOTAL (AF)	**24,779**	**21,200**	**117%**
Municipal Pumping	**18,021**	**15,440**	**117%**
[4] Zone 7	10,084	7,800	129%
[2] *Zone 7 pumping for DSRSD*	*645*	*645*	*100%*
GW through Demin Membranes	*968*	*NA*	-
Demin Permeate to Z7 Distribution System	*759*	*NA*	-
[2] City of Pleasanton	3,660	3,500	105%
[2] California Water Service	3,123	3,070	102%
[2] SFWD	446	420	106%
[2] Fairgrounds	335	320	105%
[2] Domestic	123	110	112%
[2] Golf Courses	249	220	113%
3S1E_1P3	*0*	*0*	*0%*
GWP_Castle	*222*	*200*	*111%*
Tri Valley Golf	*27*	*20*	*135%*
[2] **Agricultural Pumping**	**177**	**200**	**89%**
SFWD	0	0	0%
Concannon	0	0	0%
Calculated	177	200	89%
[2] **Mining Use**	**6,387**	**5,460**	**117%**
Mining Discharges (Export) to Stream	1,493	570	262%
Evaporation	4,194	4,190	100%
Processing	700	700	100%
[1] **Subsurface Overflow**	**194**	**100**	**194%**
SUBTOTALS (AF)			
[1] **Sustainable Yield - Natural Recharge**	9,117	12,400	74%
[2] **Sustainable Yield - Demand Components**	15,146	13,945	109%
[3] **Zone 7 - Artificial Recharge (Stream)**	3,984	8,700	46%
[4] **Zone 7 - Municipal Pumping**	10,084	7,800	129%
NET RECHARGE (Supply - Demand)	**-11,484**	**0**	
TOTAL STORAGE (AF)	**2009 WY**	**2008 WY**	
Hydrologic Inventory (HI)	192,459	203,943	
Nodal GW Elevations (NGE)	215,541	229,264	
Average Storage: (HI + NGE)/2	204,000	216,604	
Available Storage: Avg Storage - Reserve (128K AF)	76,000	88,604	

TABLE 4.2-5
ZONE 7 WATER AGENCY
LIVERMORE VALLEY MAIN GROUNDWATER BASIN
HYDROLOGIC INVENTORY AND STORAGE IN ACRE-FEET
1974-2009 WATER YEARS

