5.4.3 Cave Valley

Nevada Division of Water Resources (NDWR) driller's logs for wells in Cave Valley suggest that the basin fill is composed of mostly sand and gravel with significant cemented strata in the northern portion of the valley and interbedded sands and clay in the southern portion of the valley. Lithology reported on a limited number of well logs suggests that the northern portion of Cave Valley may have unconfined to semi-confined aquifer conditions, while the southern portion may be confined to semi-confined. Well 180 N07 E63 14BADD1 USGS-MX [Cave Valley], on the southwestern side of the valley, encountered carbonate rock at 265 ft-bgs and was hydraulically tested at 225 gpm with 118 ft of drawdown after 210 hours. Petroleum exploration drilling in Cave Valley provides additional geologic information to several thousand feet in depth. The SNWA installed two monitor wells in Cave Valley in 2005 (180W501M and 180W902M). The wells were drilled to 1,215 and 915 ft-bgs, respectively, and both wells penetrated the carbonate rock aquifer. Well 180W501M was drilled in the central portion of Cave Valley, while well 180W902M was drilled in the south-east portion of the valley near Sidehill Pass.

Basin-Fill Aquifer

Depths to water in Cave Valley range from near ground surface in parts of northern Cave Valley (i.e., near Cave Spring and Parker Station) to greater than 200 ft-bgs in the southern portion of Cave Valley (Figure 5-13). Depths to water in the vicinity of the south playa are in excess of 150 ft-bgs, suggesting that the stand of phreatophytes in the southern portion of the valley subsists on a perched water table. Water-level elevations in Cave Valley range from approximately 7,000 ft-amsl in the far northern portion of Cave Valley to approximately 5,800 ft-amsl in the southern portion of Cave Valley (Figure 5-14). Based on these water-level elevations, it appears that Cave Valley has a north-to-south hydraulic gradient of approximately 48 ft/mi.

Carbonate Aquifer

Water-level elevations for wells that penetrate the regional carbonate-rock aquifer in Cave Valley range from approximately 5,400 ft-amsl for well 180W501M in the central portion of Cave Valley to approximately 5,800 ft-amsl for well 180W902M in the southern portion of Cave Valley. The depth to water for well 180W501M is approximately 1,050 ft-bgs, and during construction it was estimated that the well produced between 3 to 5 gpm. These water-level elevations are generally higher by approximately 200 to 600 ft than the water-level elevations for carbonate-rock wells found in the central and southern portions of White River Valley, and approximately 1,200 ft higher than water-level elevations in Dry Lake Valley (see Figure 5-1). From these water-levels elevations, it appears that there is a south-to-north hydraulic gradient for wells that penetrate the carbonate rock aquifer in Cave Valley. According to Volume 1, however, Cave Valley consists of two distinct but connected portions, separated by the oblique-slip fault at Shingle Pass. This is likely the cause for the discrepancy between the water-level elevations for the carbonate rock aquifer wells in the central and southern portions of Cave Valley. The data also suggest an east-to-west hydraulic gradient exists between Cave Valley and White River Valley consistent with data presented by Harrill et al. (1988).

