OVERVIEW OF THE NORTH AND SOUTH GABILAN SUBAREAS OF THE PASO ROBLES GROUNDWATER BASIN

This overview of the Paso Robles Groundwater Basin (Basin) and the North and South Gabilan Subareas are provided to establish the groundwater setting and identify groundwater issues that may be used to develop groundwater management goals, objectives, and actions as part of the Paso Robles Groundwater Basin Management Plan. The following information was summarized from existing reports and available information for the Basin and the North and South Gabilan Subareas.

Paso Robles Groundwater Basin

The basin-wide information includes the recent hydrologic conditions and the general groundwater setting of the Paso Robles Groundwater Basin.

Groundwater Setting of the Paso Robles Groundwater Basin

The Paso Robles Groundwater Basin covers about 505,000 acres in southern Monterey County and northern San Luis Obispo County. The Paso Robles Groundwater Basin is subdivided into eight subareas. The groundwater system in the Paso Robles Groundwater Basin consists of the Paso Robles Formation and the shallow alluvial aquifers associated with creeks and rivers.

The shallow alluvial aquifers are present along the Salinas River, Estrella River, Huerhuero Creek, and other tributary creeks. Groundwater stored in the alluvial aquifer system accounts for about two percent of the total groundwater storage in the entire Basin. While the amount of total storage may be small, the alluvial aquifers are a significant source of recharge to the Paso Robles Formation, particularly along the western end of the Basin where the Salinas River is located. The coarse-grained deposits of the shallow alluvium act as an unconfined aquifer.

In areas where the alluvial aquifers are not present, the Paso Robles Formation is exposed at the ground surface. The Paso Robles Formation consists of less permeable, interbedded deposits with highly variable thicknesses and permeability, but is the primary aquifer for most agricultural and municipal users. Groundwater stored in the Paso Robles Formation generally occurs under semi-confined to confined conditions. The two primary sources of recharge to the Paso Robles Formation include the infiltration of precipitation and the percolation of stream flow into the shallow alluvial aquifers that infiltrates the Paso Robles Formation.

The alluvium and Paso Robles Formation rest on older consolidated sediments. Faults have created a conduit to allow water trapped in these older sediments to come to the surface as geothermal water.

There are currently about 150 wells located within the limits of the Paso Robles Groundwater Basin that are monitored by the San Luis Obispo County Department of Public Works and the Monterey County Water Resources Agency (Figure 1). These wells are used to track the changes in groundwater level trends through time at a specific location (which are presented in well hydrographs), or across an area for a specific date (which are presented as water level maps).