	WATER YEAR (Oct - Sep)																																1974 - 2009	
COMPONENTS	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**AVG**	**TOTAL**
INDICES																																						
Rainfall at Livermore (in)	16.11	14.8	6.23	6.02	18.54	13.59	17.56	10.3	24.38	31.98	12.96	12.59	19.79	8.89	8.69	11.15	9.35	11.32	11.64	21.33	11.82	21.29	19.95	15.11	25.28	13.13	14.1	10.95	11.21	17.03	13.07	19.3	17.49	9.66	10.68	11.39	15	
8 Station Rain Index (N. CA)(in)	78.55	48.79	28.3	19.04	71.56	39.09	59.56	37.63	84.82	88.49	58.07	37.82	72.07	28.56	34.86	50.13	35.97	32.17	36.01	65.32	31.83	85.39	61.31	68.76	82.4	54.75	56.7	32.97	46.32	59.7	47.25	57.4	80.1	37.28	34.9	46.72	53	
Evap at Lake Del Valle (in)	60.9	62.67	63.46	65.98	64.17	67.66	59.74	72.06	60.45	59.71	70.18	64.93	61.09	64.03	66.94	63.61	65.87	64.7	68.24	64.17	65.51	58.28	71.57	69.464	57.2	60.99	68.348	68.49	73.17	69.87	72.14	63.58	68.614	68.904	72.67	71.566	66	
Arroyo Valle Stream flow (AF)	30538	28307	475	177	43749	9721	45800	5817	61427	125882	25653	7282	67903	3023	1506	1988	815	9909	11692	52831	3424	67142	51058	54115	87819	15169	18948	8156	7848	19648	11410	26930	25680	2027	18059	11231	26754	963,160
SUPPLY	**18,171**	**21,422**	**11,053**	**8,633**	**24,729**	**22,142**	**23,720**	**18,752**	**29,820**	**35,316**	**15,385**	**8,651**	**20,722**	**6,532**	**7,899**	**10,957**	**10,139**	**12,487**	**10,323**	**28,224**	**15,763**	**28,745**	**22,186**	**23,789**	**29,203**	**17,547**	**21,728**	**12,592**	**21,436**	**30,641**	**21,455**	**30,583**	**24,355**	**10,554**	**12,009**	**13,295**	**18,916**	**680,959**
Stream Recharge	**11,440**	**15,400**	**6,910**	**3,820**	**16,330**	**16,110**	**16,480**	**15,040**	**16,420**	**17,158**	**9,486**	**4,747**	**9,045**	**3,565**	**4,549**	**7,880**	**7,026**	**8,347**	**5,247**	**14,714**	**11,838**	**13,058**	**11,109**	**12,284**	**13,603**	**10,813**	**12,842**	**8,768**	**16,527**	**22,038**	**13,215**	**21,630**	**13,946**	**7,710**	**7,896**	**10,548**	**11,598**	**417,538**
Natural Stream Recharge[1]	6,060	7,110	1,100	630	8,850	2,860	4,850	2,200	8,620	14,387	8,326	3,541	8,168	2,696	2,653	2,589	2,250	4,418	3,997	8,247	3,080	7,259	7,743	6,607	10,533	5,091	4,178	4,679	4,809	9,017	3,788	10,074	7,395	2,092	5,361	5,317	5,572	200,575
Arroyo Valle	*2,400*	*2,950*	*360*	*290*	*2,450*	*1,290*	*1,750*	*840*	*2,970*	*4,893*	*2,580*	*751*	*2,831*	*527*	*679*	*458*	*418*	*1,215*	*970*	*2,754*	*735*	*2,818*	*1,426*	*2,753*	*4,401*	*1,796*	*1,389*	*2,440*	*2,259*	*4,397*	*1,447*	*5,980*	*3,043*	*660*	*2,843*	*2,947*	*2,075*	*74,709*
Arroyo Mocho	*3,160*	*3,760*	*540*	*140*	*5,900*	*1,170*	*2,500*	*880*	*4,810*	*8,514*	*4,616*	*1,716*	*4,176*	*843*	*902*	*809*	*428*	*1,883*	*1,711*	*3,903*	*1,263*	*3,144*	*5,226*	*2,670*	*4,560*	*1,833*	*1,539*	*961*	*1,279*	*2,980*	*1,082*	*2,854*	*3,104*	*543*	*1,428*	*820*	*2,435*	*87,648*
Arroyo las Positas	*500*	*400*	*200*	*200*	*500*	*400*	*600*	*480*	*840*	*980*	*1,130*	*1,074*	*1,161*	*1,326*	*1,072*	*1,322*	*1,404*	*1,320*	*1,315*	*1,591*	*1,082*	*1,297*	*1,091*	*1,184*	*1,572*	*1,462*	*1,250*	*1,278*	*1,271*	*1,640*	*1,259*	*1,240*	*1,248*	*889*	*1,090*	*1,550*	*1,062*	*38,219*
Arroyo Valle Prior Rights[1]	1,771	1,540	115	0	1,038	984	1,419	922	1,848	1,870	1,160	1,206	877	869	724	971	288	668	337	846	876	1,127	398	362	727	548	644	660	1,131	1,612	1,343	293	1,930	807	306	1,247	930	33,463
Artificial Stream Recharge[2]	3,609	6,750	5,695	3,190	6,442	12,266	10,211	11,918	5,952	901	0	0	0	0	1,172	4,320	4,488	3,261	914	5,621	7,883	4,672	2,968	5,314	2,343	5,174	8,019	3,428	10,588	11,409	8,084	11,263	4,621	4,811	2,229	3,984	5,097	183,499
Arroyo Valle	*1,439*	*4,320*	*1,875*	*1,300*	*3,002*	*5,886*	*4,541*	*6,328*	*2,442*	*0*	*0*	*0*	*0*	*0*	*0*	*139*	*304*	*82*	*412*	*1,182*	*798*	*179*	*144*	*1,827*	*413*	*1,181*	*890*	*1,476*	*1,831*	*1,547*	*1,670*	*2,277*	*1,216*	*2,879*	*2,229*	*2,104*	*1,553*	*55,912*
Arroyo Mocho	*1,670*	*1,830*	*3,220*	*1,290*	*2,840*	*5,780*	*5,270*	*5,130*	*3,290*	*901*	*0*	*0*	*0*	*0*	*1,172*	*4,181*	*4,184*	*3,178*	*502*	*4,439*	*7,085*	*4,493*	*2,824*	*3,487*	*1,930*	*3,993*	*7,129*	*1,930*	*8,755*	*9,862*	*6,414*	*8,698*	*3,205*	*1,932*	*0*	*1,880*	*3,403*	*122,496*
Arroyo las Positas	*500*	*600*	*600*	*600*	*600*	*600*	*400*	*460*	*220*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*22*	*2*	*0*	*0*	*288*	*200*	*0*	*0*	*0*	*141*	*5,092*
Injection Well Recharge	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**571**	**1,524**	**1,146**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**90**	**3,241**
Rainfall Recharge[1]	**3,031**	**2,523**	**0**	**0**	**4,398**	**2,002**	**3,891**	**967**	**11,423**	**16,357**	**3,110**	**1,249**	**9,008**	**290**	**398**	**283**	**141**	**1,838**	**1,760**	**10,761**	**1,242**	**13,243**	**8,176**	**8,634**	**12,868**	**2,773**	**4,794**	**1,023**	**2,245**	**6,344**	**5,125**	**6,672**	**7,776**	**1**	**1,092**	**27**	**4,318**	**155,465**
Applied Water Recharge[1]	**2,700**	**2,499**	**3,133**	**3,023**	**2,771**	**3,040**	**2,699**	**2,115**	**1,347**	**1,371**	**2,139**	**1,905**	**1,929**	**1,907**	**2,032**	**1,634**	**1,712**	**622**	**1,746**	**1,419**	**1,593**	**1,454**	**1,981**	**2,191**	**1,351**	**1,688**	**2,041**	**1,801**	**1,664**	**1,259**	**2,115**	**1,281**	**1,633**	**1,843**	**2,021**	**1,720**	**1,927**	**69,379**
Urban	959	766	1,354	1,375	1,087	1,179	810	1,284	668	690	1,253	1,027	998	1,328	1,377	1,053	1,025	222	1,288	1,108	1,252	1,060	1,467	1,632	941	1,274	1,530	1,474	1,322	940	1,750	1,011	1,378	1,588	1,696	1,337	1,181	42,503
Unmetered	324	220	453	465	292	328	221	181	114	79	138	150	130	77	92	80	93	49	73	27	29	21	29	37	15	22	29	15	14	9	16	11	12	10	32	25	109	3,912
Wente & Concannon	83	109	157	124	95	118	147	182	140	165	208	182	232	245	289	240	265	242	279	177	192	257	347	401	277	271	347	254	174	174	168	135	134	137	183	225	204	7,355
LWRP	18	22	61	55	52	49	51	42	38	43	44	41	43	35	46	42	45	19	45	38	49	45	67	49	49	50	64	58	73	56	80	46	52	50	41	58	48	1,716
SFWD	50	0	6	29	25	36	16	51	15	55	11	41	55	67	50	36	42	30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	616
Domestic	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	69	71	71	71	72	69	71	71	0	81	80	101	78	57	58	69	75	64	2,304
Others	1,206	1,322	1,042	915	1,160	1,270	1,394	315	312	279	425	404	411	95	118	123	182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	305	10,973
Subsurface Basin Inflow[1]	**1,000**	**1,000**	**1,010**	**1,790**	**1,230**	**990**	**650**	**630**	**630**	**430**	**650**	**750**	**740**	**770**	**920**	**1,160**	**1,260**	**1,680**	**1,570**	**1,330**	**1,090**	**990**	**920**	**680**	**810**	**750**	**906**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**982**	**35,336**
DEMAND	**18,627**	**15,932**	**15,436**	**14,637**	**12,871**	**15,819**	**15,726**	**19,349**	**18,349**	**26,220**	**19,750**	**18,506**	**22,550**	**14,575**	**17,176**	**16,143**	**15,896**	**21,302**	**17,235**	**13,463**	**15,479**	**15,903**	**20,683**	**25,716**	**25,363**	**25,853**	**27,312**	**27,554**	**23,269**	**19,507**	**24,810**	**18,406**	**16,404**	**19,473**	**20,426**	**24,779**	**19,458**	**700,500**
Municipal Pumpage	**11,806**	**9,881**	**7,782**	**6,721**	**7,022**	**8,207**	**6,982**	**7,361**	**7,281**	**7,965**	**8,473**	**7,990**	**8,652**	**8,152**	**9,431**	**10,393**	**11,224**	**17,287**	**13,329**	**9,040**	**6,475**	**4,566**	**6,324**	**8,824**	**10,264**	**11,829**	**15,520**	**17,806**	**19,307**	**17,123**	**19,635**	**14,686**	**11,697**	**12,687**	**13,520**	**18,021**	**10,924**	**393,266**
Zone 7 (includes for DSRSD[2])	5,403	3,090	1,292	309	776	816	41	0	0	25	348	1,199	1,163	480	2,017	3,213	3,327	8,119	5,136	2,215	213	368	2,388	1,565	1,682	4,912	6,140	9,864	11,047	8,379	11,820	6,858	3,802	4,791	6,855	10,084	3,604	129,738
DSRSD	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*486*	*645*	*645*	*645*	*645*	*645*	*645*	*645*	*139*	*5,001*
City of Pleasanton[2]	2,264	2,497	1,707	3,271	2,640	3,273	2,961	3,089	3,565	3,886	3,486	3,056	3,705	3,310	3,548	3,316	3,856	4,164	3,368	3,252	2,578	1,262	1,333	3,208	3,935	2,563	4,558	3,112	3,579	3,674	3,688	3,604	3,587	3,638	2,387	3,660	3,183	114,582
Cal. Water Service[2]	2,612	2,852	2,781	1,312	1,964	2,358	2,489	2,695	2,286	2,660	3,035	2,788	2,774	3,276	2,761	2,850	3,073	3,966	3,744	2,570	2,626	2,053	1,551	2,947	3,595	3,271	3,567	3,707	3,458	3,979	2,911	3,166	3,106	2,971	3,143	3,123	2,889	104,021
Camp Parks[2]	769	808	980	925	796	881	819	808	713	630	647	40	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245	8,820
SFWD[2]	302	242	495	374	397	413	372	402	348	321	378	353	484	491	472	443	362	408	410	414	396	370	411	477	460	380	532	472	448	423	481	436	467	494	492	446	418	15,066
Fairgrounds[2]	200	200	200	200	200	200	200	267	217	242	281	272	280	280	280	280	280	346	336	282	325	285	343	342	230	333	369	318	423	327	365	284	441	443	289	335	292	10,496
Domestic[2]	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	113	113	116	116	117	117	113	116	109	109	134	134	167	131	93	96	109	123	109	3,926
Golf Courses[2]	156	92	227	230	149	166	0	0	52	101	198	182	146	215	253	191	226	184	220	193	221	111	182	169	249	253	245	223	218	208	203	207	199	255	245	249	184	6,617
3S/1E 1P3	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*15*	*33*	*12*	*45*	*12*	*13*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4*	*129*
Castlewood	*156*	*92*	*227*	*230*	*149*	*166*	*0*	*0*	*52*	*101*	*198*	*182*	*146*	*215*	*253*	*191*	*211*	*151*	*186*	*131*	*186*	*82*	*159*	*146*	*236*	*232*	*223*	*193*	*193*	*193*	*173*	*191*	*177*	*222*	*213*	*222*	*169*	*6,078*
Tri-Valley Golf	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*22*	*17*	*23*	*16*	*23*	*23*	*13*	*21*	*22*	*30*	*25*	*15*	*30*	*16*	*22*	*33*	*32*	*27*	*11*	*410*
Agricultural Pumpage[2]	**3,753**	**2,217**	**4,596**	**4,970**	**3,191**	**3,711**	**2,628**	**2,433**	**1,295**	**1,342**	**1,556**	**1,914**	**1,911**	**1,470**	**1,476**	**1,166**	**1,360**	**556**	**355**	**213**	**218**	**150**	**212**	**266**	**108**	**203**	**357**	**235**	**101**	**49**	**94**	**66**	**74**	**61**	**213**	**177**	**1,242**	**44,697**
SFWD	500	0	62	304	252	365	168	513	150	549	107	410	543	663	493	359	430	194	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169	6,071
Concannon	15	15	20	20	20	70	250	112	0	0	68	0	60	26	59	0	0	11	0	0	0	0	0	0	0	0	140	143	25	0	2	0	0	0	0	0	29	1,056
Calculated	3,238	2,202	4,514	4,646	2,919	3,276	2,210	1,808	1,145	793	1,381	1,504	1,308	781	924	807	930	351	346	213	218	150	212	266	108	203	217	92	76	49	92	66	74	61	213	177	1,044	37,570
Mining Use[2]	**3,068**	**3,833**	**3,058**	**2,946**	**2,658**	**3,751**	**5,586**	**9,005**	**7,613**	**13,953**	**7,481**	**7,402**	**11,387**	**4,353**	**5,869**	**4,484**	**3,312**	**3,459**	**3,551**	**4,210**	**8,786**	**10,987**	**13,381**	**15,866**	**14,241**	**13,459**	**11,310**	**9,512**	**3,861**	**2,335**	**5,081**	**3,654**	**4,633**	**5,804**	**5,488**	**6,387**	**6,827**	**245,764**
Stream Export	1,219	2,200	690	470	800	2,000	3,480	6,530	6,050	12,760	4,340	4,265	8,858	558	2,443	1,808	665	639	712	2,219	6,070	9,071	10,577	12,661	12,617	10,082	7,827	5,461	143	0	163	150	487	594	523	1,493	3,906	140,624
Evaporation	1,149	933	1,668	1,776	1,158	1,051	1,406	1,775	863	493	2,441	2,437	1,829	3,095	2,726	1,976	1,947	2,120	2,139	1,291	2,016	1,216	2,104	2,505	924	2,677	2,783	3,351	3,248	1,785	4,218	2,804	3,446	4,510	4,265	4,194	2,231	80,320
Production	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	470	550	700	700	700	700	700	700	689	24,820
Subsurface Basin Overflow[1]	**0**	**0**	**0**	**0**	**0**	**150**	**530**	**550**	**2,160**	**2,960**	**2,240**	**1,200**	**600**	**600**	**400**	**100**	**0**	**0**	**0**	**0**	**0**	**200**	**766**	**760**	**750**	**362**	**125**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**921**	**1,205**	**194**	**466**	**16,773**
NET RECHARGE (AF)	**-456**	**5,490**	**-4,383**	**-6,004**	**11,858**	**6,323**	**7,994**	**-597**	**11,471**	**9,096**	**-4,365**	**-9,855**	**-1,828**	**-8,043**	**-9,277**	**-5,186**	**-5,757**	**-8,815**	**-6,912**	**14,761**	**284**	**12,842**	**1,503**	**-1,928**	**3,840**	**-8,306**	**-5,584**	**-14,961**	**-1,833**	**11,133**	**-3,354**	**12,177**	**7,951**	**-8,919**	**-8,417**	**-11,484**	**-543**	**-19,541**
INVENTORY STORAGE (AF)	**211,544**	**217,034**	**212,651**	**206,647**	**218,505**	**224,828**	**232,822**	**232,225**	**243,696**	**252,792**	**248,427**	**238,572**	**236,744**	**228,701**	**219,424**	**214,238**	**208,481**	**199,666**	**192,754**	**207,515**	**207,799**	**220,641**	**222,144**	**220,216**	**224,056**	**215,750**	**210,166**	**195,205**	**193,372**	**204,505**	**201,151**	**213,328**	**221,279**	**212,360**	**203,943**	**192,459**		