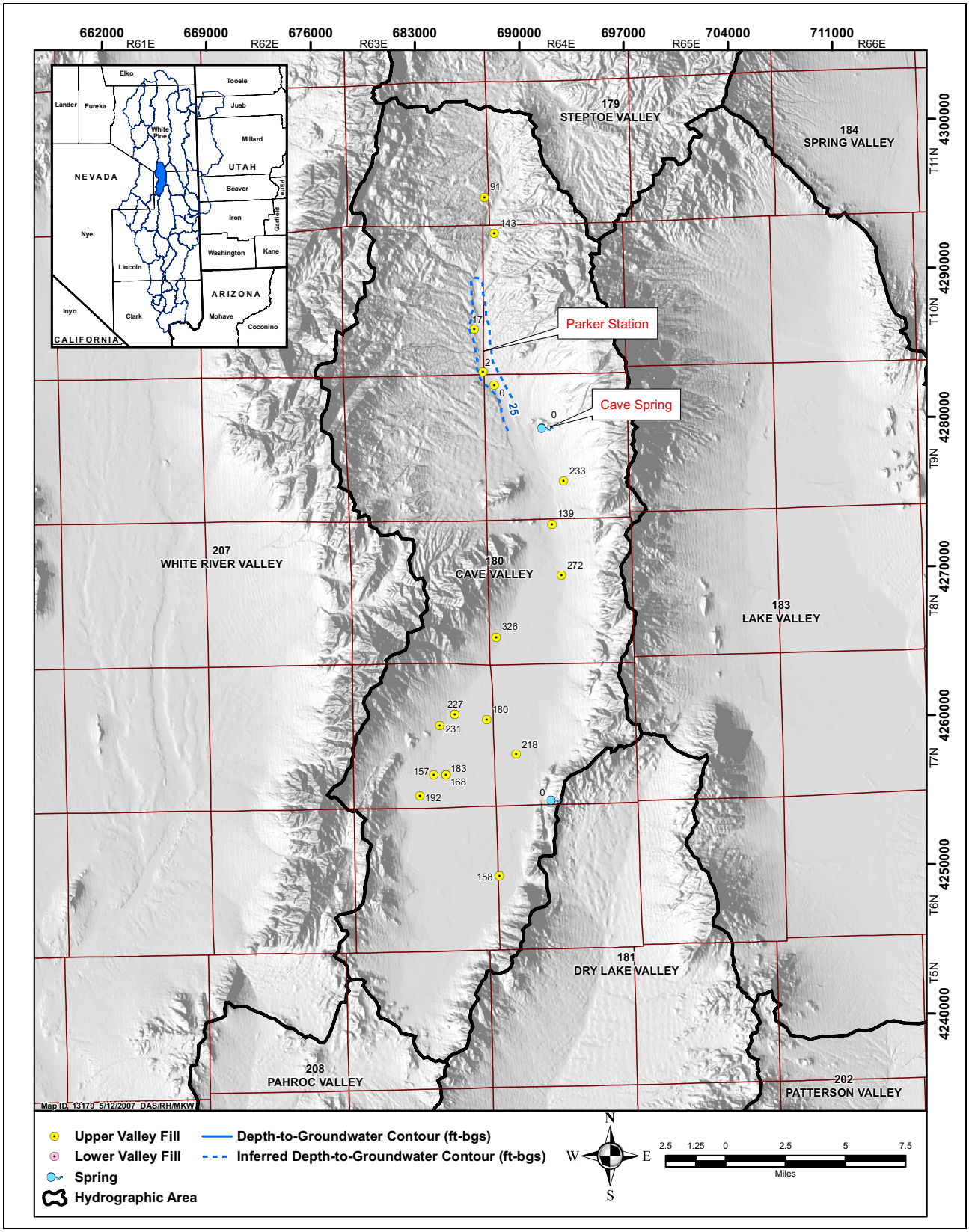

Figure 5-13
Cave Valley Depth to Water Map

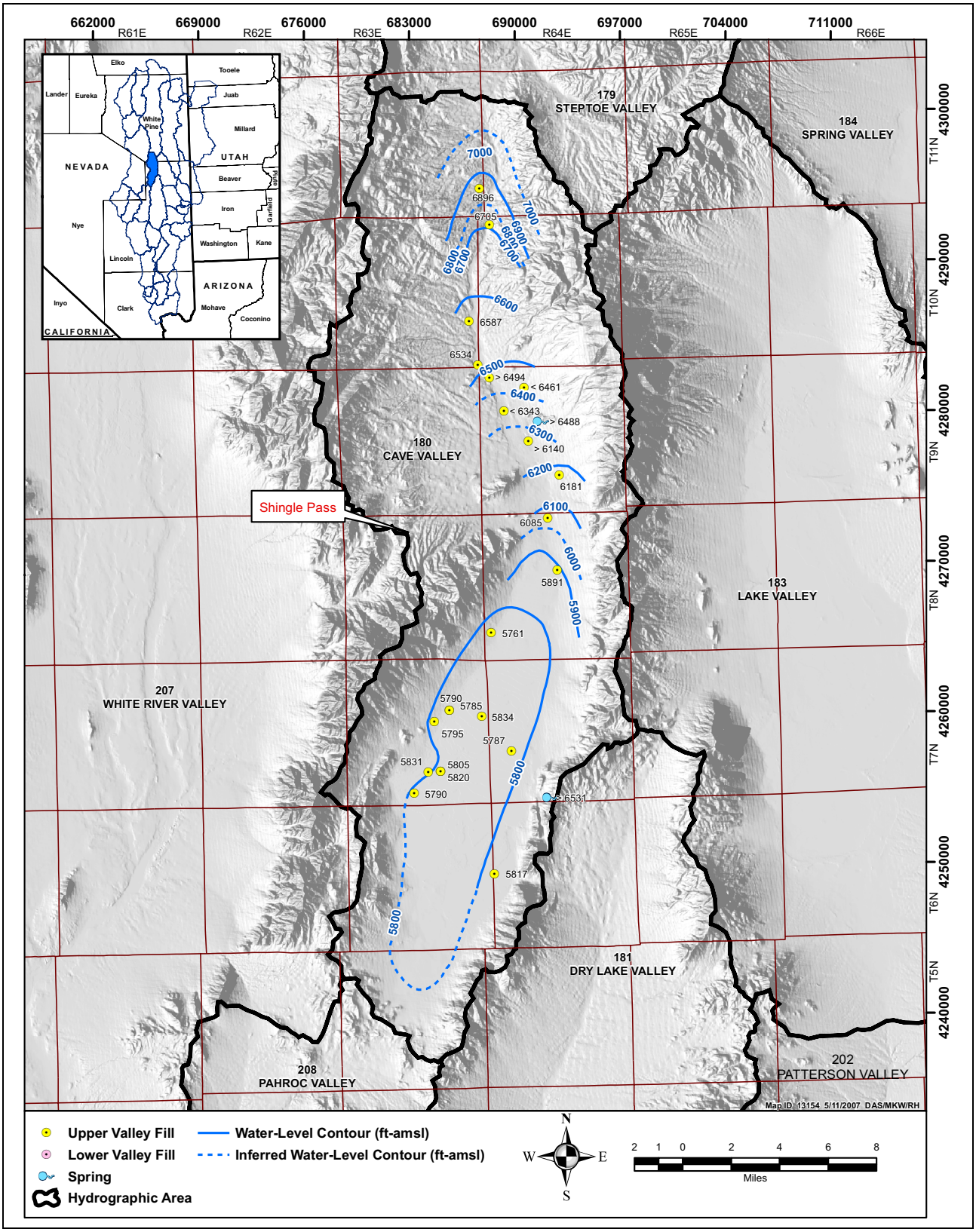

Figure 5-14
Cave Valley Water-Level Elevation Map

Water-Level Trends

The Cave Valley MX well (i.e., 180 N07 E63 14BADD1 USGS-MX [Cave Valley]), located in the south-central portion of the valley, has shown a subtly rising water-level trend since the early 1980s with about a 10 ft increase in the overall water-level elevation for the well (Figure 5-15). This well was identified as penetrating the carbonate rock aquifer. Inspection of the other hydrographs for Cave Valley found in Volume 4 show a similar type of increasing trend. The other wells for which hydrographs were constructed were identified as penetrating basin-fill materials.

