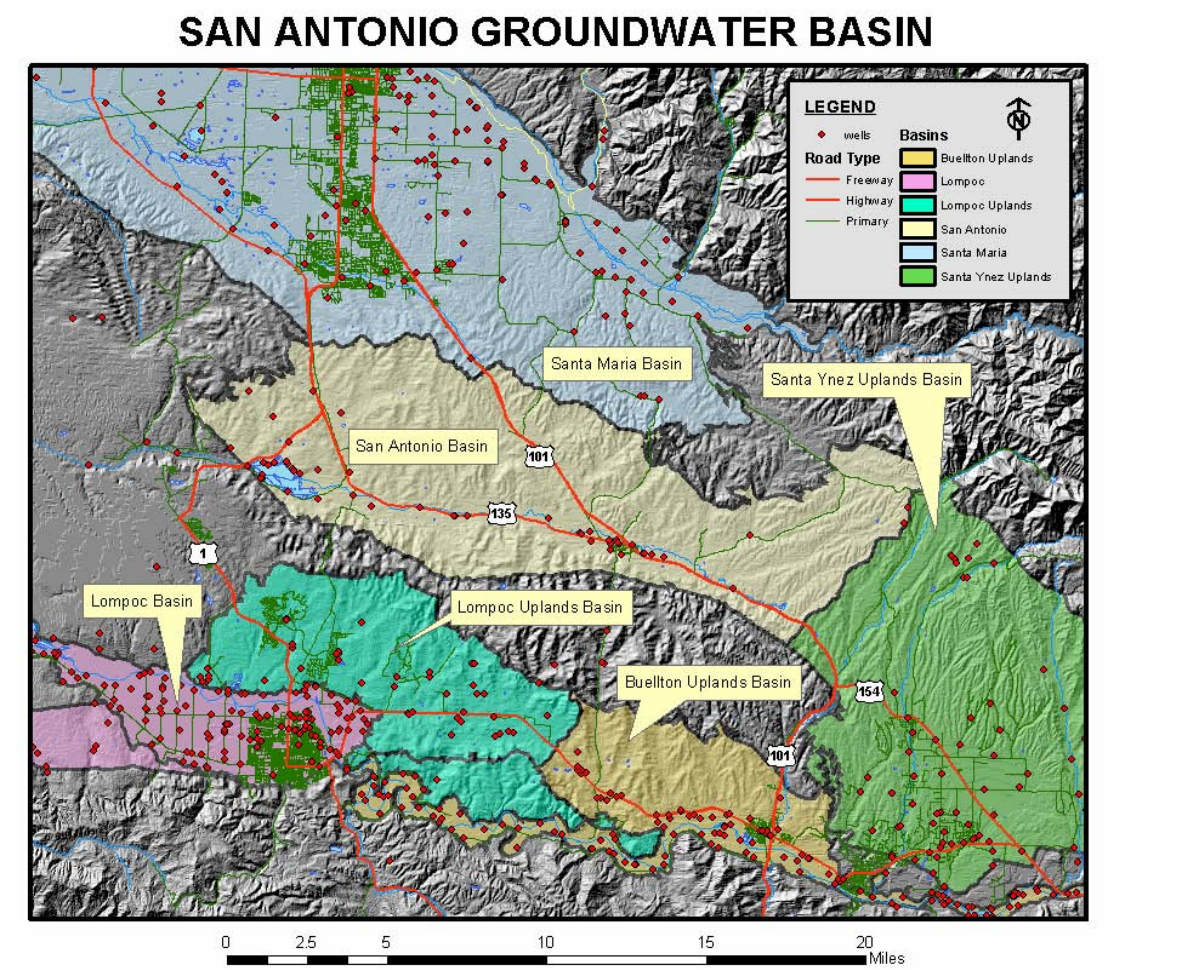
San Antonio Groundwater Basin

Physical Description

The San Antonio Valley is approximately 30 miles long by seven miles wide. It is cradled between the Solomon-Casmalia Hills to the North, the Purisima Hills to the South, the Burton Mesa to the west and the westernmost flank of the San Rafael Mountains to the East. The Valley is around 130 mi^2 and the groundwater basin within the Valley is about 110 mi^2. Average annual rainfall within the basin is about 15 inches.



