WATER REPLENISHMENT DISTRICT OF SOUTHERN CALIFORNIA

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WRD's Monitoring Wells Give Aquifer-Specific Information

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At WRD, it is critical to have a good understanding of the groundwater conditions in the Central and West Coast Basins (CWCB) to properly replenish and protect this valuable resource. However, the occurrence, movement, and quality of the groundwater is complex due to the deep, multi-layered, heterogeneous aquifer systems, earthquake faults, sea water intrusion, recharge ponds, pumping patterns, overdraft, and barrier injection wells that exist in the basins.

Aquifers can have different characteristics from each other for many reasons such as the presence (or absence) of aquitards; the amount and quality of recharge water received; the amount of pumping occurring; hydrogeologic properties of the aquifers including permeability, thickness, and storage coefficient; the mineralogy of the aquifer soils; and the types of contaminants, if any, that have entered the aquifer. These factors will cause the aquifers to have different water levels and water qualities.

Because we can not peer directly into the earth to view the conditions of the aquifers, we rely upon water wells to provide the information. WRD historically used high capacity production wells as the primary source of information because of their availability and convenience. Although these wells are great for water supply purposes, they may not be reliable for water level and water quality data if they have long screens that cross more than one aquifer (**Figure 1**). This is due to the fact that the water from the different aquifers will enter and mix in the well producing an average water type. This averaging may lead to erroneous interpretations of the water levels and water quality at the well and a false understanding of the actual basin conditions.

To remedy this averaging problem, WRD now employs a more pinpoint approach by using aquifer-specific, short-screened monitoring wells. These

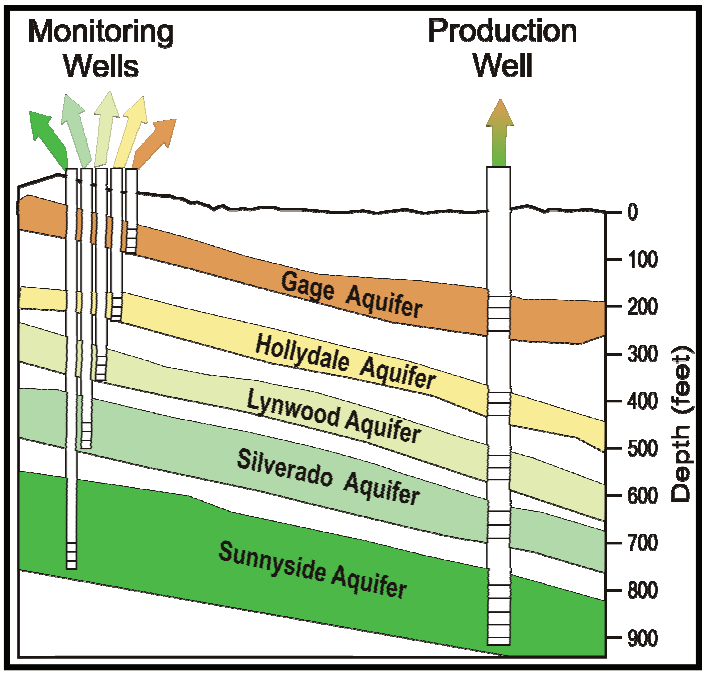

Figure 1: Monitoring wells versus Production wells for Aquifer-Specific Information.

wells provide specific water levels and water quality information for the individual aquifers tapped thereby eliminating the averaging across multiple aquifers (**Figure 1**). Since 1992, the District has installed 225 monitoring wells at 48 locations to enhance its monitoring network and significantly improve the understanding of the CWCB (**Figure 2**). Production well data are also useful if the well is screened in a single aquifer instead of across multiple aquifers.

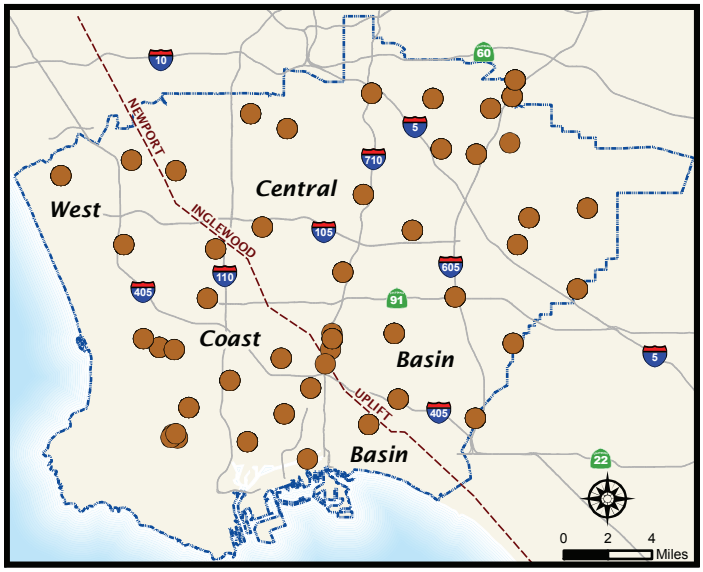

Figure 2: WRD's monitoring well network

As an example, **Figure 3** shows the water level differences between a production well (black line) that is screened across multiple aquifers and the depth-specific monitoring wells (colored lines) that are tapping individual aquifers. The water level observed

