5 Basin Management

5.1 Groundwater Management and Sustainability

5.1.1 Overview

Zone 7's basin management program attempts to find the best cost-effective way of providing a long-term viable water supply to meet 100% of valley-wide demands during any hydrologic condition while ensuring long-term stable groundwater quality and protection from groundwater basin overdraft. The program is adaptive because it relies on current hydrologic conditions to direct the program towards the best solution for the current water supply, water demand, and water quality conditions. The program includes:

- Calculating the long-term sustainable groundwater yield (Section 5.1.2)
- Limiting groundwater pumping by its retailers through legal binding contracts (Section 5.1.3).
- Importing surface water to meet demands (Section 5.1.4).
- Implementing a conjunctive use program that recharges imported water into existing streams and lakes (Section 5.1.5).
- Promoting and monitoring wastewater and recycled water use (Section 5.1.6).
- Reviewing development plans for future supply and demand impacts (Section 5.1.7).

The details of these program components are described briefly below and in more detail in the GWMP, which is planned to be updated by May 2014.

5.1.2 Natural Sustainable Yield (Safe Yield)

The Main Basin's natural, sustainable, groundwater yield is defined as the amount of water that can annually be pumped from the groundwater basin and replenished by average annual natural recharge. The long-term, natural, sustainable yield, which is calculated based on natural recharge over a century of hydrologic records and projections of future recharge conditions, consists of the following components (described in Sections 4.1, 4.2, and 5.1.4):

- Natural Stream Recharge including Arroyo Valley Prior Rights

- Rainfall Recharge
- Applied Water Recharge
- Subsurface Inflow
- Basin Overflow

The long-term, natural, sustainable yield in the Main Basin has been documented to be about 13,400 AF annually. Additional water can be and is pumped from the Main Basin each year as long as Zone 7 artificially recharges the basin with additional water from other sources.

While the natural sustainable yield represents long-term-average natural recharge, the actual amount of natural recharge varies from year to year depending on the amount of local precipitation during the year. For the 2010 Water Year, the natural recharge was about 15,090 AF, approximately 122% of normal (Table 4.2-4).

The natural sustainable yield supplies the following demand components, which Zone 7 monitors to make sure they are within the acceptable range:

Table: Sustainable Yield Components (Water Year)

DEMAND COMPONENT	NORMAL/QUOTA (AF/Yr)	2010 WY (AF)
Municipal pumping by Zone 7 retailers	7,214 (CY) (Section 5.1.3.1)	6,769
Other local groundwater users (SFWD, Alameda County Fairgrounds, golf courses, and domestic supply)	1,186	1,020
Agricultural pumping	400	158
Incidental mining area evaporation	3,200	3,111
Groundwater losses by gravel mining activities	1,400	2,696
TOTAL WATER YEAR	**13,400**	**13,755**

CY = Calendar Year

For 2010 Water Year the estimated total for these demand components was 13,755 AF; approximately 355 AF above the long-term sustainable yield of 13,400 AF. The mining activity demands (losses) vary over time depending on the stage of mining in any given pit. When the permitted gravel extraction is complete (estimated for 2030), the decrease in groundwater losses associated with the mining activities (i.e. pit dewatering, gravel washing, and moisture export) should reduce or eliminate this potential overdraft condition. For the near-term, Zone 7 staff is currently working with the gravel mining company staff to investigate ways for the water generated by their pit dewatering operations to be re-percolated into the basin rather than being lost to basin outflow as it is today.

5.1.3 Municipal Pumping

5.1.3.1 Pumping by Zone 7 Retailers

As a condition to the water supply contracts and conditions of use that Zone 7 has with its retailers, each retailer is limited to an annual 'Groundwater Pumping Quota' (GPQ), which is generally based on average historical uses and is part of the basin sustainable yield. The retailers are permitted to pump a combined 7,245 AF annually with no charge from Zone 7. However, they must pay a 'recharge fee' to Zone 7 for all pumped groundwater that exceeds their quota, and Zone 7 must provide additional artificial recharge to balance the excess pumping. This practice helps prevent over-drafting of the basin by the large municipal pumpers.

During the 2010 Calendar Year, the retailers pumped their collective GPQ. The table below shows the individual GPQs and the amounts pumped in 2010 for each retailer. The carry-over amount will be added to the retailers' GPQ for the following year.

Table: Retailer GPQs Volumes (Calendar Year)

Retailer	GPQ	Carry-over from 2009	Pumped in 2010	Carry-over to 2011
City of Pleasanton*	3,500	675	3,507	668
Cal Water Service*	3,069	5	3,098	0
DSRSD*	645	0	645 (by Zone 7)	0
City of Livermore (currently not used)	31	Not used	Not used	Not used
Normal Total/ Quota (sum of *)	**7,214**	**680**	**7,250**	**668**

5.1.3.2 Zone 7 Pumping

Figure 5.1-1 shows historical Valley water production from groundwater and imported water. Zone 7's annual groundwater pumping historically has varied with the availability of surface water and its capacity to treat that surface water. In general, Zone 7 operates its wells for demand peaks and whenever a shortage or interruption occurs in its surface water supply or treatment. However, Zone 7 has also pumped groundwater as an interim salt management strategy. The decision of which well(s) to pump first is based on pumping costs and customer requests based on aesthetic water quality issues. Although reduced groundwater pumping can have a positive impact on groundwater storage and delivered water quality, increased groundwater pumping has a positive impact on the salt mass loading because much of the salt in the groundwater pumped from the wells eventually leaves the basin as wastewater export.

The following summarizes Zone 7's groundwater production for the 2010 Calendar Year:

- Zone 7 pumped 8,417 AF of groundwater; 645 AF of Zone 7's groundwater production was for DSRSD's GPQ by agreement and the remaining 7,772 AF was for Zone 7 supply demand. This groundwater production represents 23% of Zone 7's total treated water demand for 2010.

- Zone 7 pumped 8,204 AF from the Amador Subbasin and 213 AF from the Bernal Subbasin.

- Most of the Amador Subbasin pumping came from the Mocho wellfield (5,710 AF); whereas 1,636 AF was pumped from the COL wellfield and 858 AF was pumped from the Stoneridge wellfield. All of Zone 7's Bernal groundwater production (213 AF) came from the Hopyard Wellfield.

- It is anticipated that groundwater production from the Mocho Wellfield will continue to be the highest priority whenever the MGDP is on-line.

5.1.4 Supplemental Water Sources

Zone 7 ensures that the groundwater supplies are not depleted by importing most of the Valley's water supply (approximately 75%) and by recharging the Main Basin with imported or Lake Del Valle water. In addition to the Livermore Valley Groundwater Basin, Zone 7's main sources of water supply are:

- **Arroyo Valle Prior Rights (Lake Del Valle)** - The operation of Lake Del Valle has the potential to impact Main Basin groundwater storage if unmanaged or unmitigated. Accordingly, Zone 7 coordinates releases from the reservoir into the Arroyo Valle to maintain flows and recharge through the streambed at the levels that would have occurred had the reservoir not been constructed. These releases are a requirement of Zone 7's water rights for the Arroyo Valle water and give Zone 7 the ability to use another portion of Arroyo Valle water for supply to its treatment plants. Zone 7 also recharges additional supplemental SWP water in the Arroyo Valle.

- **State Water Project (via South Bay Aqueduct)** - As a SWP contractor, Zone 7 imports supplies from the SWP using the SWP conveyance system. As of 1998, Zone 7 has an annual maximum SWP contract amount of 80,619 AF per year (AF/yr) referred to as the 'Table A Contract Amount'. However, actual SWP deliveries can be and have been less due to hydrologic conditions. In 2009, DWR revised its long-term reliable yield estimate to 60% of the Table A amount (48,370 AF/yr) due to future climate change and imposed restrictions on Delta pumping.