The valley is shaped by an eastward plunging syncline containing the deposits comprising the groundwater basin. The Paso Robles formation and alluvium are the most common material within the groundwater basin. Consolidated rocks lie below the basin deposits but surface about seven miles east of the Pacific Ocean, forcing groundwater to the surface, and creating a wetland area known as Barka Slough which denotes the western end of the Groundwater Basin. Land use within the Valley consists mainly of agriculture, ranching and a small amount of urban development in the town of Los Alamos.

History and Analyses

The basin is best described by Muir (1964), Santa Barbara County Water Agency (1977), and Hutchinson (1980). Arnold and Anderson (1907) were the first to describe in detail the geography and geology of the San Antonio Valley, for the purposes of petroleum exploration.

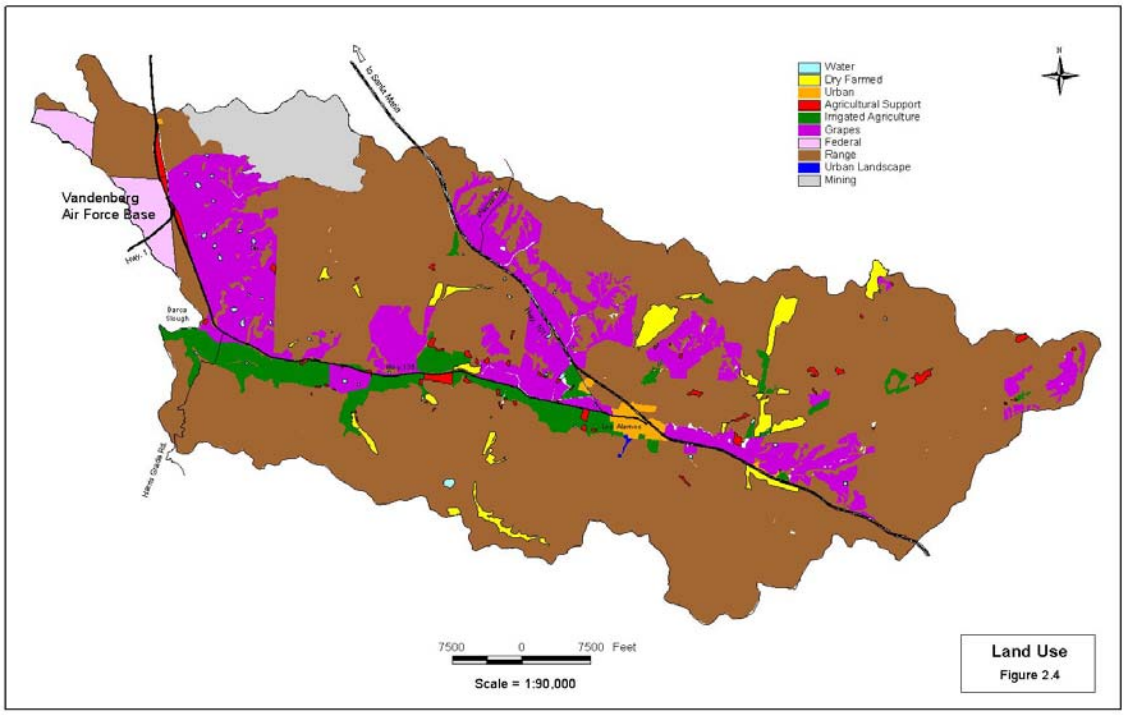
The town of Los Alamos was surveyed in 1876 and 1 year later became a flourishing community having a hotel, three saloons, and several general merchandising stores. Rapid growth of the town brought about the demand for a dependable water supply, and, as a consequence, the first domestic water wells in the Valley were dug. Before this time the water had been obtained from springs that bordered the Valley. The pumping of water for irrigation started at the turn of the century with the beginning of the sugar-beet industry. By 1943 there were 21 active irrigation wells in the Valley, and by 1958 that number had increased to 39 (Muir, 1964). Similar to the Santa Maria Valley, irrigation developed slowly between 1900 and 1920, rapidly between 1920 and 1930, and then slowed between 1930 and 1943 (Worts, 1951).

Appraisals of the hydrologic resources of the area begun in 1942 with work by G.F. Worts. Worts canvassed the wells and mapped the geology of the area but his work was suspended in 1943 and picked up again in 1957 by Muir. In addition, H.D. Wilson and R.E. Evanson were integral in developing baseline hydrologic conditions.