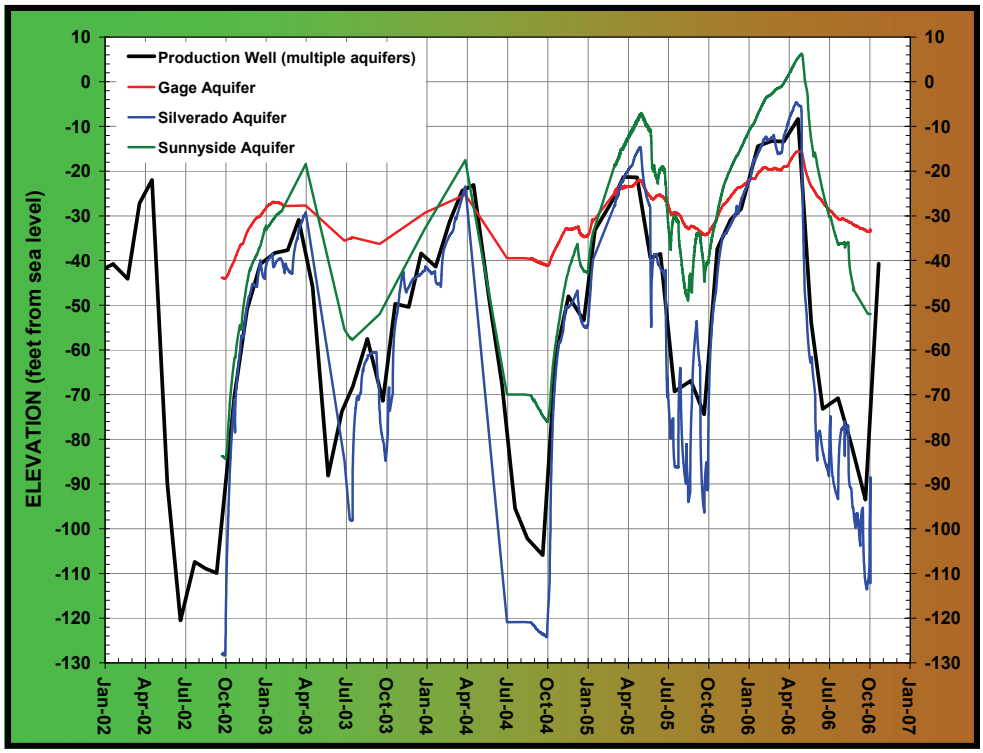

Figure 3: Water level comparisons between a production well (multiple aquifers) and monitoring wells (aquifer-specific)

in the production well is an average of the water levels of the individual aquifers penetrated and as a result do not represent true water levels. The monitoring well data, however, do provide the actual water levels for each aquifer. As shown in **Figure 3**, the water levels in the Gage Aquifer are considerably different from the Silverado and Sunnyside aquifers and the production well data do not match any specific aquifer.

Table 1 shows water quality data for a different production well that is screened across multiple aquifers and located near a WRD monitoring well cluster. The production well data suggest that manganese exceeds the Maximum Contaminant Level (MCL) of 50 micrograms per liter (ug/L). However, the aquifer specific data reveal that the high manganese is only in the Exposition Aquifer. Accordingly, if this aquifer was sealed off from the production well, it is likely that the well would produce manganese concentrations below the MCL. The production well data also suggest that perchloroethylene (PCE) is below the MCL of 5 ug/L. The monitoring wells, however, tell the full story. Although most of the aquifers do have very low PCE concentrations, the Lynwood Aquifer is elevated at 8.5 ug/L. WRD would use this information to investigate the possible sources of the high PCE in this aquifer. The production well could also be sealed off from the Lynwood Aquifer to reduce its PCE concentrations even further.

In summary, high capacity production wells are extremely useful to obtain a water supply, but their water level and water quality data can be misleading if they are screened across multiple aquifers. A more effective method to collect aquifer-specific information is through the use of targeted, short-screened monitoring wells and from single aquifer production wells. WRD's Regional Groundwater Monitoring Program regularly collects data from both types of wells to acquire an accurate understanding of the groundwater conditions in the CWCB. A report on the findings is presented annually, a copy of which can be obtained from the District's web site at www.wrd.org. For further information on this Technical Bulletin or to provide any comments, please contact the authors listed on the front page.

Well #	Aquifer	Manganese (ug/l)	PCE (ug/l)
MW1	Exposition	**118.9**	0.6
MW2	Lynwood	4.8	**8.5**
MW3	Silverado	14.0	0.8
MW4	Sunnyside	8.8	ND
Production	Multiple	81.8	1.1

Table 1: Water quality comparison in a production well (multiple aquifers) versus aquifer-specific monitoring wells.

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