- **Byron-Bethany Irrigation District (via South Bay Aqueduct) (BBID)** - Zone 7 has a contract with Byron-Bethany Irrigation District for up to an additional 5,000 AF/yr of supplemental water made available as a transfer of pre-1913 Delta water.

- **Kern Groundwater Basin (storage rights only)** - Zone 7 has purchased water storage rights (78,000 AF) in the Semitropic Water Storage District and 120,000 AF of storage in Cawelo Water Storage District. Both are located in the Kern Groundwater Basin in Kern County located in south-central California, near Bakersfield.

Figure 5.1-2 shows the volumes for each of the main water supply and use components for the 2010 Calendar Year. Highlights of activities for 2010 included the following:

- Zone 7 carried-over approximately 7,700 AF of local water in Lake Del Valle for use in 2011,
- Zone 7 imported 35,300 AF of SWP water into the Valley (including 5,000 from BBID). For the 2010 Calendar Year, total DWR allocations to Zone 7 were 50% of Zone 7's Table A Contract Amount.
- Zone7 release about 8,000 AF to the local arroyos for its artificial recharge program and to maintain a live-flowing stream on the Arroyo Valle to meet water rights permit conditions.
-
- Zone 7 increased its total outside storage to about 91,000 AF (Semitropic at 81,000 AF and Cawelo at 10,000 AF).

5.1.5 Conjunctive Use Program

Zone 7 actively embraces a conjunctive use approach to Basin Management by integrating management of local and imported surface water supplies and out-of-basin groundwater banking participation with the management of the local groundwater basin. A key component of Zone 7's integrated conjunctive use approach has been artificial recharge which utilizes releases of surface water to dry arroyos that subsequently recharge the groundwater basin. The location and timing of artificial recharge can be used as a water quality management tool as outlined in the Salt Management Plan as well as a temporal water storage activity. The timing and quantity of artificial recharge are typically dependent upon available supply, natural flows, source water quality, and regulatory requirements.

Zone 7 has caused the Main Basin's water levels to rise and be maintained above the historical lows by artificially recharging more water than was pumped and by importing most of the water needed by the Valley's growing population.

Zone 7 can manage the water quality of the groundwater basin by selecting the location and quality of recharge waters and the location and depth of groundwater pumping. Each acre-foot of surface water recharged when TDS is low in the spring adds low TDS water to the groundwater basin. Each acre-foot that is subsequently pumped removes water with higher TDS. This process, often called 'increased conjunctive use', removes salts from the groundwater basin. The salt removal effectiveness is related to the difference in the TDS of recharge and pumped water and the annual volume of water conjunctively used.

For 2010 Zone 7's Conjunctive Use Program included the following activities and highlights:

- With the increased availability of surface water, Zone 7 was able to dedicate more to artificial recharge on Arroyo Mocho for an increase of 78% over the previous year (4,841 AF in 2010

compared to 2,728 AF in 2009). Zone 7 also allowed Shadow Cliffs to divert a total of 715 AF for recharge and maintaining the lake level.

- Zone 7's groundwater pumping withdrew 8,445 AF (Calendar Year) of water from its basin storage.

- From the end of the 2009 Water Year to the end of the 2010 Water Year, storage dropped slightly about 166 AF to 84,000 AF of 'Operational Storage' (Section 4.2). Storage dropped another 720 AF from the end of the 2010 Water Year to the end of the 2010 Calendar Year.

Looking into the future, the local groundwater basin will continue to be used conjunctively to meet annual and dry year demands. Groundwater pumping in normal years will increase to about 10,000 AF per year after the completion of the Arroyo Mocho diversion into the Chain of Lakes to supplement Zone 7's artificial recharge capacity.

5.1.6 Municipal Wastewater and Recycled Water Use

Wastewater disposal from domestic and commercial sites, if disposed in natural waterways or if disposed on the land, can have a significant impact on water resources and the groundwater basin. Zone 7 also sees recycled water use as an integral part of the valley-wide water resources management program. From a water supply/quantity perspective, wastewater disposal and recycled water can be a significant source of water. From a water quality perspective they can be a potential source of contamination primarily from elevated concentrations of total dissolved solids, nitrates and chlorides, along with the potential for other wastewater contaminants (nutrients, organics, NDMA [N-Nitrosodimethylamine], and biological constituents).

In the late 1980's and early 1990's Zone 7 partnered with the cities, wastewater agencies, and the permitting agency (RWQCB) to develop a master water recycling permit. The permit goals were essentially to maximize the beneficial use of recycled water while protecting the groundwater basin from possible water quality degradation. Proper management of local resources require that wastewater disposal and recycled water use be monitored to determine the quantity, the quality, and the impact on the local resources. The City of Livermore and DSRSD are responsible for treating and monitoring the majority of wastewater and all recycled water used within the Valley. Zone 7 reviews their monitoring program data (Section 3.8.2) and evaluates the impacts of recycled water on the local groundwater resources.

The wastewater quality concerns have been greatly reduced through prevention of high-density un-sewered development, wastewater export, and elimination of nitrification of recycled water. Mitigation of the water quality concerns related to salt loading from recycled water use is addressed in Zone 7's Salt Management Plan (Section 5.2.1). This plan is currently being updated to conform to the State Water Board's new Recycled Water Policy (State Water Board, Resolution No. 2009-0011, adopted February 2009). In the process, potential impacts and mitigation strategies with respect to Zone 7's new water supply plans and retailer recycled water plans will be addressed. The updated Groundwater Management Plan/Salt Nutrient Management is due for completion by May 2014.

5.1.7 Review of Development Plans and Land Use Changes

Zone 7 reviews new development plans and their associated CEQA documentation to evaluate their potential impact to groundwater supply and quality. The potential supply impacts can be from new or increased pumping/losses or from a reduction in the Main Basin's recharge capacity. No potentially significant impacts to the groundwater supply or quality were identified during Zone 7's project review efforts in 2010. However, additional evaporative losses and groundwater exportation are anticipated as gravel mining progresses in the future Lakes C and D areas, south of Stanley Boulevard. Zone 7 is keeping groundwater levels low to minimize mining exports. Evaporation has been incorporated into long-range plans. See Section 5.4.1 for additional information on these plans.

5.2 Salt Management

5.2.1 Strategy and Overview

Zone 7's Water Supply Operations Plans can use an adaptive management approach to selecting the combination of salt management strategies to be implemented in a given year. Multiple variables are balanced when making decisions, and variables change from year to year; hence the need for a so-called adaptive or iterative management approach.

In 2004 Zone 7 prepared a Salt Management Plan (SMP, Section 5.2.2) to address the increasing level of total salts in the Main Basin. This plan led to the construction of Zone 7's groundwater demineralization facility, completed in July 2009 (Section 5.2.3), which is designed to decrease or halt the build-up of salts in the groundwater basin without having to deliver them to Zone 7's customers. Zone 7 plans to update the Salt Management Plan by May 2014 to conform to the State Water Board's new recycled water policy (State Water Board, Resolution No. 2009-0011). Zone 7 plans on incorporating this update into the GWMP update, which will be completed at the same time.

5.2.2 Salt Management Plan

Zone 7's SMP was designed to protect the long-term water quality of the Main Basin and was added at Zone 7's request as a requirement of the Master Water Recycling Permit, RWQCB Order No. 93-159, issued jointly to Zone 7, the City of Livermore, and Dublin San Ramon Services District. In May 2004, Zone 7, in cooperation with the other agencies, published the SMP to address the increasing level of salt in the Main Basin. The SMP was approved by the RWQCB in October 2004. The SMP was incorporated into Zone 7's GWMP in 2005.