STORAGE CALCULATION	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
INVENTORY STORAGE (Rounded to TAF	212	217	213	207	219	225	233	232	244	253	248	239	237	229	219	214	208	200	193	208	208	221	222	220	224	216	210	195	193	205	201	213	221	212	204	192
NODAL STORAGE (Rounded to TAF)	213	215	226	216	210	228	239	246	241	254	258	250	240	231	217	214	210	195	182	207	214	224	222	221	224	220	220	202	210	219	212	234	236	229	229	216
AVERAGE STORAGE (TAF)	**213**	**216**	**219**	**211**	**214**	**226**	**236**	**239**	**243**	**254**	**253**	**244**	**239**	**230**	**218**	**214**	**209**	**198**	**187**	**207**	**211**	**222**	**222**	**220**	**224**	**218**	**215**	**198**	**202**	**212**	**206**	**224**	**228**	**221**	**217**	**204**		
AVAILABLE STORAGE (TAF)	**85**	**88**	**91**	**83**	**86**	**98**	**108**	**111**	**115**	**126**	**125**	**116**	**111**	**102**	**90**	**86**	**81**	**70**	**59**	**79**	**83**	**94**	**94**	**92**	**96**	**90**	**87**	**70**	**74**	**84**	**78**	**96**	**100**	**93**	**89**	**76**		