The supply/demand status of this basin was updated in a 1999 study (Baca et al) prepared by the County. Safe Yield of the basin was reported to be 8,667 AFY (gross) and 6,500 AFY (net) (USGS Open File Report, 1980). Available Storage in the upper 200 feet of the basin is estimated to be about 800,000 AF. The 1999 County study estimated net pumpage (net consumptive use) of groundwater in the basin to be 15,931 AFY (equivalent to gross pumpage of 21,128 AFY). Thus, the basin was considered to be in a state of overdraft at a level of 9,431 AFY (net).

The basin supply/demand status was re-evaluated in 2003 due to the presence of an updated land use survey, pumping pattern changes and to update recharge numbers based on long-term climate. It was found that pumping of the basin had increased but also that the recharge and thus safe yield numbers had been underestimated so that the average annual overdraft is still around 9,500 AFY.

In 2002 the Cachuma Resource Conservation District (CRCD) undertook the task of updating the land use survey for the watershed in preparation for the release of the San Antonio Creek Coordinated Resource Management Plan (May, 2003).



Courtesy of the Cachuma Resource Conservation District

The CRCD used aerial imagery ground checked by staff to ascertain that 9,970 acres of vineyards and 2,800 acres of annual or vegetable crops were being grown in the basin. In addition it was determined that 1,381 acres of dry farming without supplemental irrigation existed in the basin. The graphic above illustrates the distribution of land use throughout the Valley.

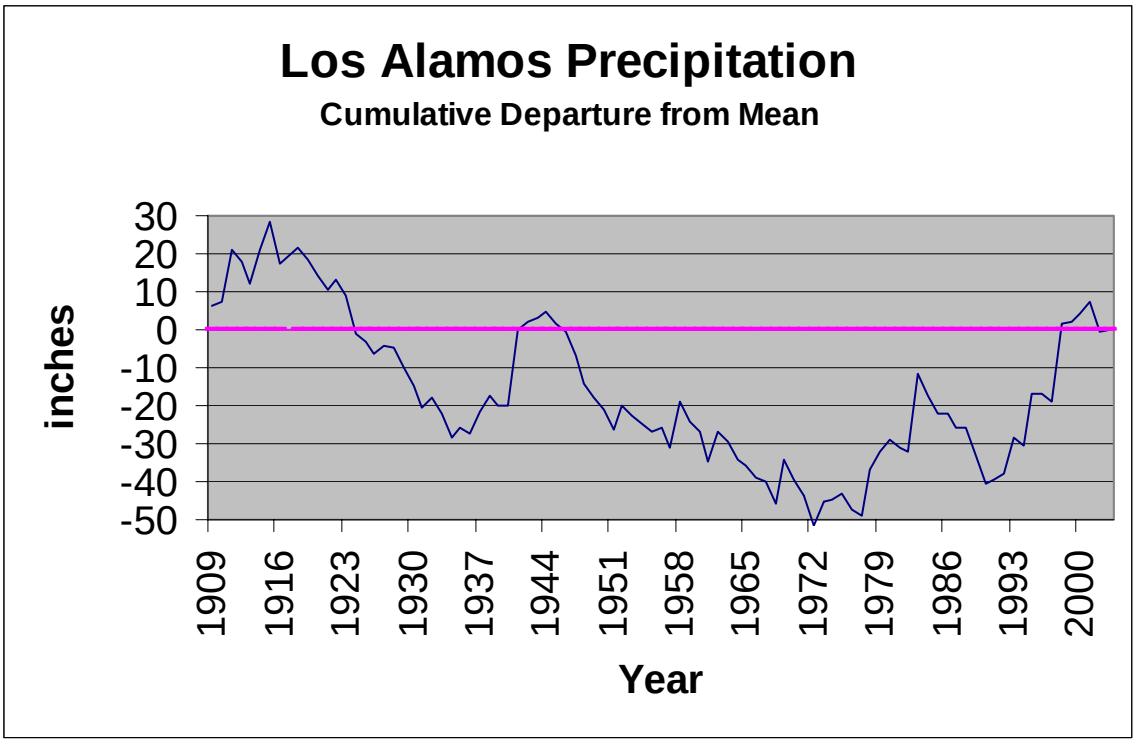
Based on these irrigated acreages and water duty factors supplied by UC Cooperative Extension the gross pumpage is estimated to be 25,540 AFY (net pumpage is estimated to be 20,432 after return flows of 20% are deducted).