The SMP identified potential salt management strategies to offset the calculated long-term average salt loading to the Main Basin. The viable alternatives generally fall into three categories:

- Management of artificial recharge to take advantage of low TDS imported water when available;

- Pump and deliver more high TDS groundwater to customers so more salts are exported as wastewater; and

- Construct and operate a groundwater demineralization facility to remove salts that are exported as waste by-products (reverse osmosis concentrate/brine), and blend the low-salt effluent with groundwater or Zone 7 system water.

Factors used to track salt loading include data and information collected from the various monitoring programs (Section 3). The existing monitoring programs are sufficient for tracking salt loading from existing sources and for existing land use conditions. Future land use changes and any increased use of recycled water may require additional monitoring to track the resultant additional salt loading. The monitoring component of the SMP facilitates tracking any progress in salt removal.

The SMP identified 14 cross-sectional transects to evaluate potential subsurface inflows of salt into the Main Basin. Staff has completed a preliminary evaluation of three transects across the northwestern boundary of the Main Basin: Chabot, Hacienda, and East Dublin. Staff will continue to evaluate the other SMP transects, the results of which will be presented when the SMP is updated.

In February 2009, the State Water Board adopted a Recycled Water Policy (State Water Board, Resolution No. 2009-0011) which requires that Salt Nutrient Management Plans be completed for all groundwater basins in California by May 2014. While this requirement does not apply to a basin where a plan has already been approved by the Regional Water Board, Zone 7 plans to update the basin's Salt Management Plan (*Zone 7, 2004*) by the May 2014 deadline to conform to the State Water Board's new recycled water policy. Zone 7 plans on incorporating this update into the GWMP update, which will be completed at the same time.

5.2.3 Demineralization

In July 2007, Zone 7 started construction of the Mocho Groundwater Demineralization facility to reduce salt build-up in the groundwater basin while improving delivered water quality to meet targets established in Zone 7's Water Quality Policy. The facility went online in July 2009. It is a reverse osmosis (RO) membrane-based treatment system producing product water with extremely low TDS. The demineralized water is then blended with other groundwater (non-demineralized) or system water to achieve the desired overall delivered water TDS and hardness. The brine concentrate from the RO process is exported out of the watershed to San Francisco Bay through the regional wastewater export pipeline operated by LAVWMA. Based on Zone 7's projections, additional salt removal facilities may be required to keep pace with the additional salt loading projected for the basin as the overlying communities approach build-out.

During the 2010 Water Year, 3,142 AF of groundwater from the Mocho Wellfield were routed through the demineralization plant's reverse osmosis (RO) membranes. As a result, 2,468 AF of very low-to-no-salt permeate was blended with system or other groundwater and fed into Zone 7's distribution system for delivery to Zone 7's customers. The RO process also generated concentrate (brine) that was exported from the basin via the LAVWMA treated wastewater pipeline which discharges to the San Francisco Bay. Approximately 675 AF of brine containing about 2,760 tons of salt, was exported from the basin as a direct result of the groundwater demineralization operations during the 2010 Water Year. The discharge

volumes and salt concentrations of the exported brine is monitored by DSRSD and reported to Zone 7 staff periodically throughout the year.

Table: Salts Removed by Zone 7's Groundwater Demineralization Plant Operations (Water Year)

Volume exported from Valley (AF)	Average TDS Concentration (mg/L)	Salt Mass Exported (Tons)	Tons Salt Removed per 1000 AF of Export
675	3,010	2,760	4,090

5.3 Groundwater Resource Protection Programs

5.3.1 Well Ordinance Program

The construction, repair, reconstruction, destruction or abandonment of wells within Zone 7 is currently regulated by Alameda County General Ordinance Code, Chapter 6.88. Zone 7 administers the associated well permit program within its service area including within the three incorporated cities: Dublin, Livermore, and Pleasanton. As a result, any planned new well construction, soil-boring construction, or well destruction must be permitted by Zone 7 before the work is started. Additionally, all unused or abandoned wells must be properly destroyed; or, if there are plans to use the well in the future, a signed statement of future intent must be filed at Zone 7. There is currently no fee for the Zone 7 permits.

A copy of the current Zone 7 drilling permit application is available for download from the Zone 7 web-site. Zone 7 must receive permits at least five days prior to beginning any drilling. Well construction and destruction permit requirements are determined on a case-by-case basis, but generally follow DWR's California Well Standards (Bulletins 74-81 and 74-90). This program allows Zone 7 to protect the groundwater basin from any negative impacts that would be threatened by poorly-constructed wells.

Zone 7 issued 130 drilling permits in the 2010 Calendar Year (100 in 2009). Zone 7 tracks the purpose of each project requiring a drilling permit. Following is the itemization of the types of permits issued:

- 42 for drilling associated with geotechnical investigations;
- 54 for drilling associated with contamination investigations, monitoring and clean-ups;
- 8 for general groundwater monitoring;
- 17 for the destruction of existing wells;
- 9 for new water supply wells; and
- 0 for cathodic protection wells.

In late 2009, a Zone 7 Construction Inspector was assigned to the Zone 7 Groundwater Protection Section to assist with permit compliance inspections and to ensure that the California Well Standards (DWR

Bulletin 74-90) were being met during well constructions, reconstructions and destructions. In 2010, more than 90% of the permitted well work was inspected by Zone 7 permit compliance staff.

Zone 7 is in the process of creating its own "Well Ordinance" to regulate the construction, repair, reconstruction, destruction or abandonment of wells within the Zone 7 service area. It is currently relying on the Alameda County General Ordinance Code that recently replaced the original County Ordinance (No. 73-68), that Zone 7 and the cities of Livermore, Pleasanton and Dublin adopted; however, the General Ordinance is silent about Zone 7's jurisdiction within the County and these cities. Once completed, and reviewed by the affected public agencies, the new Zone 7 ordinance will be presented to the Zone 7 Board of Directors and to the local City councils along with requests for rescission of their previous adoptions of County Ordinance 73-68, and for the adoption of the new Zone 7 ordinance. These actions are anticipated to take place in 2011.

5.3.2 Septic Tank Management Program

Although Alameda County Environmental Health (ACEH) issues permits for the operation, installation, alteration, and repair of onsite wastewater treatment systems in Alameda County; Zone 7 requires special approval for any the following septic systems located within the Valley:

- Any new septic system constructed, partially or fully, for a commercial or industrial use;
- Any conversion of a residential septic system to a commercial or industrial use; or
- Any new residential septic system that discharges greater than one rural residential equivalence of wastewater (i.e., greater than an annual average of 320 gallons/day).

In 1982, the Zone 7 Board of Directors adopted the 'Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles' and its recommended policies (Resolution No. 1037). In addition, a separate policy was established in 1983 that prohibits the use of septic tanks for new developments zoned for commercial or industrial uses (Resolution No. 1165). This prohibition can be waived by the Zone 7 Board if, "it can be satisfactorily demonstrated to the Board that the wastewater loading will be no more than the loading from an equivalent rural residential unit (on a five-acre lot) and said septic tank(s) will be in compliance with all other conditions and provisions."

No commercial septic tank applications were received by Zone 7 during 2010; therefore, no commercial septic systems were approved by the Zone 7 Board. However, one special approval was issued by Zone 7 staff for a second residential septic tank use on an 8.7 acre lot. Staff conditioned the approval on the installation of nitrogen-reducing treatment system on at least one of the two residential septic systems to reduce the total onsite wastewater nitrogen loading density below the equivalence of a single residential equivalence on five acres, which is Zone 7's policy standard.