TABLE 4.3-1
ZONE 7 WATER AGENCY
MAIN BASIN SALT LOADING CALCULATIONS
2009 WATER YEAR

INFLOW COMPONENTS	APPLIED WATER			RECHARGED WATER			SALT LOAD
	Volume Applied (AF)	TDS Conc (mg/L)	% Recharged	Volume Recharged (AF)	TDS Conc (mg/L)	Salt Load (Tons)	(Tons per TAF of Rch)
NATURAL STREAM RECHARGE				**5,317**	**486**	**3,510**	**660**
Arroyo Valle				**2,947**	**310**	**1,242**	**420**
Flood releases recharge				2,139	259	753	350
Upper reach natural inflow				236	542	174	740
Lower reach natural inflow				571	406	315	550
Arroyo Mocho				**820**	**410**	**457**	**560**
Arroyo Las Positas				**1,550**	**860**	**1,811**	**1,170**
ARROYO VALLE PRIOR RIGHTS				**1,247**	**240**	**407**	**330**
ARTIFICIAL STREAM RECHARGE				**3,984**	**231**	**1,248**	**310**
Arroyo Valle				**2,104**	**240**	**686**	**330**
Arroyo Mocho				**1,880**	**220**	**562**	**300**
Arroyo Las Positas				**0**	**270**	**0**	**0**
INJECTION WELL RECHARGE				**0**		**0**	
RAINFALL RECHARGE				**27**	**0**	**0**	**0**
APPLIED WATER RECHARGE	**22,334**	**355**	**8%**	**1,720**	**3,358**	**10,785**	**6,270**
Urban Applied Water	**18,718**	**361**	**7%**	**1,337**	**3,440**	**9,188**	**6,870**
Imported Water (SBA from Zone 7)	5,821	278	7%	416	3,899	2,202	5,300
Groundwater from Zone 7 (no Demin)	4,692	461	7%	335	6,457	2,940	8,770
Groundwater from Zone 7 (Demin)	5,268	300	7%	376	4,200	2,147	5,710
Groundwater from Retailers & Others	2,937	476	7%	210	6,662	1,899	9,050
Unmetered Groundwater	**177**	**528**	**7%**	**25**	**3,738**	**127**	**5,080**
Wente & Concannon	**2,725**	**249**	**8%**	**225**	**3,014**	**921**	**4,090**
Imported Water (directly from SBA)	2,725	249	8%	225	3,014	921	4,090
Groundwater (Wente & Concannon wells)	0	478	8%	0	0	0	0
LWRP reclaimed water irrigation	**591**	**570**	**10%**	**58**	**5,806**	**457**	**7,880**
Domestic groundwater pumpage	**123**	**550**	**60%**	**75**	**902**	**92**	**1,230**
SUBSURFACE BASIN INFLOW				**1,000**	**1,550**	**2,106**	**2,110**
TOTAL INFLOW				**13,295**	**837**	**18,056**	**1,360**

OUTFLOW COMPONENTS	WATER EXTRACTED			SALT REMOVED
	Volume Removed (AF)	TDS Conc (mg/L)	Salt Removed (Tons)	(Tons/TAF of Export)
MUNICIPAL PUMPAGE	**18,021**	**564**	**13,810**	**770**
Zone 7 Wells - non Demineralized	9,116	615	7,615	840
Zone 7 Wells - Demineralized*	968	752	989	1020
Zone 7 - ASR Wells	0		0	0
Other	7,937	483	5,206	660
AGRICULTURAL PUMPAGE (all salt is reapplied as Unmetered GW)	**177**	**528**	**127**	**720**
MINING USE	**6,387**	**155**	**1,341**	**210**
Stream Export	1,493	450	913	610
Evaporation	4,194	0	0	0
Processing Losses	700	450	428	610
GROUNDWATER BASIN OVERFLOW	**194**	**650**	**170**	**880**
TOTAL OUTFLOW	**24,779**	**459**	**15,448**	**620**

NET RECHARGE IN 2009 WY (acre-feet)	**-11,484**
NET SALT LOADING IN 2009 WY (tons)	**2,608**

* Includes 798 tons of salt exported as a result of demineralization process.

