4.0 GROUNDWATER MANAGEMENT ISSUES

Groundwater management in the El Paso portion of the Hueco revolves around two interrelated issues: declining groundwater levels and brackish groundwater intrusion. Historic pumping has caused groundwater levels to decline. The lowered groundwater levels in and around wellfields results in changed flow patterns. Because brackish groundwater is in close proximity to fresh groundwater in many areas of the Hueco, these altered flow patterns can cause and have caused brackish groundwater to move (or intrude) into areas that had contained fresh groundwater. For the purposes of this report, fresh groundwater is groundwater that meets the drinking water standard, and brackish groundwater has a dissolved salt content that exceeds the drinking water standard.

4.1 Declining Groundwater Levels

One of the basic pieces of data in hydrogeology is the groundwater level that can be measured in a well. In practice, a groundwater level is measured in terms of depth to water from the top of the well casing. This can be translated into a groundwater elevation by subtracting the depth to water from the elevation of the top of the casing.

These data are important in two respects:

- The routine measurement of groundwater elevations over time can yield information on whether the groundwater storage is decreasing (decreasing groundwater elevation with time), stable (no significant change to groundwater elevation with time), or increasing (increasing groundwater elevation with time).
- The groundwater elevations in nearby wells can be used to evaluate the direction of flow. Groundwater flows from high elevation to low elevation. Moreover, routine measurement can then be used to evaluate if the direction of flow is changing with time.

Figure 4-1 shows the location of four EPWU wells, and their hydrographs of groundwater elevation history are shown in Figures 4-2 to 4-5. Note that in each, a large decline due to EPWU pumping is observed through the late 1980s. This corresponds to the increased pumping that was presented in Figure 2-2.

However, note that the groundwater elevations have essentially stabilized since the reduction of pumping in all but the northeast well. The stabilization represents a combination of decreased pumping and the influence of water from the Rio Grande and associated canals and drains. The wells in the northeast have not exhibited stabilization to the same extent as wells in the airport, downtown and lower valley areas due to the distance to the induced recharge source.

4.2 Groundwater Quality

Figures 4-6 through 4-14 present the current groundwater quality of the El Paso portion of the Hueco at various elevations in terms of chloride concentrations in the groundwater.

For reference, land surface elevation in El Paso is approximately 3900 ft above mean sea level (MSL). Note that the water quality degrades with depth and to the east.

Chloride represents one of the dissolved constituents in Hueco Bolson groundwater. Often, the concentration of total dissolved solids (TDS) is used to characterize water quality. In Texas, the secondary standard (non-health standard) for TDS is 1,000 milligrams per liter (mg/l). The secondary standard for chloride (one of the components of total dissolved solids) is 250 mg/l. In the Hueco, EPWU wells will often exceed the chloride standard before exceeding the TDS standard. It is therefore preferable to use chloride to define water quality, therefore, in order to conservatively estimate the extent of fresh groundwater that is available for pumping.

These maps were prepared using data from three sources:

- EPWU discrete zone samples collected during drilling of test holes and wells in 2002 and 2003 (supplemented with older discrete zone data where water quality has not changed). These samples were analyzed for chloride.
- Water quality data from shallow well data (less than 100 feet) southeast of El Paso from wells constructed by El Paso County Water Improvement District No. 1. The reported TDS data were converted to chloride data using regression curves.
- Electrical conductivity profiles of existing wells in Juarez obtained from Junta Municipal de Agua y Saneamiento de Juarez (JMAS). Electrical conductivity is a measurement that can be made in the borehole that is analogous to TDS. Data from the JMAS consisted of downhole electrical conductivity measurements in screened areas. These data were converted through regression curves to chloride concentrations.

The locations of these wells are presented in Figure 4-15. The data were interpolated to cover all areas shown in Figures 4-6 through 4-14 using three-dimensional kriging.

Table 4-1 presents a summary of estimated volumes of groundwater in various groundwater quality groupings based on these maps. For purposes of this analysis, fresh groundwater is defined by chloride concentrations less than 250 mg/l. Based on this approach, there is currently about 9.4 million AF of fresh groundwater in the El Paso area, as compared to an estimated 10.6 million AF of fresh groundwater in 1974 (Muller and Price, 1979).

Table 4-1
Summary of Groundwater Storage Estimates in El Paso Area
Based on Chloride Concentrations

Chloride (mg/l)	Groundwater Storage in El Paso Area (million AF)
<250	9.4
250-500	7.0
500-750	5.3
750-1000	4.6
>1000	19.2
Total	45.5

4.3 Brackish Groundwater Intrusion

Groundwater elevations are only one part of the overall groundwater management situation. Figure 4-16 presents the operational status of EPWU wells over the last five years. Note that several of the wells have not been operated in the eastern portion of the airport area and in the lower valley. These wells pumped fresh groundwater when they were first constructed, but over time the water quality has deteriorated to the point where they cannot supply water to the distribution system without treatment. The groundwater elevation declines have resulted in brackish groundwater intrusion, and the loss of several wells.

Hutchison and others (2003) completed an analysis of wells in and around the airport area in order to assess the potential for future brackish water intrusion as part of the design of the Joint Desalination Facility (JDF). The analysis consisted of plotting the historic chloride concentrations in a well and drawing a trend line. The trend line was then extrapolated to estimate when chloride concentration would exceed 250 mg/l.

Figures 4-17 and 4-18 present the analysis of two of the wells. Figure 4-19 present a summary map of all the wells analyzed, including an estimate of when chloride concentrations would exceed 250 mg/l. It can be seen from this analysis that brackish water intrusion into the airport area is still a management concern. As is developed later in this report, the JDF is designed to specifically address this issue.