Vandenberg AFB historically pumped approximately 3,400 AFY from the San Antonio Basin. With the recent shift to State Water as its principal supply, VAFB pumpage has dropped to about 300 AFY.

The basin was previously evaluated during a dry period (1958-1977) and thus both deep percolation from rainfall and stream seepage are believed to have been previously underestimated. The trends during this period are depicted on the “cumulative departure from mean” chart on the following page.

These types of charts help show wet and dry trends and appropriate base periods that should be used when evaluating basin conditions. The mean or zero line is the thick (pink in color version) in the middle of the chart. The jagged or abrupt line is the cumulative departure from mean; when it is going down it means a dry period and when it is rising it represents a wet trend. Note how in the previous evaluation period used to calculate safe yield (1958-1977) the trend is downward, dry, and in the last 25 years the cumulative departure has climbed back up to almost mean. What this means is that the area was drier than normal from around 1950 to around 1975 and has been wetter than

normal between around 1975 to around 2000. This is an interesting trend that correlates well with studies being done at the University of Washington on the Pacific Decadal Oscillation (PDO). http://www.atmos.washington.edu/



Using a 1943-2001 base period for evaluating the basin SBCWA arrived at about 10,000 AFY for deep percolation of rainfall using methodology after Blaney, 1963 and Ahlroth, 2002 that calculates deep percolation from rainfall. Stream seepage estimates have varied between 2,000- 5,000 AFY. 5,000 AFY is more reasonable taking into account the wetter base period and lowered groundwater levels. This means the safe yield of the basin is actually about 15,000 AFY. The table on the following page lists the calculated inputs and outputs of the San Antonio groundwater basin.

Groundwater is the sole source of water supply within the basin boundaries, there are no surface diversions and there are no deliveries of state water to the basin. Vandenberg Air Force Base (VAFB) boundary stretches into the westernmost portion of the Basin and sometimes uses groundwater for Base operations, as a backup to State Water Project supplies. VAFB's water is actually exported out of the basin to the Lompoc Terrace or Lompoc Uplands areas.

Water discharges from the basin through well extractions and surface outflow to the Pacific Ocean. The surface outflow at the western end of the basin supports the Barka Slough wetland. As previously stated, the basin is in overdraft at an estimated level of around 9,500 AFY. This may lead to adverse effects over the long term in either supply or water quality. Overdraft will also result in a gradual progressive reduction in the amount of water discharged on an average annual basis from the basin. Thus, the Barka Slough wetland may progressively diminish.