Table 4.3-2
Zone 7 Water Agency
Historical Salt Loading (in tons)
1974 to 2009 Water Years

SALT INFLOW COMPONENTS YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	AVG	TOTAL
NATURAL STREAM RECHARGE	3,220	3,460	870	590	4,650	1,730	2,710	1,490	4,840	7,700	5,450	3,140	5,070	2,970	2,880	2,950	2,590	3,360	3,630	6,140	2,640	4,550	4,440	4,240	5,470	3,390	3,330	4,010	3,110	6,480	2,970	4,740	4,521	2,182	4,044	3,510	3,696	133,067
Total Arroyo Valle	1,020	1,040	390	320	960	710	780	550	1,090	1,470	1,100	460	910	350	640	350	320	580	710	1,480	390	1,210	510	1,050	1,430	1,020	870	1,980	890	1,560	520	2,020	1,502	447	2,178	1,242	946	34,049
Flood releases recharge	100	340	0	0	220	0	130	0	270	620	20	0	420	0	0	0	0	100	0	340	0	380	200	180	520	0	50	0	240	220	0	1,010	472	0	0	753	183	6,585
Upper reach natural inflow	390	390	390	320	390	390	390	390	390	330	350	300	320	250	590	280	250	360	580	630	260	590	220	660	560	870	630	1,720	200	630	90	0	544	0	276	174	420	15,104
Lower reach natural inflow	530	310	0	0	350	320	260	160	430	520	730	160	170	100	50	70	70	120	130	510	130	240	90	210	350	150	190	260	450	710	430	1,010	486	447	1,902	315	343	12,360
Arroyo Mocho	1,720	2,040	290	80	3,210	640	1,360	480	2,610	4,630	2,510	930	2,270	460	490	440	230	1,020	810	2,170	1,000	1,580	2,630	1,740	2,290	1,000	860	570	890	3,000	840	1,240	1,578	564	504	457	1,365	49,133
Arroyo Las Positas	480	380	190	190	480	380	570	460	1,140	1,600	1,840	1,750	1,890	2,160	1,750	2,160	2,040	1,760	2,110	2,490	1,250	1,760	1,300	1,450	1,750	1,370	1,600	1,460	1,330	1,920	1,610	1,480	1,441	1,171	1,362	1,811	1,386	49,885
AV PRIOR RIGHTS	361	418	31	0	494	267	386	251	502	381	236	328	286	283	325	356	125	290	151	276	321	306	87	93	188	149	175	224	399	630	559	80	446	230	100	407	282	10,140
ARTIFICIAL STREAM RECHARGE	1,073	2,204	1,909	2,293	3,287	3,699	2,894	3,229	1,613	180	0	0	0	0	530	1,581	1,812	1,586	414	1,955	2,793	1,029	491	1,322	497	1,351	2,272	1,352	3,496	3,015	2,697	1,969	1,222	1,399	724	1,248	1,587	57,135
Arroyo Valle	293	1,174	509	883	1,427	1,599	1,234	1,719	663	0	0	0	0	0	0	51	132	36	184	385	293	49	31	472	107	321	242	502	646	605	697	619	281	822	724	686	483	17,385
Arroyo Mocho	340	500	870	880	1,350	1,570	1,430	1,390	890	180	0	0	0	0	530	1,530	1,680	1,550	230	1,570	2,500	980	460	850	390	1,030	2,030	840	2,850	2,410	2,000	1,300	914	577	0	562	1,005	36,183
Arroyo Las Positas	440	530	530	530	510	530	230	120	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	50	27	0	0	0	99	3,567
INJECTION WELL RECHARGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180	500	500	0	0	0	0	0	0	0	0	0	33	1,180
RAINFALL RECHARGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPLIED WATER RECHARGE	7,673	7,213	9,124	10,664	8,350	8,304	7,184	5,503	4,712	4,731	5,050	5,934	6,633	5,561	6,833	6,014	6,533	6,919	5,795	5,103	4,717	3,315	4,118	4,962	4,420	4,773	6,137	6,439	6,049	5,186	6,080	5,317	4,590	5,952	7,349	10,785	6,223	224,021
Total Urban Irrigation	3,359	3,507	3,457	4,603	3,859	3,434	3,116	3,030	3,078	3,069	3,185	3,593	4,095	3,813	4,790	4,498	4,846	6,026	4,885	4,371	3,947	2,697	3,200	3,930	3,750	4,010	4,860	5,340	5,190	4,470	5,240	4,530	3,727	5,108	5,918	9,188	4,270	153,718
Imported Water (SBA from Zone 7)	450	860	1,340	2,740	1,960	1,220	1,310	1,120	1,110	840	870	1,180	1,410	1,470	1,990	1,640	1,870	1,430	1,220	1,800	2,340	1,660	1,810	1,950	1,440	1,930	2,220	2,580	2,350	1,600	2,370	2,090	2,045	2,644	3,110	2,202	1,727	62,171
Groundwater from Zone 7 (no Demin)	2,909	2,647	2,117	1,863	1,899	2,214	1,806	1,910	1,968	2,229	2,315	2,413	2,685	2,343	2,800	2,858	2,976	4,596	3,665	2,571	1,607	1,037	360	280	230	510	550	810	980	1,070	1,180	750	407	606	1,023	2,940	1,809	65,123
Groundwater from Zone 7 (Demin)																																				2,147	2,147	2,147
Zone 7 Groundwater, ASR wells																										130	90	130	100	0	0	0	0	0	0	0	41	450
Groundwater from Retailers & Others																							1,030	1,700	2,080	1,440	2,000	1,820	1,760	1,800	1,690	1,690	1,275	1,858	1,785	1,899	1,702	23,827
Unmetered GW (74-95: in Urban)																							18	22	10	13	17	9	9	6	10	7	83	51	159	127	2,647	2,117
Wente & Concannon	2,494	1,776	3,437	4,131	2,561	2,750	2,098	2,073	1,314	1,282	1,455	1,931	2,148	1,428	1,643	1,186	1,347	733	540	372	380	268	400	580	350	370	770	570	330	370	330	430	353	337	849	921	1,231	44,307
Imported Water (directly from SBA)	200	300	440	890	480	330	420	520	430	330	440	510	720	430	600	370	440	370	310	230	250	180	270	420	280	250	360	270	160	260	250	430	353	337	849	921	406	14,600
Groundwater (Wente & Concannon wells)	2,294	1,476	2,997	3,241	2,081	2,420	1,678	1,553	884	952	1,015	1,421	1,428	998	1,043	816	907	363	230	142	130	88	130	160	70	120	410	300	170	110	80	0	0	0	0	0	825	29,707
LWRP reclaimed water irrigation	1,820	1,930	2,230	1,930	1,930	2,120	1,970	400	320	380	410	410	390	320	400	330	340	160	370	360	390	350	460	390	270	340	440	470	460	280	430	250	358	384	342	457	683	24,591
Domestic groundwater pumpage																							40	40	40	40	50	50	60	60	70	100	69	72	81	92	62	864
SUBSURFACE BASIN INFLOW	2,040	2,040	2,060	3,650	2,510	2,020	1,320	1,280	1,280	880	1,320	1,530	1,510	1,570	1,870	2,360	2,570	3,420	3,200	2,710	2,220	2,020	1,870	1,390	1,650	1,530	1,850	1,970	1,890	1,890	1,890	2,410	2,217	2,087	2,214	2,106	2,010	72,344
TOTAL SALT INFLOW	14,367	15,335	13,995	17,197	19,291	16,020	14,493	11,752	12,948	13,872	12,056	10,931	13,499	10,384	12,438	13,261	13,630	15,575	13,190	16,184	12,691	11,220	11,006	12,007	12,404	11,693	14,264	13,995	14,945	17,201	14,196	14,515	12,996	11,850	14,431	18,056	13,830	497,887