5.3.3 Toxic Site Surveillance Program

Zone 7 documents and tracks sites across the groundwater basin that pose a potential threat to drinking water. Information on these sites is gathered from state, county, and local agencies, as well as from Zone

7's well permitting program. Each site has been assigned a Zone 7 number, which corresponds to a file number containing reports or other information about the site. In addition, all sites are reviewed and given a priority designation (high, moderate, or low) based on criteria used by the RWQCB and ACEH that have been modified to meet Zone 7 standards. For example, a site is designated as high priority if contamination at the site is in groundwater at concentrations greater than the maximum contaminant level (MCL) and a water supply well is within 2,000 ft down-gradient of the site, or it is shown that drinking water will likely be impacted by the contamination at the site.

In general, the Toxic Site Surveillance Program has found two types of contamination threatening groundwater in the Livermore Valley Groundwater Basin:

- **Petroleum-based fuel products -** include total petroleum hydrocarbon as gasoline (TPHg), TPH as diesel (TPHd), benzene, toluene, ethylbenzene, xylene (collectively known as BTEX), and fuel oxygenates, such as methyl tertiary-butyl ether (MTBE) and tertiary-butyl alcohol (TBA). California has assigned clean-up standards (Title 22, California Code of Regulations) for the BTEX compounds and fuel oxygenates. However, a clean-up standard for total petroleum (TPHg or TPHd) has not officially been established.

- **Industrial chemical contaminants –** include the chlorinated solvents tetrachlorethylene (PCE), trichloroethylene (TCE), and their degradation by-products, such as vinyl chloride (VC) and dichloroethene (DCE). PCE is common in the dry cleaning business, and TCE is commonly used as a degreaser for electronics. Both PCE and TCE have an established maximum contaminant level (MCL, EPA National Primary Drinking Water Regulations) of 5 µg/L.

In 2010, Zone 7 tracked the progress of 74 active sites where groundwater contamination has been detected or contamination is threatening groundwater. Eight contamination cases were closed during 2010, after they were determined to no longer pose a threat to drinking water. Maps have been generated that show the site locations, their priority, and their proximity to municipal supply wells for each main area of the groundwater basin: Livermore (Figure 5.3-1), Pleasanton (Figure 5.3-2), and Dublin (Figure 5.3-3).

As summarized in the latest program report, presented to the Zone 7 Board in February 2011, eleven of the sites are designated as high priority: six in Livermore, four in Pleasanton, and one in Sunol. Although several sites in Dublin have elevated levels of MTBE (i.e., >10,000 parts per billion [ppb]) and one has elevated levels of TCE, none are classified as high priority because they are not near drinking water supply wells and are outside the Main Basin.

Seven of the eleven high priority sites are fuel leak cases and the other four are the result of industrial solvent contamination. All of the seven fuel leak cases are being overseen by ACEH. Three cases have remediation underway, and the remaining four fuel leak cases have completed a remediation workplan. A domestic well in Sunol was impacted by one of these fuel leak sites and currently has a wellhead treatment system in operation.

Of the four high priority industrial solvent cases, two are being overseen by the RWQCB while the other two are not included in any of the Local Oversight Programs (LOP). Both of the RWQCB cases involve contamination from dry cleaner facilities; one in Pleasanton and one in Livermore. The Pleasanton site is

now undergoing active remediation. The Livermore site has attempted remediation but with limited success; low-level PCE contamination has now reached two municipal supply wells located down-gradient of the Livermore dry cleaner site. The water purveyor is currently using granulated-activated carbon (GAC) filters to ensure against any customer health impacts. The lateral and vertical extent of contamination has been determined and an effective remedial action plan is being developed.

The other two industrial solvent cases which are of concern to Zone 7, but are not currently included in any of the LOP cases, also involve PCE contamination: one in Pleasanton and one in Livermore. The contamination in Pleasanton has impacted a public supply well, which has required the well owner to utilize GAC to remove the contamination prior to public consumption. Zone 7 is in the process of investigating a potential source for this site in order for the RWQCB to consider taking it on as a formal case in the RWQCB's oversight program. For the site in Livermore, a potential Responsible Party has been identified, but the extent of contamination has not been determined. Zone 7 is working with the RWQCB to expedite opening this site as a formal case in the RWQCB's oversight program and begin directing its further investigation.

5.4 Capital Projects

5.4.1 Chain of Lakes Recharge Projects

As mitigation for removal of aquifer material and interruption of groundwater movement resulting from the mining of aggregate resources between Livermore and Pleasanton, ten of the resulting quarry lakes, collectively called the Chain of Lakes (COL), will be deeded to the Zone 7 Water Agency for water resources management purposes (see Figure 5.4-1). Zone 7's planned uses for these lakes include water supply storage, capture and percolation of surface water, detention of flood waters, and enhancement of special-status species habitat. Full implementation of these uses is not expected before 2030 when the mining operations are projected to be complete. However, Zone 7 is working on several interim projects that are designed to convey, capture and recharge imported SWP water and mining discharge.

Planning for the full implementation project(s) is included in Zone 7's current Capital Improvement Program (CIP) Ten-Year Water System Plan as a project itself (i.e., Chain of Lakes Master Plan). The project concepts have been developed over time, but the project details and the associated environmental impact analyses aren't scheduled to kick-off until fiscal year 2012-13, and are anticipated to take two to four years to complete.

In the near-term, Zone 7 staff has begun collaborating with Vulcan Materials on a project that will capture and percolate groundwater that they normally would discharge to the Arroyo Mocho and be lost as 'basin outflow'. Vulcan produces varying quantities of groundwater, mostly from their quarry pit de-watering operations, and discharges a large portion of it into the Arroyo Mocho under the authority of an NPDES permit issued by the RWQCB. This project will add piping to their discharge line to convey their discharge into Lake I. Once in Lake I, the water will percolate through the sidewall and recharge the Amador Subbasin aquifers. It is estimated that this project will eliminate 1,500 to 3,000 AF of groundwater losses per year when constructed. The project is anticipated to be in-service by the end of 2011.

Another near-term recharge enhancement project that Zone 7 staff is working on, is the Arroyo Mocho Diversion project, which is anticipated to be in service by 2014. This project will construct a fish-friendly stream diversion facility on the Arroyo Mocho that will divert imported SWP water released to the arroyo from the SBA into Lake H or Cope Lake and subsequently conveyed into Lake I to further enhanced Zone 7's artificial aquifer recharge capacity. Zone 7 staff are currently negotiating the design requirements and operational parameters with the resource permitting agencies; National Marine Fisheries Service (by referral from US Army Corp of Engineers), California Department of Fish and Game, and RWQCB.

5.4.2 Well Master Plan

The Well Master Plan project involves the construction of seven to nine new municipal water supply wells over the next 20 years to meet Zone 7's potable water drought reliability goal. The reliability goal was established in 2002 by Zone 7 Resolution 02-2382. It requires Zone 7 to maintain sufficient well capacity for Zone 7 to meet 100% of its Municipal and Industrial (M&I) customers' projected future needs, even during worse-case drought conditions. As additional benefits, these wells will provide Zone 7 with a better ability to manage groundwater levels, groundwater flow, dissolved salt build-up/removal, delivered water quality blending, and peak-day demands.

Zone 7's Well Master Plan (WMP), the planning effort for the new wells, was completed by CH2M Hill in 2003, and an Environmental Impact Report (EIR) was certified by the Zone 7 Board in August 2006. The first two new wells (COL 1 and COL 2), including the associated pipelines, pump stations and treatment facility, have since been constructed in the Chain of Lakes Wellfield and have been fully operational for one year. Their combined maximum production capacity is estimated at eight million gallons per day (MGD). The next new wells are being planned for completion in 2017, and will likely also be constructed in the Chain-of-Lakes Wellfield.

