

## A CENTURY OF GROUNDWATER CHANGES IN THE CENTRAL AND WEST COAST BASINS

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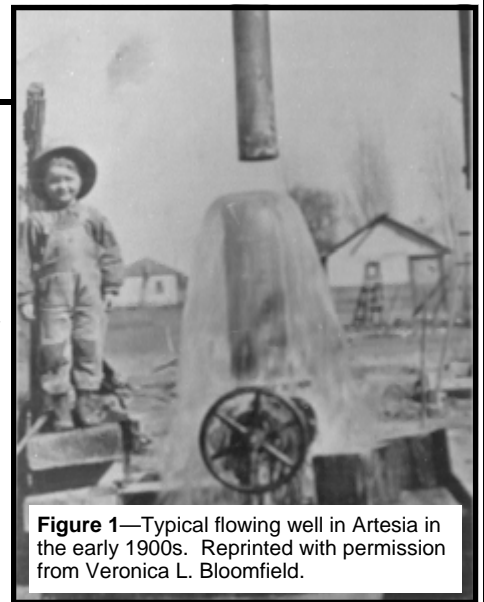
**One Hundred Years Ago** the groundwater story of the Central and West Coast Basins (CWCB) of coastal Los Angeles County was very different than it is today. At that time, the basins were so full of water that much of the Central Basin had flowing artesian wells, giving names to cities such as Artesia and Fulton Springs (later Santa Fe Springs). Of the nearly 3,500 wells that were in operation in the CWCB in 1904 (compared to 500 wells today) nearly half were flowing artesian wells such as that pictured in **Figure 1**.

The high groundwater levels a hundred years ago also provided natural protection against seawater intrusion, a condition which does not exist today and is the source of many problems for the basins. **Figure 2** is a groundwater elevation contour map for the year 1904, showing the areas of flowing artesian wells (shaded regions) and natural groundwater elevations all above sea level.



**Figure 2**—Groundwater elevation contour map for 1904, modified from Mendenhall (1905). Contour values are in feet above sea level. Shaded regions in the central and eastern portions of the map are areas of flowing artesian wells. WRD boundary shown in blue for reference. Newport-Inglewood Uplift added to map for reference. Central Basin is on the east side of the uplift, and the West Coast Basin is on the west.

What else was going on 100 years ago? National events included the following: Teddy Roosevelt was the 26<sup>th</sup> President; there were only 45 states; the construction of the Panama Canal began; and the first ice cream cones were introduced at the 1904 St. Louis World's Fair. There were only 8,000 cars in the country and the maximum speed limit in most cities was 10 mph. The average U.S. worker made \$200 to \$400 per year. A first-class postage stamp cost 2 cents, a loaf of bread was 5



**Figure 1**—Typical flowing well in Artesia in the early 1900s. Reprinted with permission from Veronica L. Bloomfield.

cents, a quart of milk 6 cents, and a Sears Roebuck refrigerator cost \$27.50 (holds 125 lbs of ice!).

Locally, the population of the City of Los Angeles was 102,500 in 1900 but grew to over 400,000 just ten years later and 3.7 million by 2003. As the population grew so did the use of groundwater. By 1953, groundwater production reached a high of 331,600 acre feet per year (afy), nearly double the natural safe yield of 173,000 afy (CDWR, 1962). This severe overdraft caused many problems, including declining water levels, drying up of wells, and seawater intrusion that contaminated the freshwater aquifers. The artesian wells stopped flowing causing wells to be drilled deeper and pumps to be installed to bring up the deepening groundwater resource. **Figure 3** shows the water levels in a well in the Vernon area that fell a projected 240 feet between the years 1904 and 1960.

To address these problems, water agencies, political entities, and the judicial courts implemented three

important measures; 1) adjudication of the basins, 2) installation of seawater barrier injection wells, and 3) the creation of WRD. The West Coast Basin adjudication took effect in 1961 and limited groundwater extractions to 64,468 afy. The Central Basin adjudication took effect in 1965 and limited extractions to 217,367 afy. Although this cap on total production of 281,835 afy helped, it still exceeded the natural safe yield of the CWCB.

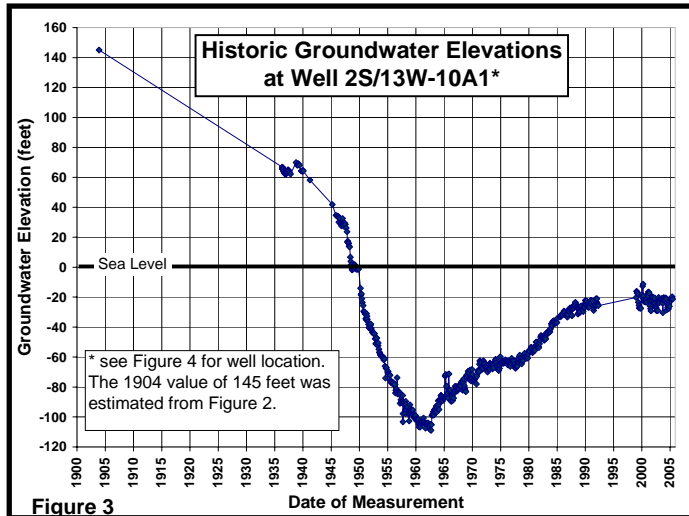
In the early 1950s, the Los Angeles County Flood Control District successfully demonstrated that freshwater injection wells could

into the ground to make up the annual overdraft. Replenishment occurs at spreading grounds and seawater barrier wells.