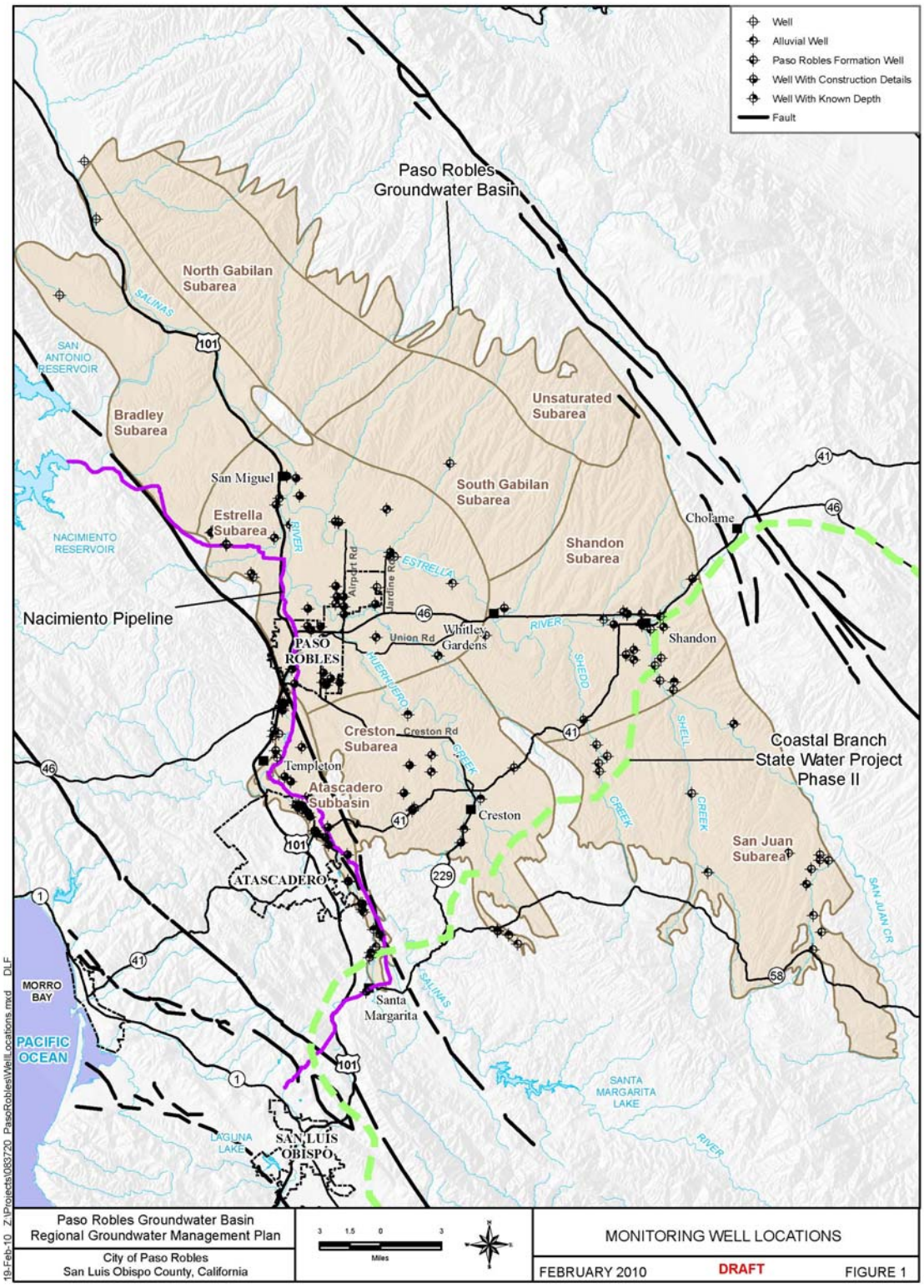

Figure 1. Location of Groundwater Monitoring Wells in the Paso Robles Groundwater Basin

Recent Hydrologic Conditions

This section summarizes the recent hydrologic conditions for the areas tributary to the Paso Robles Groundwater Basin. The annual precipitation is measured at seven rainfall gauge stations located throughout the Basin to record the geographic variation in rainfall. One of the gauges with a long, continuous period of record is the Atascadero MWC Station No. 34. The long-term average annual precipitation at this gauge for the 1916 to 2009 period is 17.6 inches per year.

During the 1998 to 2009 period, the Atascadero MWC Station No. 34 averaged 16.7 inches per year. Based on this comparison, the average annual precipitation for the 1998 to 2009 period is somewhat drier than the long-term average.

While the 12-year average for the 1998 to 2009 period may not differ greatly from the long-term average, there is considerable annual variation in precipitation. During the 1998 to 2009 period, the annual precipitation at the Atascadero MWC Station No. 34 ranged from a minimum of 7.6 inches in 2007 to a maximum of 34.6 inches in 2005. Additionally, the last three years (2007 to 2009) received below average rainfall.

North Gabilan and South Gabilan Subareas

The following information for the North Gabilan and South Gabilan Subareas includes the recent land and water conditions and local groundwater conditions.

Land and Water Use

The North Gabilan and South Gabilan Subareas are located along the northeastern portion of the Paso Robles Groundwater Basin. The North Gabilan Subarea has an area of approximately 52,600 acres, which makes up about 11percent of the area of the Basin. The South Gabilan Subarea has an area of approximately 44,500 acres, which makes up about nine percent of the area of the Basin. Almost all of the North Gabilan Subarea, and the northern portion of the South Gabilan Subarea is located in Monterey County The South Gabilan Subarea is drained by several small creeks that flow into the Estrella River; the small creeks draining the North Gabilan Subarea flow into the Salinas River .

The water use in 2006 totaled about 5,452 acre-feet representing about six percent of the water use in the Basin. The water users in the North Gabilan Subarea and their uses are shown on Table 1. The water users in the South Gabilan Subarea and their uses are shown on Table 2 .In 2006, the entire demand was met with groundwater.

Table 1. Total Estimated Pumping in the North Gabilan Subarea in 2006 (AF)

Agriculture	Municipal	Small Community	Small Commercial	Rural	**Total**
1,758	0	0	0	51	**1,809**
(97%)	(0%)	(0%)	(0%)	(3%)	**(100%)**

(Todd, 2009)

Table 2 Total Estimated Pumping in the South Gabilan Subarea in 2006 (AF)

Agriculture	Municipal	Small Community	Small Commercial	Rural	**Total**
1,670	0	0	0	213	**1,884**
(89%)	(0%)	(0%)	(0%)	(11%)	**(100%)**

(Todd, 2009)

Local Groundwater Conditions

The Gabilan Mesa area is a southwestern to southern sloping ridge that rises from the Salinas and Estrella rivers to the watershed boundary. This uplift rises from an elevation of 600 to 1,000 feet along the rivers to elevations of more than 2,000 feet along the ridgeline. This is an area dissected by several south-flowing parallel, 100 to 200-foot deep canyons that drain to the Estrella River between Estrella and San Miguel, and to the Salinas River between San Miguel and San Ardo. These canyons are each several miles long and typically less than 500 feet wide. None of the canyons has been extensively developed, with existing development concentrated along the lower reaches of the valley.