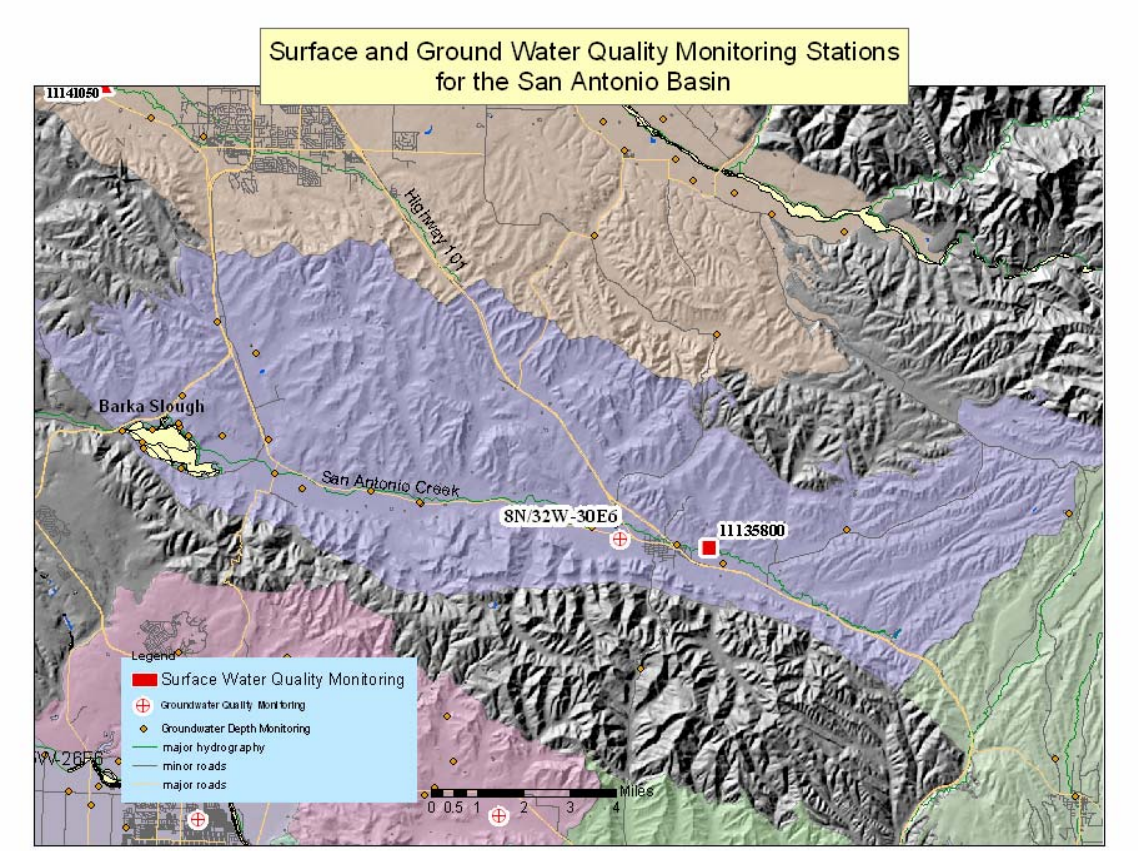
San Antonio Basin Hydrologic Budget

Outputs from San Antonio groundwater basin	2003 Analysis	1999 Analysis
1. Los Alamos Community Service District	-270	-188
2. Other domestic usage throughout the basin	-170	
3. Agricultural extractions	**-20,000**[1]	-11,843
4. Vandenberg Air Force Base	**-300**	-3400
5. Baseflow out of Basin	-800	
6. Et of Phreatophytes in Barka Slough and along San Antonio Creek	-3000	
Sub total	-24,540	-15,431
Inputs from San Antonio groundwater basin		
1. Underflow into Basin	0	0
2. Deep Percolation from Rainfall	10,000	
3. Stream Seepage	5,000	
Sub total	**+15,000**	**+6,500**[2]
Totals	-9,540	-9,431

All amounts expressed as Acre Feet per Year (AFY)
[1]Using a 20% return flow value; the 1999 analysis used 25%
[2]From USGS open file report, 1980

Water Quality

Water quality studies conducted by the USGS in the late 1970's indicated an average TDS concentration within the basin of 710 mg/l, with concentrations generally increasing westward toward the ocean along the Valley floor. Tributary canyons such as Howard, Canada de las Flores and Harris generally have much better quality water, TDS on the order of 300-600 mg/l. The cause of the westward water quality degradation has been thought to be the accumulation of lower quality water from agricultural return flow and the dissolution of soluble minerals (Hutchinson, 1980). The highest TDS concentration (3,780 mg/l) was found in the extreme western end of the Valley and westward of the Barka Slough; the lowest concentration (263 mg/l) was found at the extreme eastern end. Analyses compiled for samples taken between 1958 and 1978 indicate that groundwater quality remained fairly stable during that period. Analyses of water sampled in 1993 for several wells show only slight increases since the previous study. There is evidence that poor quality connate waters exist within fracture zones of the bedrock and that this water might be induced into overlying strata, especially west of Barka Slough. There is no evidence of seawater intrusion in the basin, nor is the basin considered susceptible to seawater intrusion due to the consolidated rock that separates the basin from the ocean. The map on the following page indicates the current surface and groundwater quality monitoring locations.



Depth and Screen/Perforation Information
For Groundwater Quality Monitoring Sites

State Well ID	USGS Number	Depth	Screen Intervals
8N/32W-30E6	344442120173201	600’	300’-600’

Description of Surface Water Quality Monitoring Sites

Station Number	Description	Watershed Size
11135800	San Antonio Creek at Los Alamos	34.9 sq. mi.