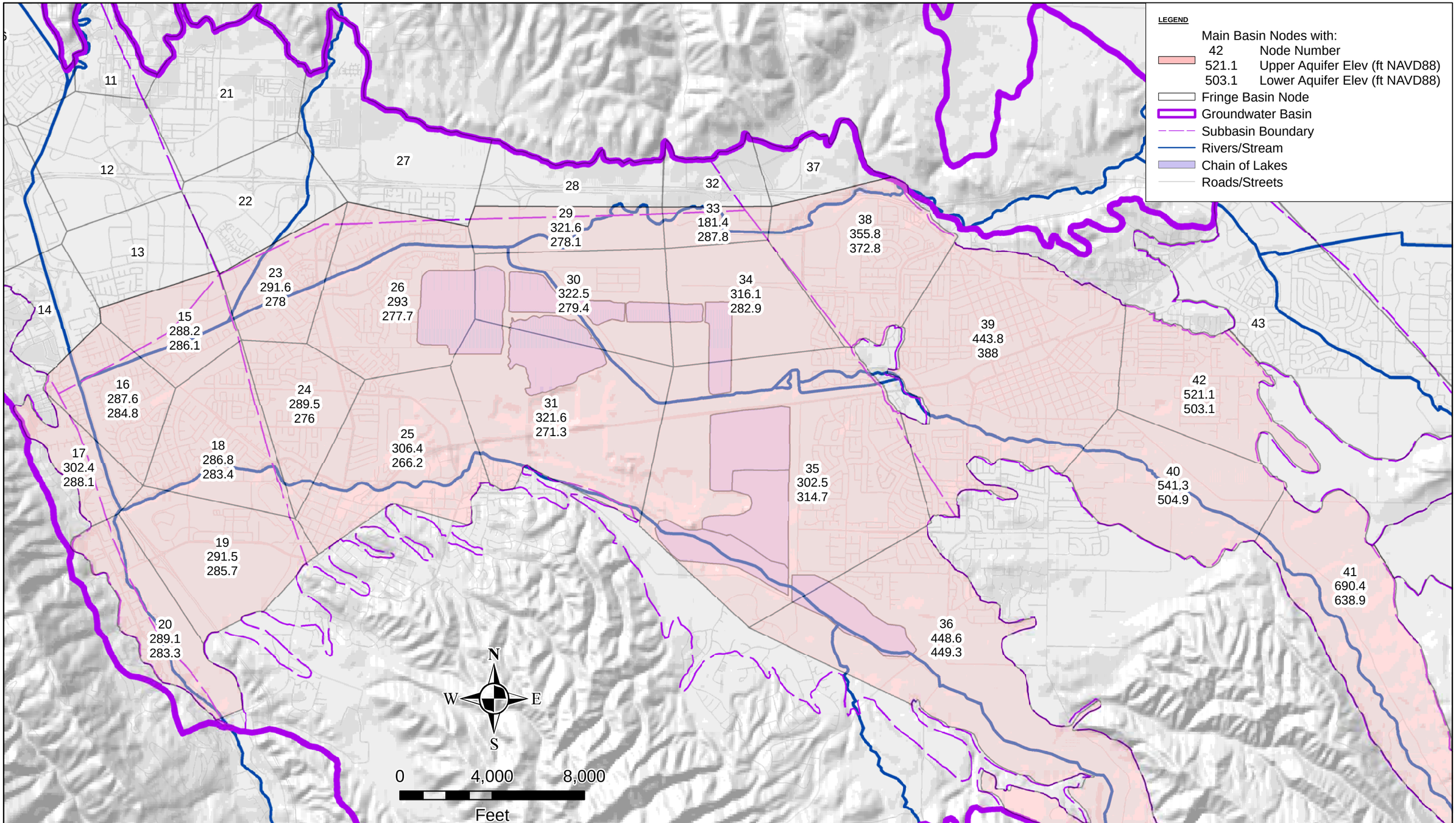
OUTFLOW COMPONENTS YEAR	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	AVERAGE	TOTAL
MUNICIPAL PUMPAGE	-7,218	-6,577	-5,067	-4,383	-4,559	-5,374	-4,485	-4,700	-4,778	-5,409	-5,525	-5,753	-6,465	-5,543	-6,680	-6,918	-7,186	-11,317	-8,895	-6,081	-3,887	-2,667	-3,860	-5,190	-6,510	-5,960	-8,470	-10,560	-12,030	-11,060	-12,200	-10,100	-5,570	-8,500	-9,270	-13,810	-7,015	-252,557
Zone 7 Wells - non Demineralized																							-1,520	-950	-910	-1,240	-2,770	-4,890	-6,310	-5,590	-7,900	-4,900	-2,570	-3,330	-4,620	-7,615	-3,937	-55,115
Zone 7 Wells - Demineralized*																																				-989	-989	-989
Zone 7 - ASR Wells																										-500	-470	-800	-660	0	0	0	0	0	0	0	-221	-2,430
Other Municipal Pumpage																							-2,340	-4,240	-5,600	-4,220	-5,230	-4,870	-5,060	-5,470	-4,300	-5,200	-3,000	-5,170	-4,650	-5,206	-4,611	-64,556
AGRICULTURAL PUMPAGE	-2,294	-1,476	-2,997	-3,241	-2,081	-2,420	-1,678	-1,553	-884	-952	-1,015	-1,421	-1,428	-998	-1,043	-816	-907	-363	-230	-142	-130	-88	-130	-160	-70	-120	-890	-380	-190	-110	-80	-50	-40	-51	-159	-127	-853	-30,714
MINING USE	-1,110	-1,740	-800	-670	-870	-1,600	-2,510	-4,370	-4,160	-7,830	-2,860	-2,820	-6,020	-840	-2,310	-1,730	-920	-970	-1,010	-2,140	-4,930	-6,890	-7,510	-9,980	-9,580	-8,640	-5,800	-4,450	-470	-260	-440	-530	-530	-590	-720	-1,341	-3,054	-109,941
Stream Export	-730	-1,360	-420	-290	-490	-1,220	-2,130	-3,990	-3,780	-7,450	-2,480	-2,440	-5,540	-360	-1,830	-1,250	-440	-490	-530	-1,660	-4,450	-6,410	-7,040	-9,460	-9,080	-8,080	-5,320	-4,010	-110	0	-80	-90	-220	-270	-310	-913	-2,631	-94,723
Evaporation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Processing Losses	-380	-380	-380	-380	-380	-380	-380	-380	-380	-380	-380	-380	-480	-480	-480	-480	-480	-480	-480	-480	-480	-480	-470	-520	-500	-560	-480	-440	-360	-260	-360	-440	-310	-320	-410	-428	-423	-15,218
GROUNDWATER BASIN OVERFLOW	0	0	0	0	0	-170	-610	-640	-2,490	-3,420	-2,590	-1,390	-690	-690	-460	-120	0	0	0	0	0	-230	-970	-970	-1,000	-480	-170	0	0	0	0	0	0	-740	-1,080	-170	-530	-19,080
TOTAL SALT OUTFLOW	-10,622	-9,793	-8,864	-8,294	-7,510	-9,564	-9,283	-11,263	-12,312	-17,611	-11,990	-11,384	-14,603	-8,071	-10,493	-9,584	-9,013	-12,650	-10,135	-8,363	-8,947	-9,875	-12,470	-16,300	-17,160	-15,200	-15,330	-15,390	-12,690	-11,430	-12,720	-10,680	-6,140	-9,881	-11,070	-15,448	-11,448	-412,133

