

# FINAL REPORT PASO ROBLES GROUNDWATER BASIN STUDY

## EXECUTIVE SUMMARY

### GENERAL

This Final Report of the Paso Robles Groundwater Basin study presents the results of efforts to investigate and quantify the hydrogeologic conditions of the basin. The work was conducted jointly by Fugro West, Inc. and Cleath and Associates, in conjunction with Peter Canessa, P.E. and ETIC Engineering, Inc.

The Paso Robles Groundwater Basin study was a technical investigation intended to provide the San Luis Obispo County Public Works Department, North County public water agencies, and overlying landowners and water users a better understanding of the basin by answering questions related to the quantity of groundwater in the basin, the hydraulic movement of groundwater through the basin, sources and volumes of natural recharge, and trends in water quality. Although this study does not address specific planning or water management issues, it provides the foundation that the community needs to participate in water resource planning. The knowledge gained by this study, including the comprehensive compilation of key data, is necessary for the community to develop a confident and consensus based decision-making process.

### BASIN DEFINITION AND BASIN BOUNDARIES

The Paso Robles Groundwater Basin encompasses an area of approximately 505,000 acres (790 square miles). The basin ranges from the Garden Farms area south of Atascadero to San Ardo in Monterey County, and from the Highway 101 corridor east to Shandon.

Internally, a single hydrologically distinct subbasin was defined. The Atascadero subbasin encompasses the Salinas River corridor area south of Paso Robles, including the communities of Garden Farms, Atascadero, and Templeton.

### GROUNDWATER OCCURRENCE, LEVELS, AND MOVEMENT

Water level data show that over the base period from July 1980 through June 1997 there is no definitive upward or downward water level trend for the whole basin. However, different water level trends are observed at specific locations in the basin. Water levels have declined, in some areas rather dramatically, in the Estrella and San Juan areas, with rising water levels in the Creston area.

In general, groundwater flow moves northwesterly across the basin towards the Estrella area, thence northerly towards the basin outlet at San Ardo. The biggest change in groundwater flow patterns during the base period is the hydraulic gradient east of Paso Robles, along the Highway 46 corridor, which has steepened in response to greater pumping by the increasingly concentrated development of rural ranchettes, vineyards, and golf courses.



## **WATER QUALITY**

In general, the quality of groundwater in the basin is relatively good, with few areas of poor quality and few significant trends of ongoing deterioration of water quality. Historical water quality trends were evaluated to identify areas of deteriorating water quality. A major water quality trend is defined as a clear trend that would result in a change in the potential use of water within 50 years, if continued.

Six major trends of water quality deterioration in the basin were identified, including:

1. increasing total dissolved solids (TDS) and chlorides in shallow Paso Robles Formation deposits along the Salinas River in the central Atascadero subbasin;
2. increasing chlorides in the deep, historically artesian aquifer northeast of Creston;
3. increasing TDS and chlorides near San Miguel;
4. increasing nitrates in the Paso Robles Formation in the area north of Highway 46, between the Salinas River and the Huer Huero Creek;
5. increasing nitrates in the Paso Robles Formation in the area south of San Miguel; and
6. increasing TDS and chlorides in deeper aquifers near the confluence of the Salinas and Nacimiento rivers.

## **GROUNDWATER IN STORAGE**

The total estimated groundwater in storage within the Paso Robles Groundwater Basin is approximately 30,500,000 acre feet (af). This value changes yearly, depending on recharge and net pumpage. Between 1980 and 1997, groundwater in storage increased approximately 12,400 af, an approximate 0.04% increase. This represents an average increase in storage of 700 acre feet per year (afy). On one hand, this relatively small percentage could be viewed as an indication of stable basin-wide conditions; however, it is noted that steadily decreasing storage in the 1980's was offset by increased water in storage throughout the 1990's. Furthermore, not all areas of the basin have observed the same trends in water levels and change in storage.

In the Atascadero subbasin, total groundwater in storage averaged about 514,000 af. Approximately 2,600 af more groundwater was in storage in the subbasin in 1997 compared to 1980, a 0.5% increase in total groundwater in storage during the base period. This represents an increase of about 200 afy in storage.

## **HYDROLOGIC BUDGET**

The purpose of a hydrologic budget (or water balance) is to assess all the inflows and outflows of water to the groundwater basin over the base period. The water budget was



performed by calculating each component of water inflow and outflow for each year of the base period, and comparing the totals to the annual change in groundwater in storage as determined by the specific yield method. The base period, defined in this study from July 1980 through June 1997, is a representation of the long-term average conditions of water supply.