The water-bearing Paso Robles Formation underlying this area is roughly four miles wide and 20 miles long, extending from San Ardo to east of San Miguel. The Paso Robles Formation in this area reaches a depth of up to 1,000 feet. Production zones are comprised of sand and gravel zones in the upper portion with increasing thickness of sand beds in the lower section. Sand and gravel beds are interbedded with clay and comprise less than 25 percent of the full thickness of the deposits. Some wells are capable of producing up to 1,000 gallons per minute (gpm); however, most domestic wells produce less than 25 gpm. Typically, the higher-producing wells are more than 600 feet deep; whereas domestic wells are less than 100 feet deep. In the North Gabilan and South Gabilan Subareas, most production wells extract water from the Paso Robles Formation.

Groundwater Flow

Groundwater flows from areas with higher elevations to lower elevations. Figure 2 shows the groundwater elevations and general flow directions for Spring 2009. Groundwater generally flows to the west, towards the Estrella Subarea, and then north paralleling the Salinas River to the Basin outlet into the Salinas Valley Groundwater Basin. There is a groundwater low (pumping depression) in the Estrella Subarea beneath the City of Paso Robles. There is a single monitoring well located near the center of the South Gabilan Subarea.

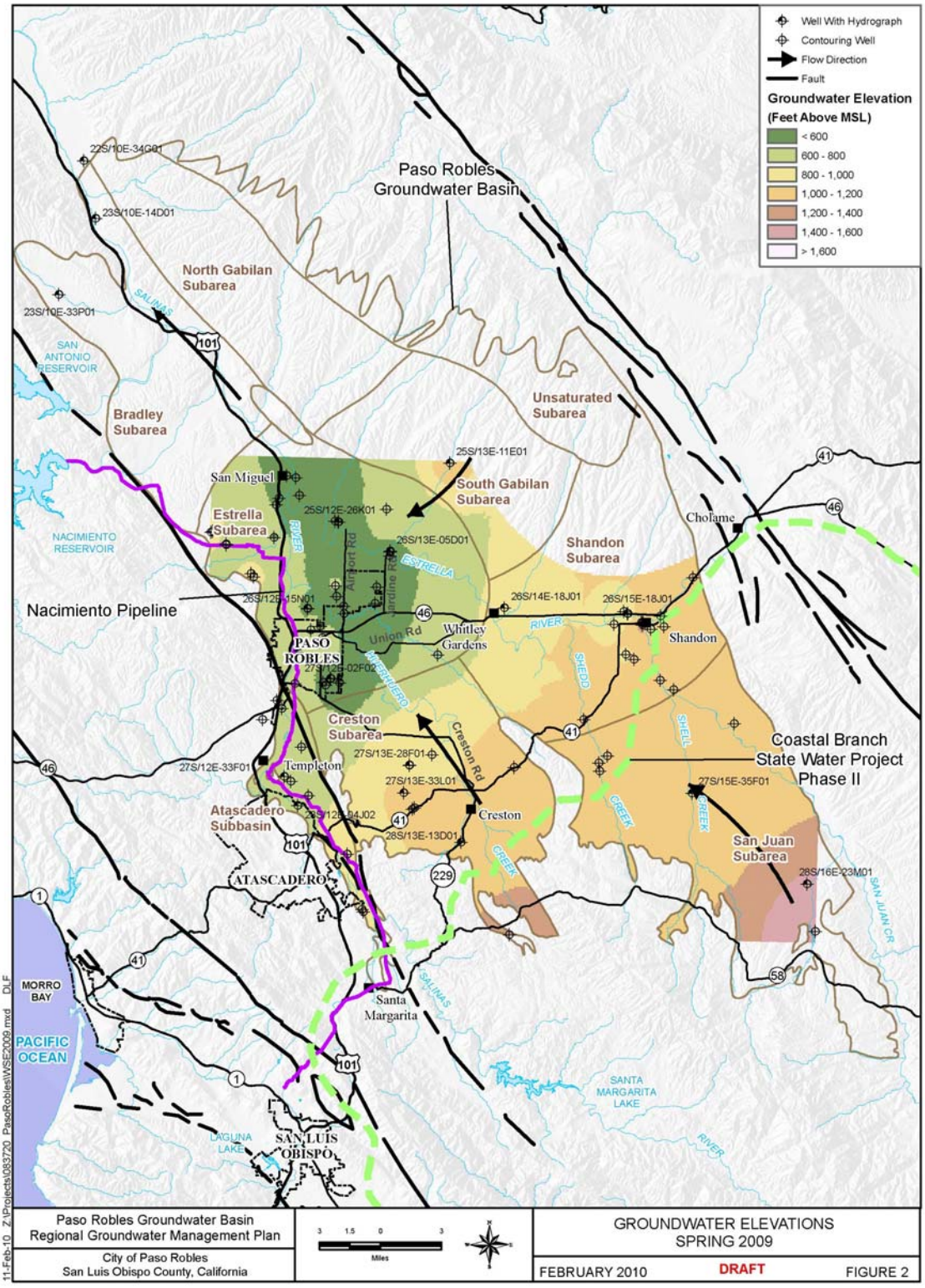

Figure 2. Spring 2009 Groundwater Levels in Paso Robles Groundwater Basin

Groundwater Levels

The available monitoring well in the South Gabilan is used to demonstrate how groundwater levels have changed through time (well hydrographs) at this location in the subarea. Figure 3 shows the groundwater level trend for the well. The location of the well is shown on Figure 2. A brief discussion is provided for the well.