The net effect of these management changes was an increase in water levels and a halt to seawater intrusion. **Figure 3** shows the effects of these management changes, where water levels switched from a falling trend to a rising one in the early 1960s. This rising trend occurred throughout the CWCB, restoring the groundwater basins to a healthier and more reliable state.

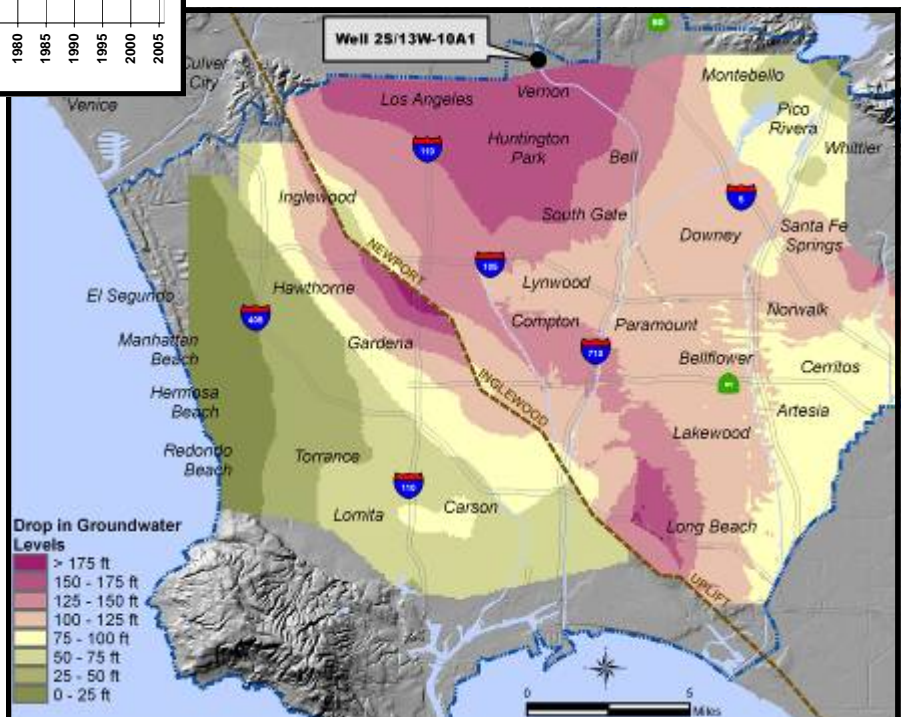
It is not desirable to return to the high water level days of 1904 because of the problems that would occur due to shallow groundwater. However, to understand the net effect of 100 years of water level changes, WRD prepared a map to illustrate the changes between 1904 and 2004 (**Figure 4**). Areas with the greatest changes are in the Los Angeles, Vernon, Huntington Park, Long Beach, and Gardena areas, where water levels are over 150 feet lower than they were in 1904. Areas with the least changes are along the west coast, where the seawater barrier injection wells artificially keep groundwater near sea level, where they were back in 1904. WRD will continue to closely track and report on the groundwater levels in the CWCB.

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halt advancing underground seawater. Over the next 50 years, they installed a series of nearly 300 injection wells along 16 miles of coastline. Today, WRD purchases nearly 30,000 afy of water to inject into the wells to stop the intruding seawater.

In the mid 1950s, the DWR recognized that the solution to the groundwater problems of the CWCB required management on an area-wide basis, and that WRD would be empowered to take the necessary actions for proper basin management. Based on this, in 1959, the WRD was formed through a special election in Los Angeles County to manage artificial replenishment in the CWCB and eventually to protect groundwater quality. It is WRD's job to determine the amount of annual overdraft (difference between pumping and natural replenishment) and then purchase the necessary water (imported and recycled) to put back



**Figure 4**—Drop in Groundwater Elevations from 1904 to 2004

**References used for this Technical Bulletin:**

Images of America, Artesia, 1875-1975: Compiled by Albert O. Little, Edited by Veronica L. Bloomfield and Veronica E. Bloomfield, 2000, Arcadia Publishing.

Development of Underground Waters in the Central Coastal Plain Region of Southern California: by Walter C. Mendenhall, 1905, USGS Water Supply Paper No. 138.

Development of Underground Waters in the Western Coastal Plain Region of Southern California: by Walter C. Mendenhall, 1905, USGS Water Supply Paper No. 139.

Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix B, Safe Yield Determinations: 1962, California Department of Water Resources, Bulletin 104



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