5.4.3 Demineralization Plant

In July 2007, Zone 7 started constructing the Mocho Groundwater Demineralization Facility to halt salt build-up in the groundwater basin and to improve delivered water quality. The facility was completed in December 2009 and has been in operation for more than one year, albeit not continuously operated at full capacity during that time. Nonetheless, it was directly responsible for removing 2,760 tons of salt from the groundwater basin during the 2010 Water Year (see Section 5.2.3 for a more detailed description of this project).

Tentatively, Zone 7 plans to construct a second groundwater demineralization plant in about 2030, and possibly a third after that, if necessary. One issue of concern that could impede progress of these plans is that in order to extract more groundwater from the basin, there would need to be a way to replenish the groundwater at about the same rate in order to keep the groundwater supply sustainable. Although there are plans to increase the artificial recharge capacity of Zone 7's system, the actual water supply for the program and the actual percolation rate (and rate of plugging) for Lake I, has not been firmly established. Both of these unknowns should be resolved in the coming years, well in advance of the future demineralization facility plans. Zone 7 staff will work more on these issues during its Groundwater Management Plan/Salt Nutrient Management Plan update effort.

5.4.4 Monitoring Wells

One nested monitoring well set (four wells total) was installed in the Main Basin during the 2010 Calendar Year as part of the Hydrostratigraphic Investigation at the Chain of Lakes Project (Section 5.4.5). The nested wells are part of an ongoing study to evaluate the use of Lakes C and D as viable aquifer recharge basins in comparison to Lake I. These four new wells (3S/1E 13P 5 to 8) will be measured for water levels on a semi-annual basis and water quality on an annual basis as part of Zone 7's Groundwater Monitoring Program. Well construction details for each new well are presented in the table below.

Table: New Monitoring Wells for 2010 Calendar Year

Project	Well Name	Well Number	Depth (ft)	Upper Screen (ft bgs)	Lower Screen (ft bgs)
Hydrostratigraphic Investigation at the Chain of Lakes	Well #1	3S/1E 13P 5	141	110	130
	Well #2	3S/1E 13P 6	258	230	250
	Well #3	3S/1E 13P 7	377	350	370
	Well #4	3S/1E 13P 8	605	580	600

5.4.5 Other Projects

Starting in the 2010 Water Year and continuing into the 2011 Water Year, Zone 7 performed a *Hydrostatic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes* (Zone 7, May 2011) in cooperation with the Department of Water Resources' Local Groundwater Assistance Program. The project investigated the potential connectivity between future Lakes C and D, of the future Chain-of-Lakes (Figure 5.4-1), and the productive aquifers in the West Amador Subbasin. The scope of work included drilling one exploratory borehole, performing borehole geophysical logging, and installing nested monitoring wells in the borehole (see Section 5.4.4). A pumping test was also performed to verify connectivity of hydrostratigraphic units. Zone 7 then evaluated the results to modify and extend Zone 7's network of cross sections south through the study area. The new nested wells have been incorporated into the Groundwater Monitoring Program (Section 3.2).

The following key observations and conclusions were made as a result of the study:

- The subsurface materials encountered in the borehole were mostly sandy gravels consistent with high yielding aquifers, as were the aquifer parameters estimated from the pumping test results (i.e., transmissivity and hydraulic conductivity);

- Pumping tests provided a means of evaluating communication between wells and continuity of aquifer units; whereas, water quality provided little help;

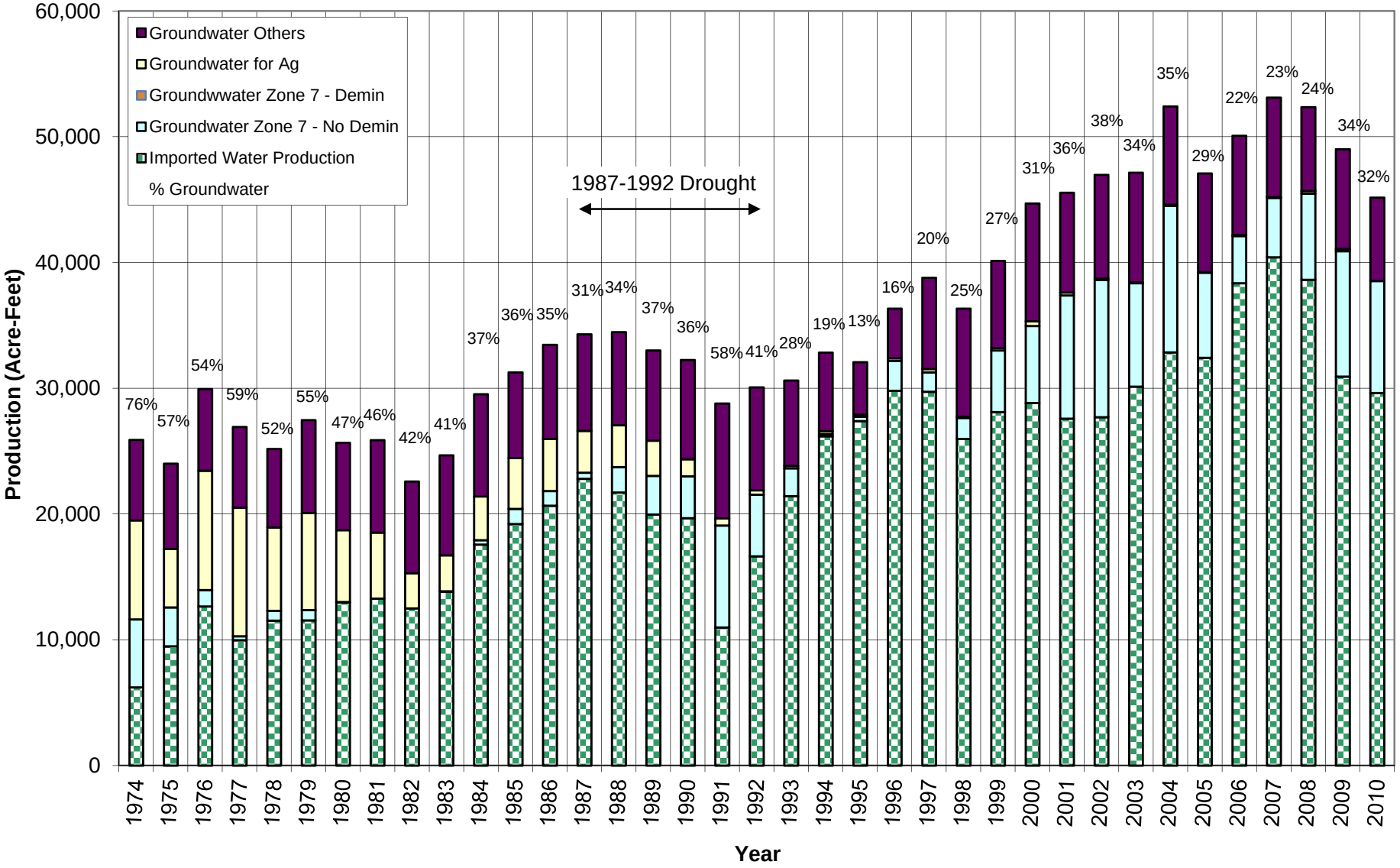
- The results of the geophysical logging in the new borehole, as well as those on file from other boreholes in the study area, provide a means to extend previous stratigraphic interpretations conducted in the northern portion of the Amador Sub-basin south to the study area.

- There are fewer and thinner aquitards in the study area than observed to the northwest, below the Lake I area. This is consistent with the interpretation that the study area represents a proximal (upstream) area of the alluvial fan deposits that comprise the Main Basin.