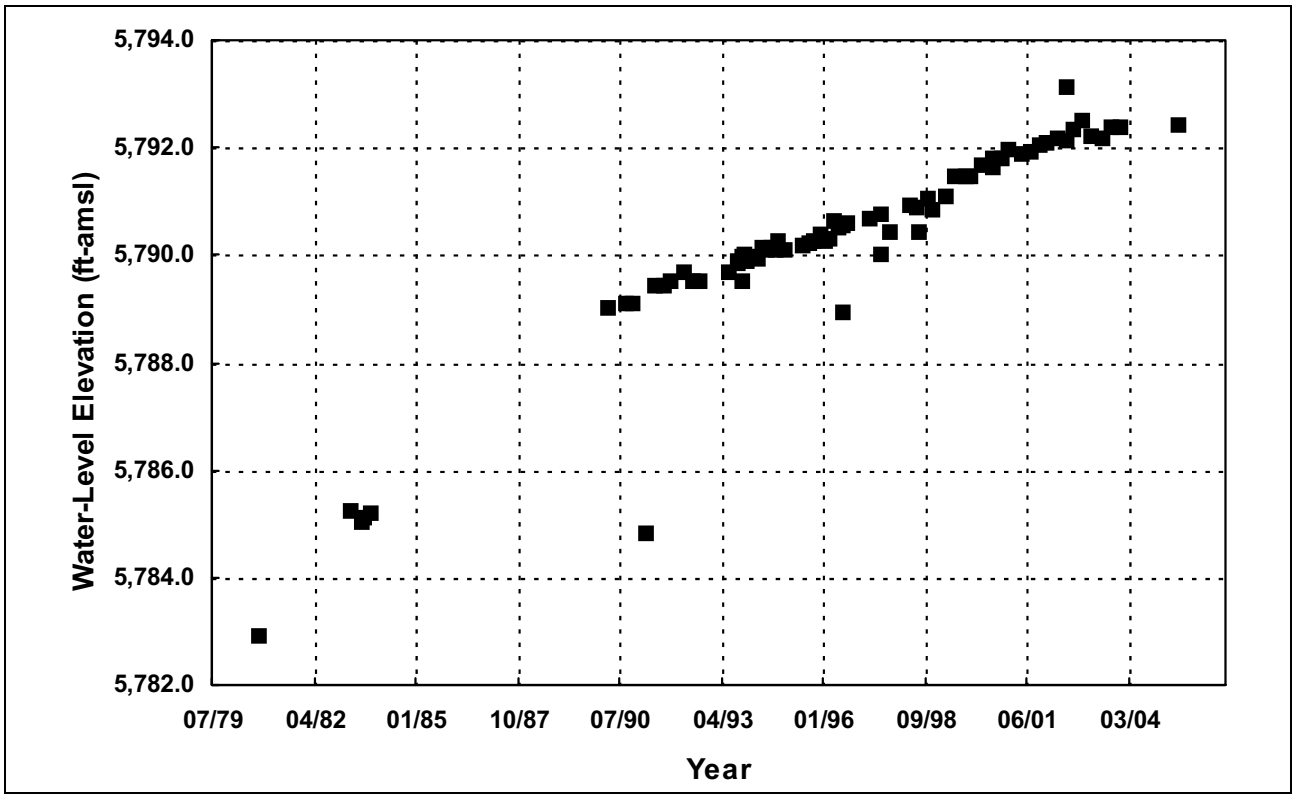

Figure 5-15
Historical Water-Level Elevations at 180 N07 E63 14BADD1 USGS-MX (Cave Valley)

5.4.4 Dry Lake Valley (HA 181) and Delamar Valley (HA 182)

Driller's logs and available gravity data indicate that carbonate bedrock underlies the northwest part of Dry Lake Valley at a relatively shallow depth. For example, the North Dry Lake MX well (181 N03 E63 27CAA 1 USGS-MX [N. Dry Lake]) was drilled to 2,395 ft-bgs and encountered alluvium to 195 ft-bgs, a thin stratum of volcanic rock to 340 ft-bgs, and limestone to the total depth of the well. The Muleshoe Valley MX well (181 N04 E64 07DC 1 USGS-MX [Muleshoe Valley]), in the northern part of Dry Lake Valley, encountered sand and gravels to 1,253 ft-bgs. This well is reported to have been pumped at 50 gpm for 144 hours resulting in 316 ft of drawdown. The South Dry Lake MX well (181 S03 E64 12AC 1 USGS-MX [S. Dry Lake Well]) was completed to 1,010 ft-bgs and encountered interbedded sands, gravels, and clay. This well is noted as being tested at 500 gpm for 70 hours with 41 ft of drawdown. Some cemented sand strata are also reported in driller's logs in southern Dry Lake Valley. Based on a limited number of well logs, it appears that unconfined aquifer

conditions exist in northern Dry Lake Valley, while semi-confined to confined conditions exist in the south.

Only six wells are incorporated into the compiled data set for Delamar Valley, including two MX wells. The lithology reported on driller's logs indicates the presence of interbedded sands, gravels, and clay, with a considerable quantity of clay noted in the logs to 1,210 ft-bgs. The Delamar MX well (182 S06 E63 12AD 1 USGS-MX [Delamar Well]) is reported to have been pumped for 128.5 hours at a rate of 85 gpm with 62 ft of drawdown.

In 2005, the SNWA installed two monitor wells in Dry Lake Valley and two monitor wells in Delamar Valley. Of the two monitor wells drilled in Dry Lake Valley, one penetrated the basin-fill aquifer system (i.e., 181W909M), while the other well penetrated the carbonate-aquifer system (i.e., 181M-1). The two wells installed by the SNWA in Delamar Valley (i.e., 182M-1 and 182W906M) were drilled to 1,345 and 1,735 ft-bgs, respectively. Both wells penetrated volcanic rocks.

Basin-Fill Aquifer

Water-level data are sparse in these two basins with depths to water on the main axis of the valley floor generally in the range of 200 to 500 ft-bgs in Dry Lake Valley and depths exceeding 800 ft-bgs in Delamar Valley. Figure 5-16 shows that the water-level elevations range from approximately 5,500 ft-amsl in the northern portion of Dry Lake Valley to approximately 4,300 ft-amsl in the southern portion of Dry Lake Valley for wells completed in the basin-fill. Water-level elevations are approximately 3,850 ft-amsl in the central portion of Delamar Valley. The water-level elevations and composite water-level contours shown on Figure 5-16 indicate that there is a north-to-south groundwater gradient for these two basins. Based on the available water-level elevations in Dry Lake and Delamar valleys, the hydraulic gradient from the central portion of one valley to the other is approximately 13 ft/mi.