NET SALT INFLOW (Tons)	3,745	5,542	5,131	8,903	11,781	6,456	5,210	489	636	-3,739	66	-453	-1,104	2,313	1,945	3,677	4,617	2,925	3,055	7,821	3,744	1,345	-1,464	-4,293	-4,756	-3,507	-1,066	-1,395	2,255	5,771	1,476	3,835	6,856	1,969	3,361	2,608	2,382	85,754
CUMULATIVE SALT INFLOW (Tons)	3,745	9,286	14,417	23,320	35,101	41,557	46,767	47,257	47,892	44,153	44,219	43,767	42,663	44,976	46,921	50,598	55,215	58,141	61,196	69,017	72,761	74,106	72,642	68,349	63,593	60,086	59,020	57,624	59,879	65,650	67,126	70,962	77,817	79,786	83,147	85,754		

TDS Concentration Calculations	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Net Basin Recharge		-456	5,490	-4,383	-6,004	11,858	6,323	7,994	-597	11,471	9,096	-4,365	-9,855	-1,828	-8,043	-9,277	-5,186	-5,757	-8,815	-6,912	14,761	284	12,842	1,503	-1,928	3,840	-8,306	-5,584	-14,961	-1,833	11,133	-3,354	12,177	7,951	-8,919	-8,417	-11,484
Basin Storage (HI Method)	212,000	211,544	217,034	212,651	206,647	218,505	224,828	232,822	232,225	243,696	252,792	248,427	238,572	236,744	228,701	219,424	214,238	208,481	199,666	192,754	207,515	207,799	220,641	222,144	220,216	224,056	215,750	210,166	195,205	193,372	204,505	201,151	213,328	221,279	212,360	203,943	192,459
Tons of Salt in Main Basin	129,598	133,343	138,885	144,016	152,919	164,699	171,156	176,366	176,855	177,491	173,751	173,817	173,365	172,261	174,574	176,519	180,196	184,814	187,739	190,794	198,615	202,359	203,704	202,240	197,947	193,191	189,684	188,618	187,223	189,477	195,248	196,724	200,560	207,415	209,384	212,796	211,992
Main Basin TDS Concentration	450	464	471	499	545	555	560	558	561	536	506	515	535	536	562	592	619	653	692	729	705	717	680	670	662	635	647	661	706	721	703	720	692	690	726	770	811
Cumulative Increase in TDS Conc		14	21	49	95	105	110	108	111	86	56	65	85	86	112	142	169	203	242	279	255	267	230	220	212	185	197	211	256	271	253	270	242	240	276	320	361

***** Approximately 80% of these salts are exported from the Valley as a result of the demineralization process

NOTE: From 1974-1995 salt inflow from Applied Water from 'Unmetered Groundwater', 'Domestic Pumpage', and 'Groundwater from Retailers' was included in 'Groundwater from Zone 7'.



ZONE 7 WATER AGENCY 100 North Canyons Parkway Livermore, CA	DRAWN: TR	SCALE: 1 in = 4,000 ft	**Figure 4.2-1** **Mean Groundwater Elevation By Node** **Upper and Lower Aquifers, Fall 2009** **Storage - Nodal GW Elevation Method**
	REVIEWED: TR	DATE: May 7, 2010	
	FILE: E:\MONITOR\GWStorage\2009wy\Fig4.2-1-NodalGWE.mxd		

Figure 4.2-2
Graphs of Historical Main Basin Hydrologic Inventory
1974 to 2009 Water Years