- The results of this study suggest that the future Lakes C and D would be effective aquifer recharge facilities for replenishing the upper portions of the Lower Aquifer from which several of Zone 7's and City of Pleasanton's municipal supply wells pump.

FIGURE 5.1-1

Valley Water Production from Imported Water and Groundwater Sources
1974 to 2010 Water Years



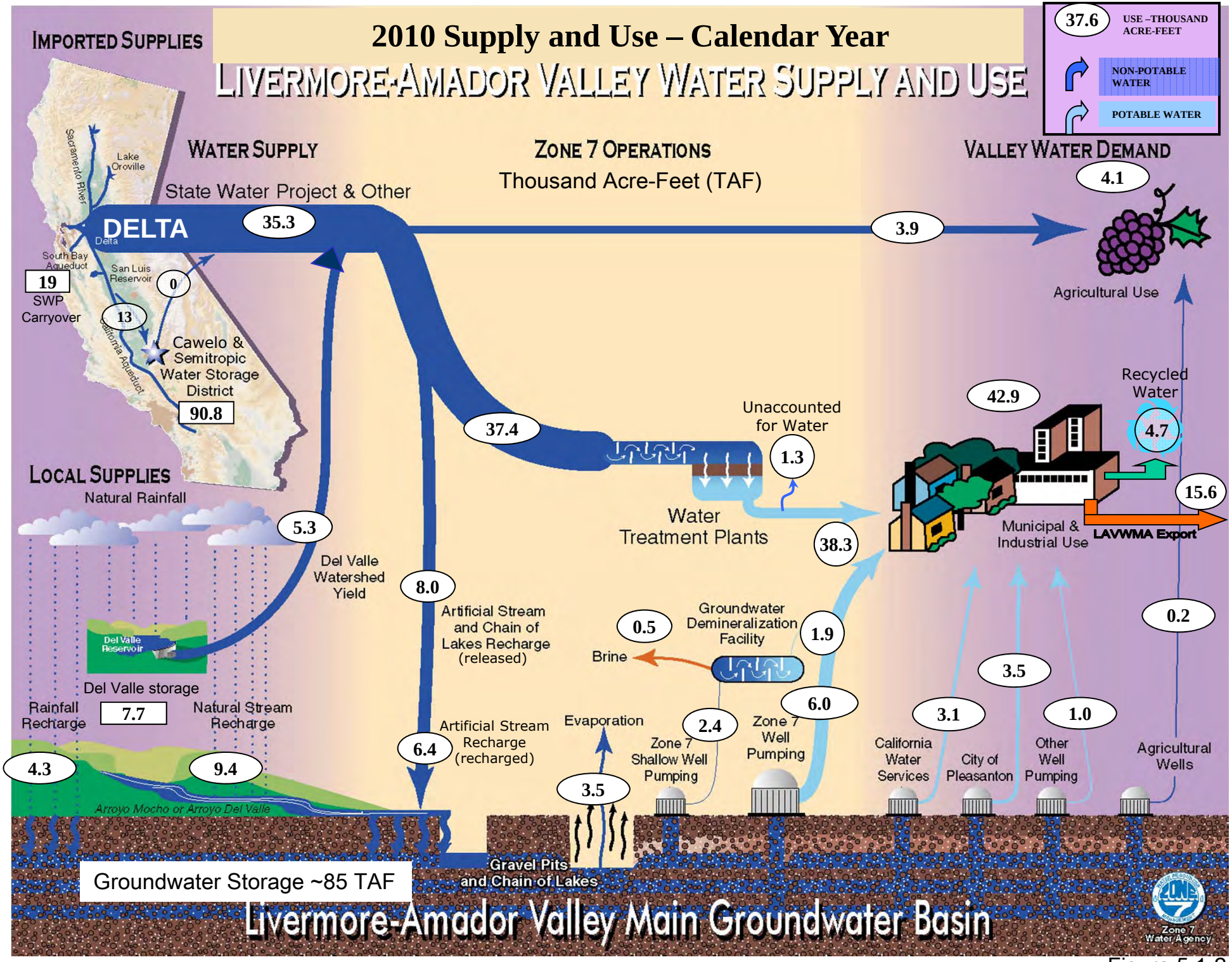
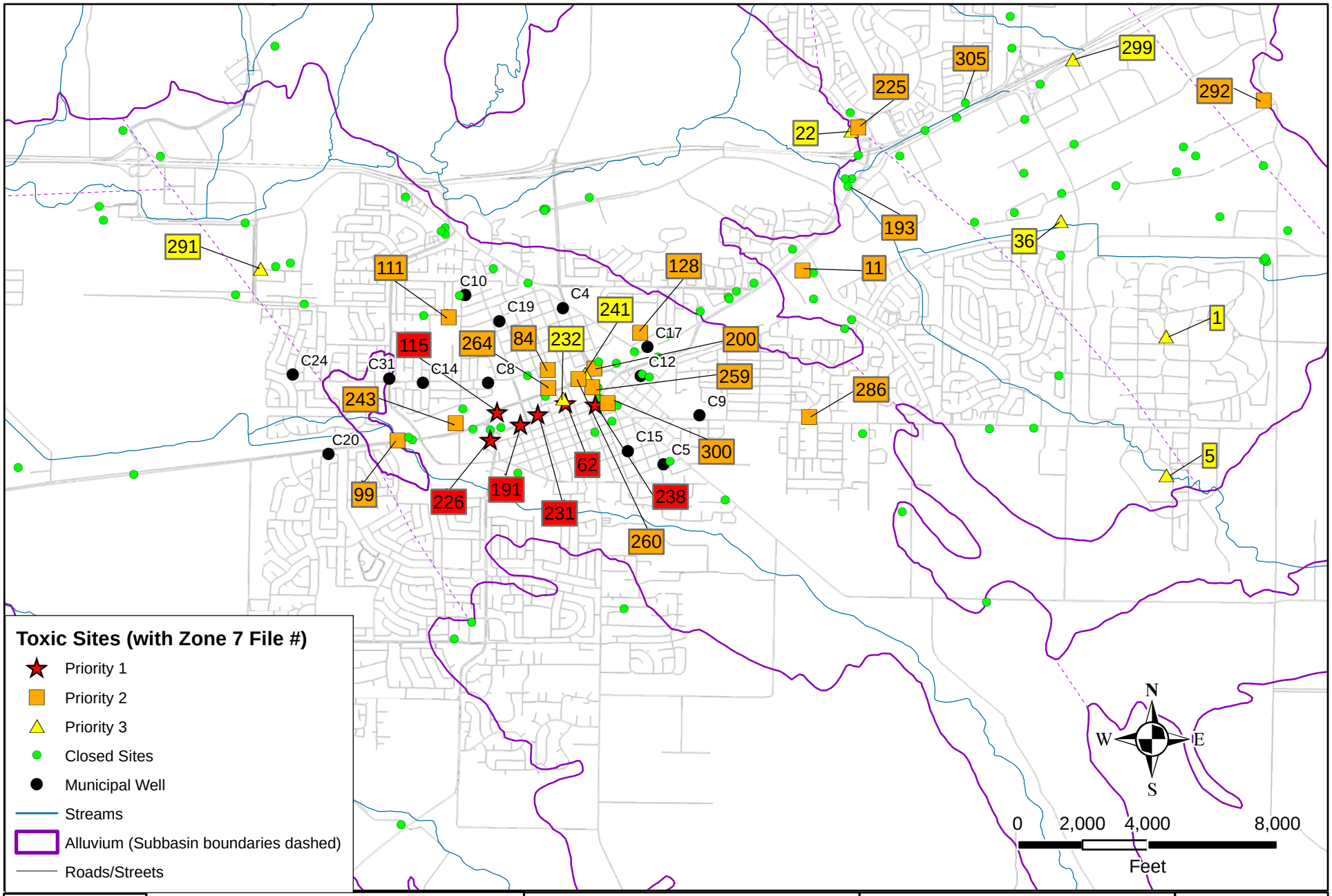
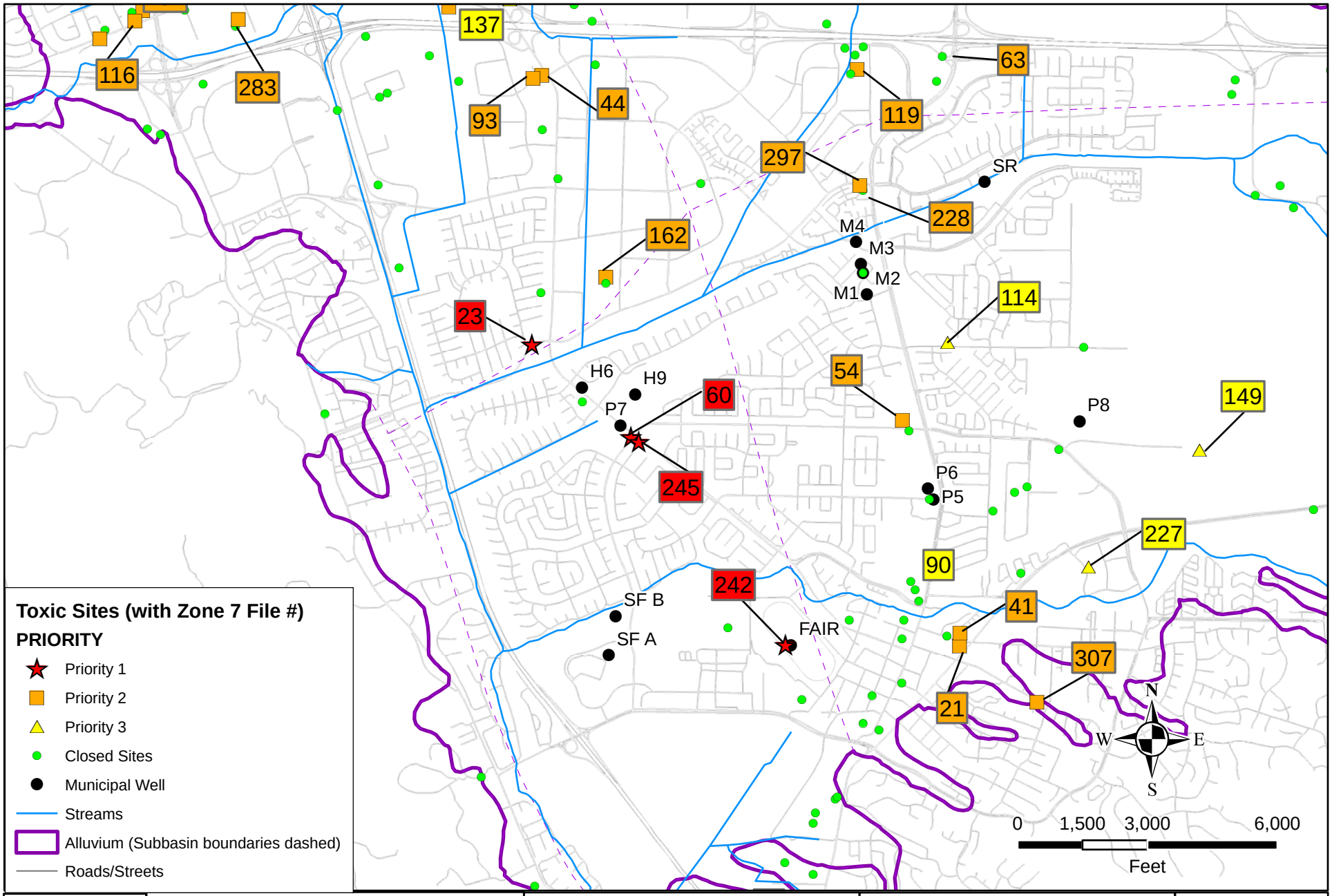