Well 25S/13E-11E01 - This well is located near the center of the subarea in Hog Canyon as shown on Figure 2. Over the 50-year period of record, groundwater levels in this well have generally ranged between 1,140 and 1,160 feet above msl. Since 1997, groundwater levels have declined about 20 feet. During this 12-year period, the rate of decline has averaged about 1.5 feet per year. The seasonal variation (difference between spring and fall observations) in groundwater levels during this period is about less than five feet.

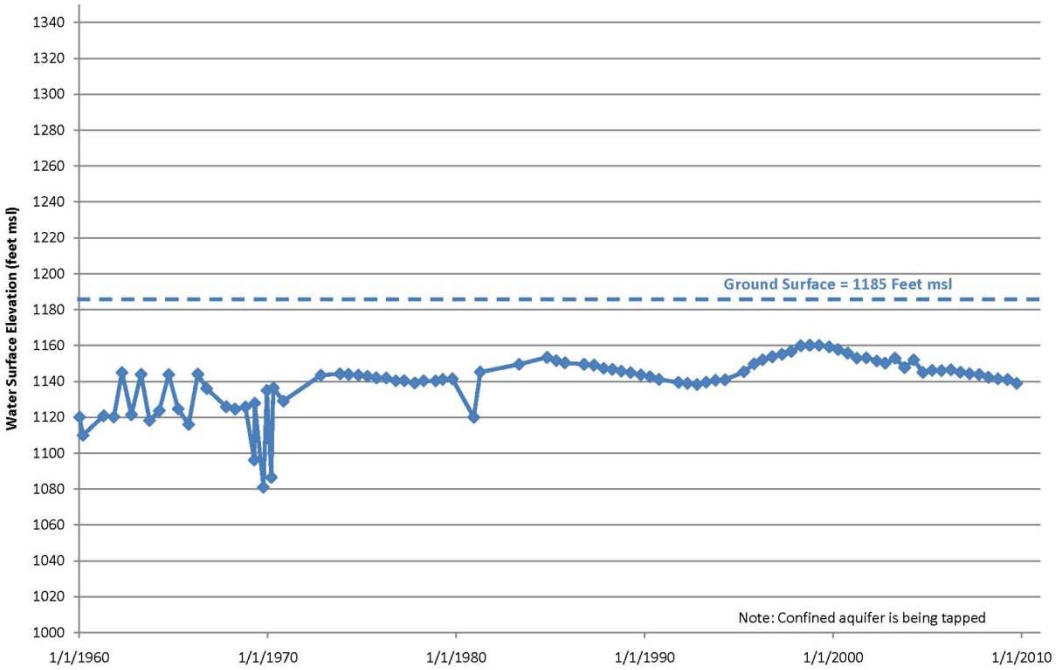

Figure 3. Hydrograph for Well 25S/13E-11E01

Groundwater Quality

Total dissolved solids (TDS), a measurement of the salts in the water, is typically sued to assess water quality. For municipal purposes, the TDS should be less than 500 mg/l, but can be up to 1,000 mg/l. There are no municipal users in the subarea.

TDS concentrations in groundwater from the 2002 survey ranged from 370 mg/l in Portuguese Canyon, to a high of 1,320 mg/l in Indian Valley. The average TDS concentration in samples collected from six wells and one spring in the Gabilan subareas was 700 mg/l.

Most groundwater samples reviewed in the subarea have no irrigation restrictions, with two samples reporting a slight to moderate restriction on irrigating trees and vines due to potential sodium and chloride ion toxicity (Fugro and Cleath, 2002).

References

Fugro and Cleath, 2002. *Paso Robles Groundwater Basin Study.* August 2002

Fugro, 2010. *Paso Robles Groundwater Basin Balance Review and Update.* February 2010

Todd, 2009. *Evaluation of Paso Robles Groundwater Basin Pumping, Water Year 2006.* May 2009