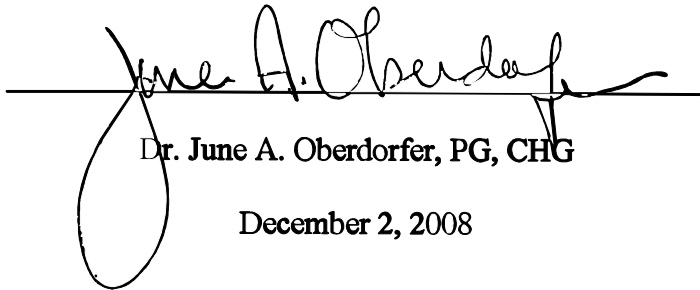


**Sheep Creek Water Company's Los Angeles County Property as Part of the
Antelope Valley Area of Adjudication**

Response to Dr. Ram Arora's Declaration, October 3, 2008



Dr. June A. Oberdorfer, PG, CHG

December 2, 2008

Hydraulic Connection

The Sheep Creek Water Company's Los Angeles County well-site property (the Site) lies just to the west of the Los Angeles County – San Bernardino County line, which also serves as the southeastern boundary of the Antelope Valley Area of Adjudication (AVAA). Dr. Arora indicates in his Declaration that the Site “is not within the hydrogeologic unit of the Antelope Valley Basin”. My review of available data indicates that the groundwater beneath the site is in good hydraulic connection with the rest of the AVAA in the vicinity of the Site. This good hydraulic connection means that the pumping effects of this well will propagate into the rest of the AVAA.

Two hundred and fifteen driller's well logs located (made available from the California Department of Water Resources database) along the southeastern edge of the AVAA (a region 12 miles west of the county line) were reviewed. That review indicated that there are no subsurface barriers to flow, such as bedrock highs, that would separate the aquifer material beneath the Site from the rest of the AVAA to the west. In fact, the depth to bedrock in the vicinity of the site (based on well logs for borings located 1 to 2 miles to the southwest the Site) of is on the order of 1,000 feet, with the overlying alluvial aquifer material having a saturated thickness of about 630 feet. There is no indication of any impediment to flow separating the Site from the rest of the AVAA.

One geologic log (Izbicki et al., 2000, which is Sheep Creek's Exhibit I) for a boring located in Sheep Creek wash about 3.5 miles to the southeast of the Site, within San Bernardino County, was examined and found to contain very similar alluvial material to a depth of at least 540 feet, indicating that similar aquifer materials most likely are continuously present to the east of the county line as well as to the west. Thus examination of 215 logs up to 12 miles to the west of the Site, in the immediate vicinity of the Site, and one log 3.5 miles to the southeast all indicate the presence of thick, permeable, alluvial materials, primarily sands.

Dr. Arora states that “faults in the area may impede movement of groundwater water [sic] flow and its direction.” A review of USGS documents could not find any faults mapped in the vicinity of the Site that could act as an impediment to flow between the Site and the rest of the AVAA.

A review of water levels in the area indicates that the general direction of flow near the county line in the vicinity of the Site is to the north. Although the data are sparse, the groundwater level contours are continuous across the county line, indicating no significant impediments to flow that would hydraulically separate the area into two basins. The well at the Site almost certainly draws water from both the AVAA and from the Mojave Area of Adjudication, the latter commencing just across the county line. Dr. Arora acknowledges that there is hydraulic connection across the county line from the Sheep Creek recharge area at the mountain front when he states that groundwater flow from that recharge area is, among other directions, to the “west toward the Antelope Valley Basin” and to the “northwest (in the direction of Sheep Creek Water Company’s Los Angeles County property)”.

On a regional scale, the principle groundwater flow direction from the mountain front recharge zone of Sheep Creek appears to be toward the northeast and east as indicated by the USGS study (Izbicki and Michels, 2004, which is the Sheep Creek Exhibit G). The carbon-14 age dating of the groundwater in the western portion of San Bernardino County indicates that the flow of groundwater from beneath the mountain front recharge area of Sheep Creek is primarily towards the discharge area adjacent to the Mojave River. Exhibit 1 is a plot of carbon-14 activity, with arrows indicating the groundwater flow direction, from the report by Izbicki and Michels (2004). This flow direction is consistent with the fact that there is a requirement in the Mojave Adjudication for an underflow of 800 acre-feet/year from the Oeste subarea (containing the Sheep Creek mountain front recharge area) to the Alto subarea to the east (Wagner, 2006). Exhibit 2 is a map showing the subareas in the Mojave adjudication. That adjudication recognized that there was a significant component of flow to the east. This dominant flow direction indicates that the majority of the flow from Sheep Creek is not towards the Site, so that the well at the Site is most likely not primarily pumping water recharged from Sheep Creek.

Site Not Within a Known and Definite Channel of Sheep Creek

As Dr. Arora points out, recharge from Sheep Creek occurs as percolation along the channels of Sheep Creek as it flows across the surface of the Sheep Creek alluvial fan. Once the creek leaves the confines of the canyon in the San Gabriel Mountains, it no longer flows in a restricted channel, either as surface flow or as a subterranean stream.

The State Water Resource Control Board (SWRCB) developed criteria for groundwater to be considered a subterranean stream:

The physical conditions that must be present in a subterranean stream flowing in a known and definite channel are: (1) a subsurface channel must be present; (2) the channel must have relatively impermeable bed and banks; (3) the course of the channel must be known or capable of being determined by reasonable Inference; and (4) groundwater must be flowing in the channel (DWR, 2003, which is Sheep Creek Exhibit C).

Once Sheep Creek exits the mountains and crosses the alluvial fan, it no longer has a defined subsurface channel with relatively impermeable bed and banks. Instead, groundwater is present in aquifer material that extends laterally and vertically over large distances of deposited alluvial sediments. The one deep well log in Sheep Creek wash discussed above (Izbicki et al., 2000) substantiates that with its thick sequence of alluvial sediments.

Site Not Within the El Mirage Valley Groundwater Basin

Dr Arora states that the Site is within the El Mirage Valley Groundwater Basin (DWR basin number 6-43) whose boundaries are identified within Bulletin 118 (DWR, 2003, which is Sheep Creek Exhibit C). A careful examination of the groundwater basin map indicates that this is not the case. Exhibit 3 presents the map of groundwater basins for the entire State of California. Exhibit 4 is a close-up taken from that map showing the location of the El Mirage Valley Groundwater Basin relative to the county line. The El Mirage Valley Groundwater Basin lies east of the county line in the vicinity of the Site, while the Site lies to the west. This map demonstrates that the Site is within what DWR defines as the Antelope Valley Groundwater Basin (DWR basin number 6-44), not within the El Mirage Valley Groundwater Basin.

Conclusion

There is no technical basis for the Site being excluded from the AVAA. Groundwater at this location is in good hydraulic connection with the rest of the AVAA. The Site is not within a

subterranean stream of Sheep Creek, nor does the recharge from Sheep Creek flow primarily towards the site but rather flows primarily to the northeast towards the Mojave River. The Site is within the Antelope Valley Groundwater Basin as defined by the DWR, not within the El Mirage Groundwater Basin.

References

DWR (California Department of Water Resources), 2003. *Bulletin 118, California's Groundwater*.

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Izbicki, John A., and Michel, Robert L., 2004. *Movement and Age of Groundwater in the Western Part of the Mojave Desert, Southern California, USA*, U.S. Geological Survey, Water-Resources Investigations Report 01-4314.

Wagner, Robert C. (Mojave Basin Area Watermaster Engineer), 2006. *Summary Report of Subsurface Flow Between Subareas*, February 22.