2010 Supply and Use – Calendar Year
LIVERMORE-AMADOR VALLEY WATER SUPPLY AND USE
37.6
USE –THOUSAND ACRE-FEET
NON-POTABLE WATER
POTABLE WATER
IMPORTED SUPPLIES
WATER SUPPLY
State Water Project & Other
ZONE 7 OPERATIONS
Thousand Acre-Feet (TAF)
VALLEY WATER DEMAND
4.1
Agricultural Use
Sacramento River
Lake Oroville
DELTA
Delta
35.3
3.9
South Bay Aqueduct
San Luis Reservoir
19
SWP Carryover
0
13
California Aqueduct
Cawelo & Semitropic Water Storage District
90.8
37.4
Unaccounted for Water
1.3
Water Treatment Plants
38.3
42.9
Recycled Water
4.7
15.6
Municipal & Industrial Use
LAVWMA Export
LOCAL SUPPLIES
Natural Rainfall
5.3
Del Valle Watershed Yield
8.0
Artificial Stream and Chain of Lakes Recharge (released)
0.5
Brine
Groundwater Demineralization Facility
1.9
0.2
Del Valle Reservoir
Del Valle storage
3.5
Rainfall Recharge
7.7
Natural Stream Recharge
6.0
3.1
1.0
Artificial Stream Recharge (recharged)
6.4
Evaporation
2.4
Zone 7 Shallow Well Pumping
Zone 7 Well Pumping
California Water Services
City of Pleasanton
Other Well Pumping
Agricultural Wells
4.3
9.4
3.5
Arroyo Mocho or Arroyo Del Valle
Gravel Pits and Chain of Lakes
Groundwater Storage ~85 TAF
Livermore-Amador Valley Main Groundwater Basin
Zone 7 Water Agency

Figure 5.1-2



ZONE 7 WATER AGENCY 100 North Canyons Parkway, Livermore, CA	DRAWN: CD/TR REVIEWED: CD/MK File: P:\WRE\GWMP\2010AnnRpt\Figures\Fig5.3-1-Toxics-Livermore.mxd	**Toxic Site Surveillance Livermore Area Sites**	Scale: 1" = 4000' Date: May 2011 FIGURE 5.3-1