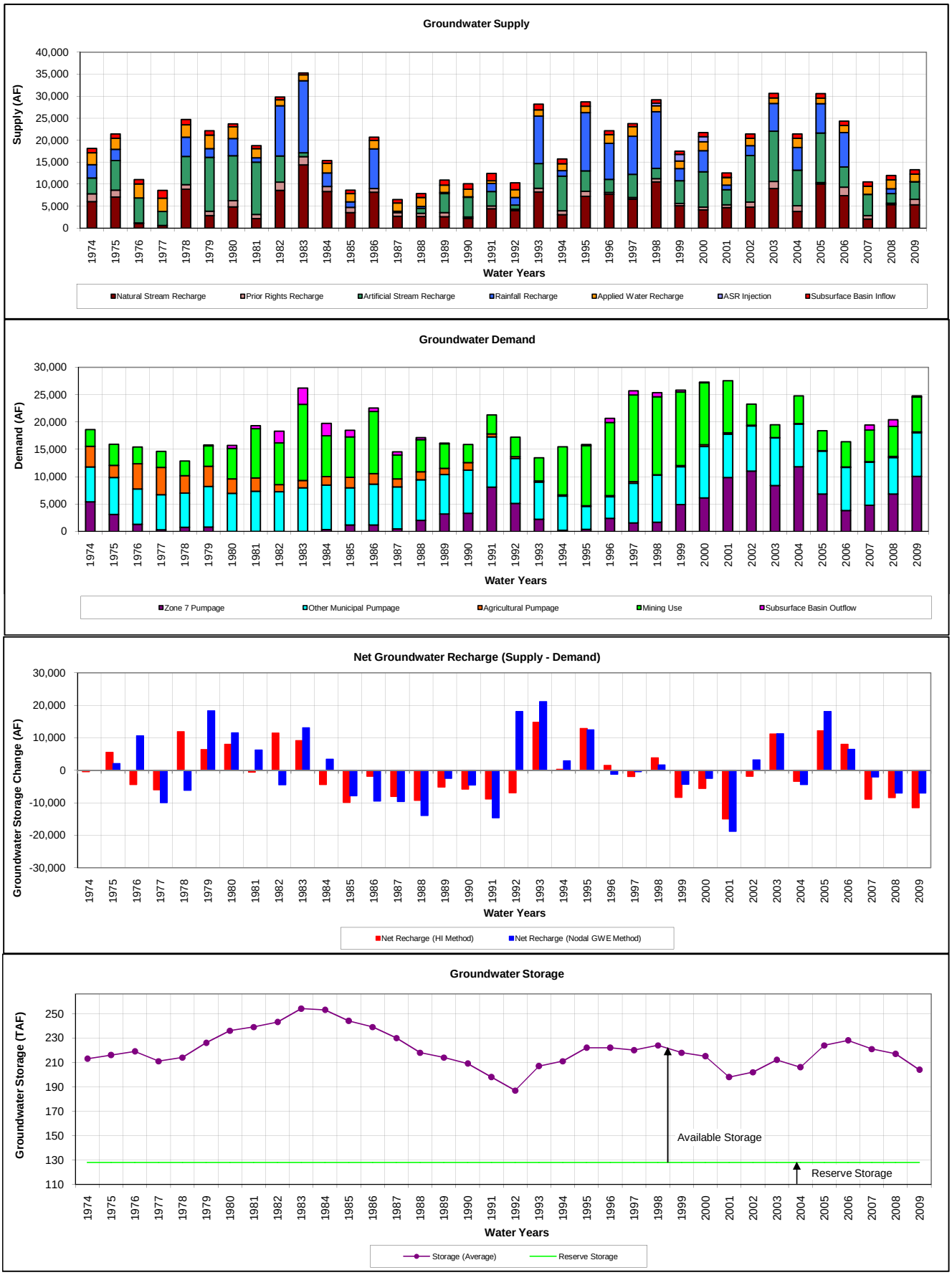


Figure 4.2-3
Storage Calculation Graphs
1974 to 2009 Water Years

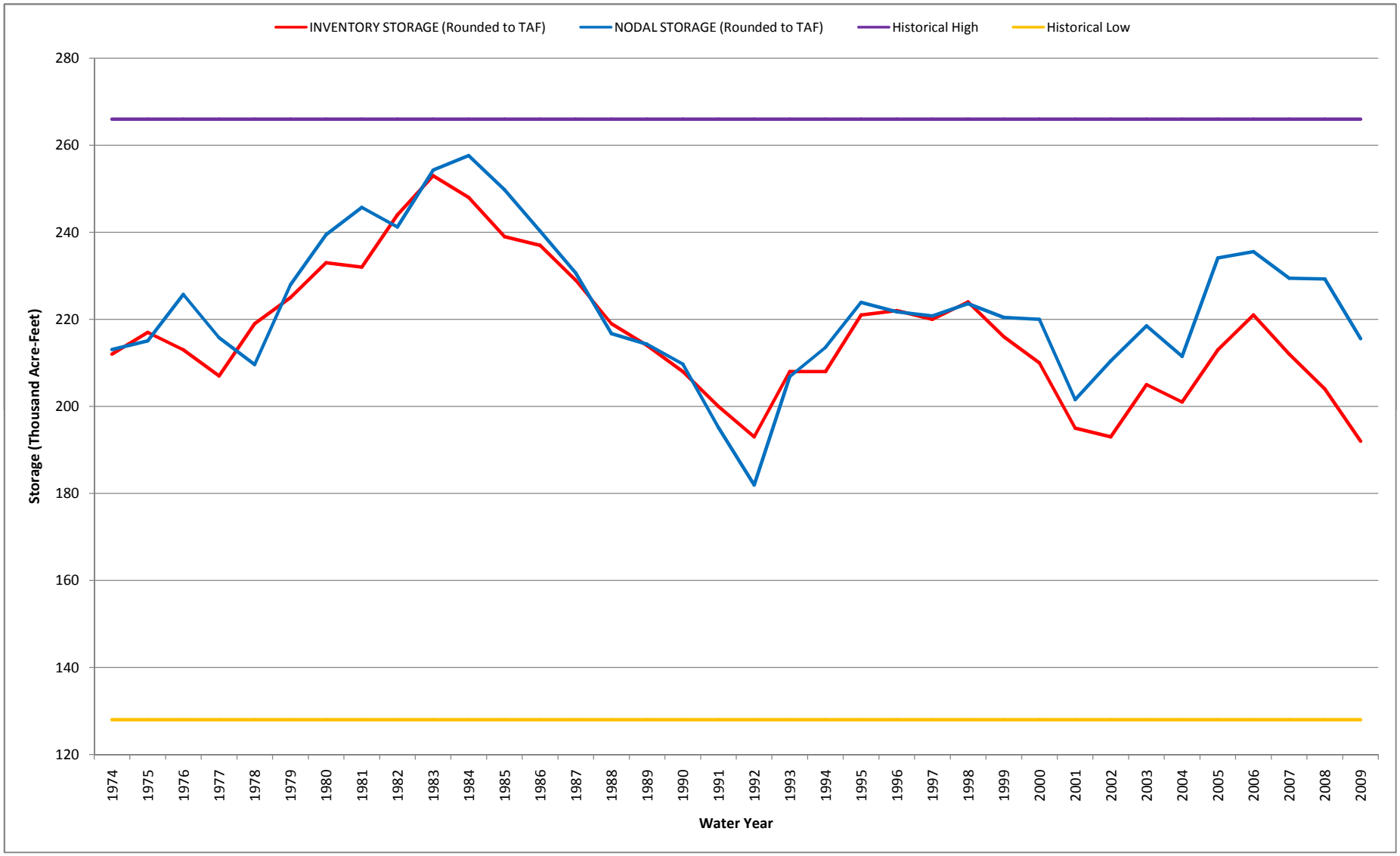


Figure 4.3-1
Graphs of Salt Loading and Salt Concentrations (1974-2009)