The hydrologic budget is simply a statement of the balance of total water gains and losses from the basin, and can be summarized by the following equation:

$$\text{Inflow} = \text{Outflow} (\pm) \text{Change in Storage}$$

where Inflow equals the sum of:

- ⇒ subsurface inflow
- ⇒ percolation of precipitation
- ⇒ streambed percolation
- ⇒ percolation of irrigation return water
- ⇒ percolation of wastewater discharge, and
- ⇒ imported water;

and Outflow equals the sum of:

- ⇒ subsurface outflow
- ⇒ gross agricultural pumpage
- ⇒ municipal, rural domestic, and small commercial systems pumpage
- ⇒ extraction by phreatophytes, and
- ⇒ exported water.

Using this inventory, the sum of all the components of outflow from the Paso Robles Groundwater Basin exceeded the sum of all the components of inflow by an estimated 2,700 afy.

As described earlier, an independent method of calculating the change in the volume of groundwater in storage was performed using the specific yield method and compared to the results of the inventory method. This approach indicated a slight annual increase in groundwater in storage of about 700 afy.

For the Atascadero Subbasin, the sum of all the components of outflow approximately equaled inflow during the base period, with total groundwater in storage of about 514,000 af.



The change in storage calculation showed an annual increase in groundwater over the 17-year base period of about 200 afy.

Reconciliation of the hydrologic budget shows a consistency in the results of the two methods of calculation. At first glance, the results of the hydrologic budget calculations, along with the change in storage calculations and analysis of the water level data, indicate a basin-wide stability. This conclusion, however, is tempered by the recognition that parts of the basin have experienced significant declines in water level over the past several years, particularly in the Estrella area along the Highway 46 corridor from the eastern edge of Paso Robles to Whitley Gardens as a result of relatively concentrated development of rural residential housing, golf courses, and vineyards.

## **PERENNIAL YIELD**

The perennial yield of a basin, as defined in this investigation, is the rate at which water can be pumped over a long-term without decreasing the groundwater in storage. Many definitions of perennial yield (or safe yield) tie the concept of basin yield to the rate of groundwater extraction that will not create an economic impact. However, for the purposes of this study, the concept of perennial yield is more closely tied to the natural rate of replenishment or recharge to the basin, such that there is no decrease in groundwater in storage.

The results of this investigation indicate a perennial yield value of approximately 94,000 afy for the Paso Robles Groundwater Basin (which includes the Atascadero subbasin). Calculated separately, the perennial yield of the Atascadero subbasin approximates 16,500 afy.

## **BASIN CONDITIONS IN 2000**

In the year 2000, groundwater pumpage in the Paso Robles Groundwater Basin was approximately 82,600 af, compared with the perennial yield estimate of 94,000 afy. Similarly, Atascadero subbasin pumpage in the year 2000 was approximately 11,100 af, compared to the perennial yield estimate of 16,500 afy.

Total net groundwater pumpage in the basin (and the subbasin) declined steadily from 1984 through 1998. Groundwater production data since 1998 show, however, that groundwater pumpage may again be increasing. Pumpage in 2000 was higher than at any previous time since 1992. It should also be noted that groundwater pumpage exceeded the perennial yield from the start of the base period in 1980 through 1990. Only in the last decade has pumpage been less than the perennial yield.

Currently, agricultural pumpage comprises 69% of total basin pumpage. Depending on new trends or pressures in the agricultural industry, it is likely that basin pumpage will approach or exceed the perennial yield in the near future. The San Luis Obispo County Master Water Plan Update (EDAW, 1998) projects future water demands for the area to be 120,620 afy by the year 2020, which suggests that future water demands may soon exceed the 94,000 afy perennial yield of the basin.



In the Atascadero subbasin, municipal, rural domestic, and small commercial water systems comprise 91% of total pumpage in the subbasin. Interpolation of data from the County Master Water Plan projects water demand in 2020 in the Atascadero subbasin to be in the range of 16,000 to 20,000 afy, compared to the perennial yield value of 16,500 afy.

It is important to note that short-term periods of groundwater extractions in excess of the perennial yield will not necessarily result in significant negative economic impacts. Groundwater in storage in the basin is sufficiently large such that short-term overdraft conditions may be acceptable to withstand drought periods.

## **RECOMMENDATIONS**

It is recommended that a basin-wide numerical groundwater flow model be developed for the Paso Robles Groundwater Basin. The model will serve as a tool for quantitative evaluation of existing and future hydraulic conditions across the basin, including changing groundwater level elevations, well yields, natural and artificial recharge, and associated effects on surface water-groundwater interaction and water quality. Specifically, the objectives of the model include:

- Refining uncertain components of the hydrologic budget for the basin;
- Refining estimates of perennial yield for the basin;
- Evaluating water quality trends in response to hydraulic changes across the basin;
- Evaluating potential impacts on groundwater levels and perennial yield as a result of continued and varied basin operations and hydraulic conditions; and
- Defining operational options for comprehensive and/or localized management of groundwater use across the basin.