ZONE 7 WATER AGENCY
100 North Canyons Parkway, Livermore, CA

DRAWN: CD/TR

REVIEWED: CD/MK

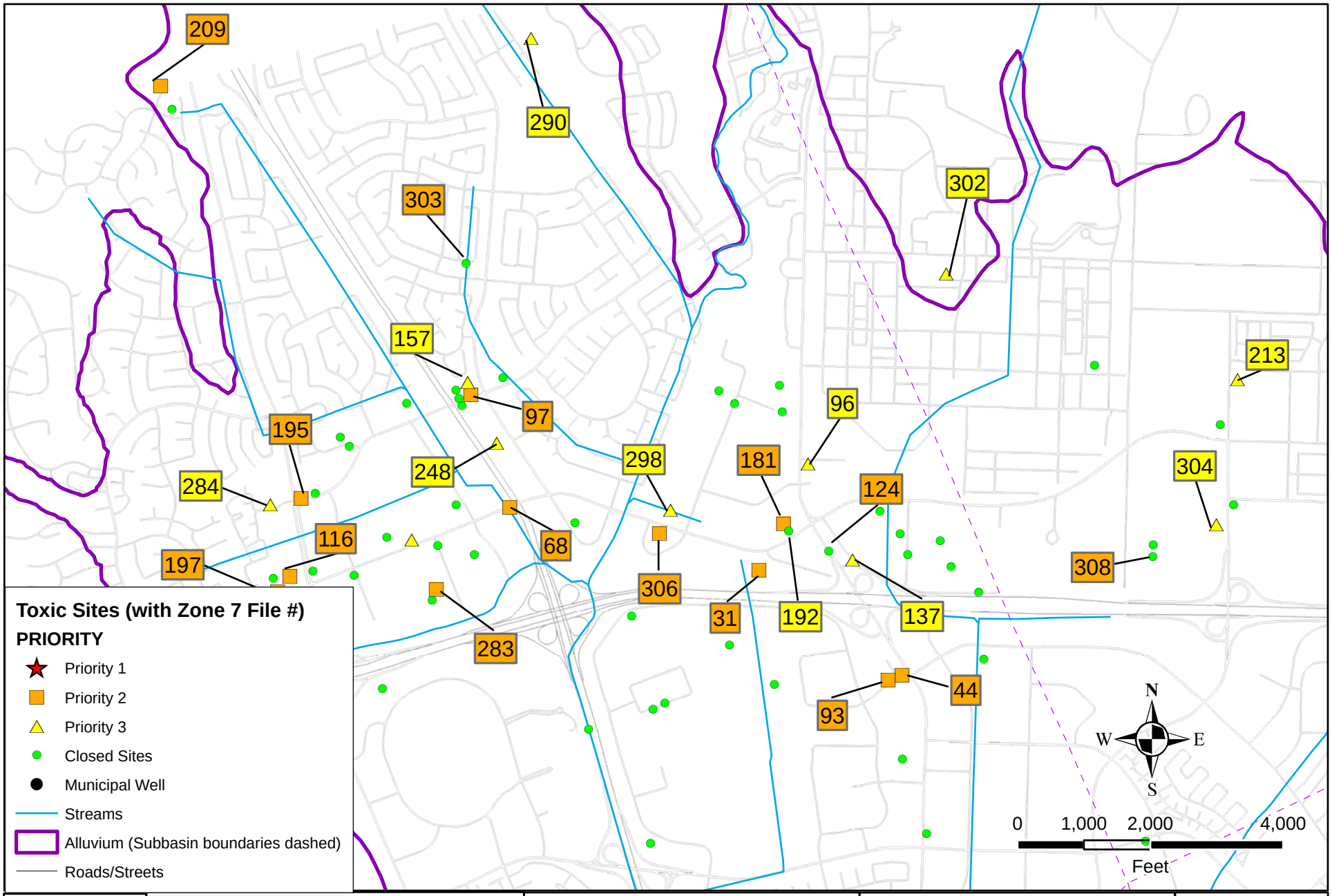
File: P:\WRE\GWMP\2010AnnRpt\Figures\Fig5.3-2-Toxics-Pleasanton.mxd

Toxic Site Surveillance Pleasanton Area Sites

Scale: 1" = 3000'

Date: May 2011

FIGURE 5.3-2



ZONE 7 WATER AGENCY
100 North Canyons Parkway, Livermore, CA

DRAWN: CD/TR

REVIEWED: CD/MK

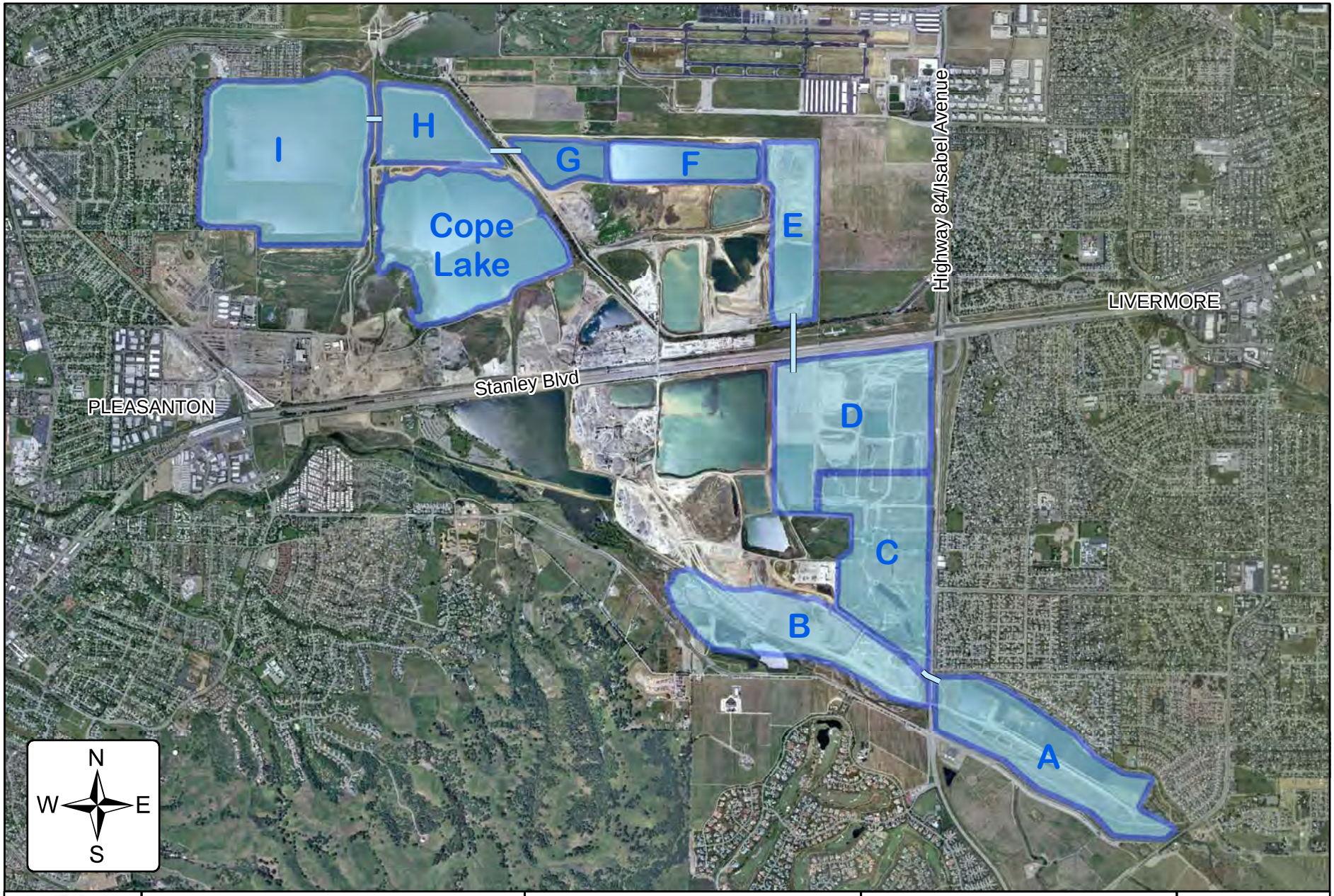
File: P:\WRE\GWMP\2010AnnRpt\Figures\Fig5.3-3-Toxics-Dublin.mxd

Toxic Site Surveillance
Dublin Area Sites
(North of Main Basin)

Scale: 1" = 2000'

Date: May 2011

FIGURE 5.3-3



ZONE 7 WATER AGENCY 100 North Canyons Parkway, Livermore, CA	DRAWN: CW/TR	**Location of Future Chain Of Lakes**	Scale: 1" = 3,000 ft
	REVIEWED: MK		Date: Apr 12, 2010
	File: P:\WRE\GWMP\2009AnnRpt\Figures\Fig5.4-1-COL.mxd		FIGURE 5.4-1