Carbonate Aquifer

Two wells in the compiled data set were identified as penetrating the carbonate-rock aquifer. Both well are located on the west side of Dry Lake Valley (Figure 5-1). It can be seen from the figure that the water-level elevations for the two wells range from 4,541 to 4,288 ft-amsl. These water-level elevations are approximately 1,300 to 1,500 ft lower in elevation than carbonate-rock wells in Cave Valley to the north, and 650 to 900 ft higher in elevation than carbonate-rock water levels in Pahranagat Valley.

Water-Level Trends

Water-level fluctuations in Dry Lake Valley and Delamar Valley appear to be show a slight upward trend over the past 25 years similar to the trend observed for Cave Valley. The water-level variations can likely be attributed to climatic variability, as there is little to no groundwater development in these two basins. For example, Burbey (1997) stated that development of Delamar Valley has been limited to livestock grazing as the depths to water are prohibitive for other economic activities. Figure 5-17 shows that water-level elevations for the USGS-MX (North Dry Lake Well) have increased approximately five feet from 1986 to the present. This well was identified as penetrating the

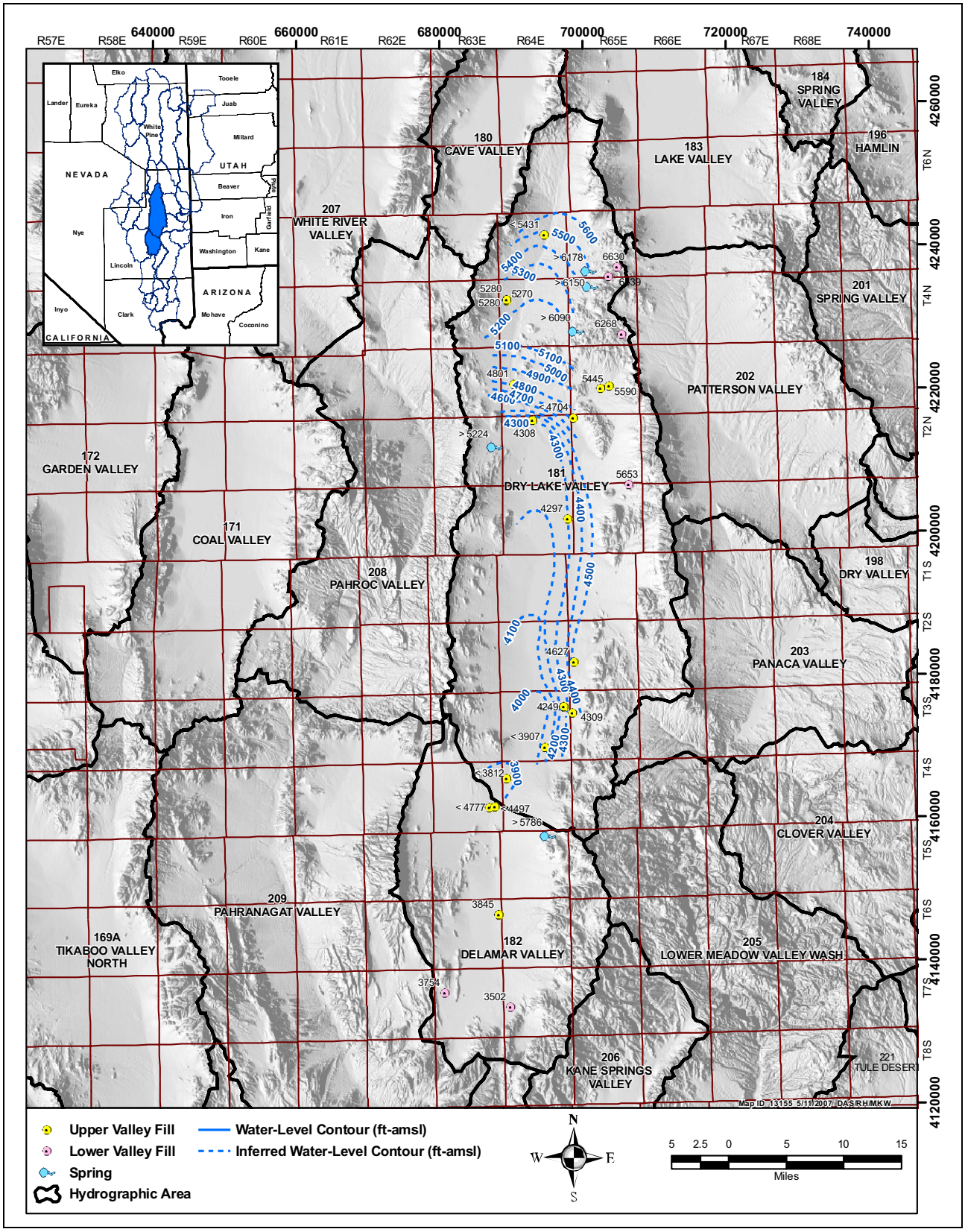

Figure 5-16
Dry Lake and Delamar Valleys Water-Level Elevation Map

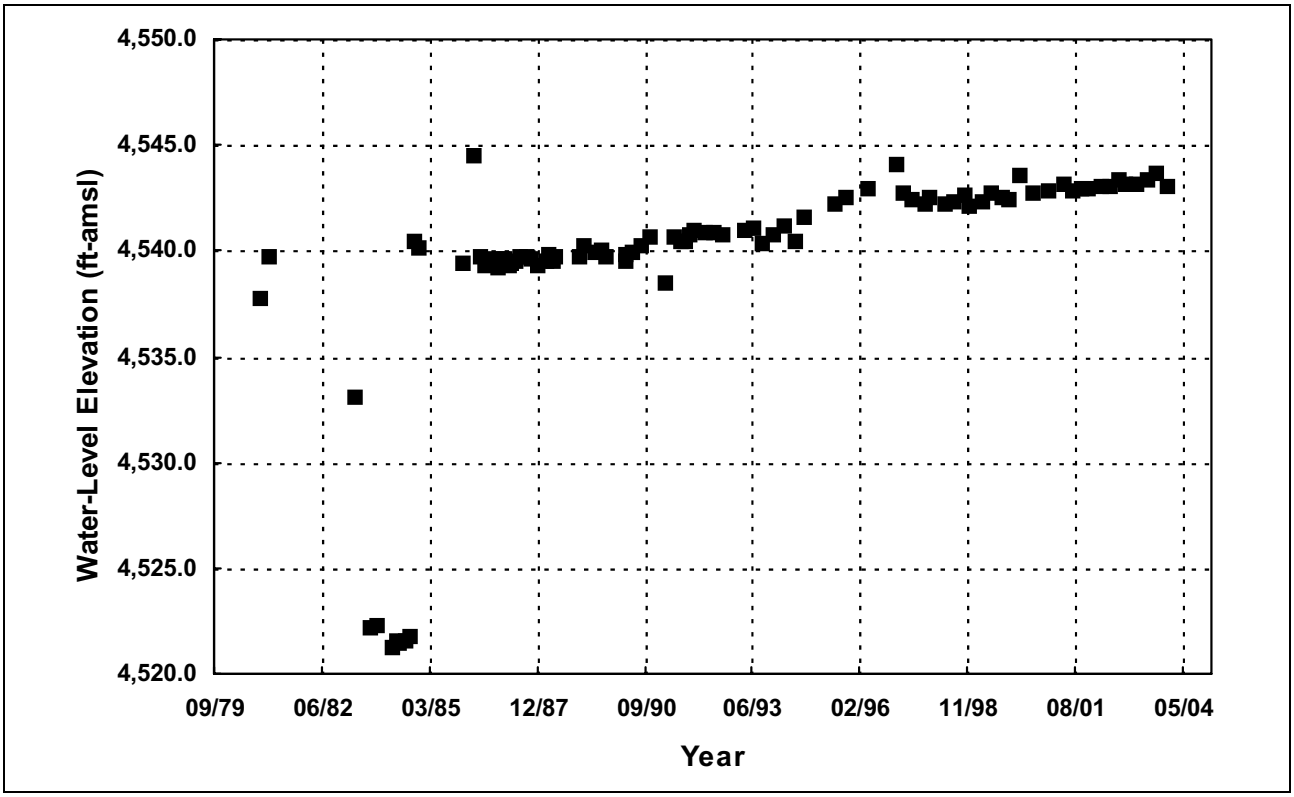

Figure 5-17
Historical Water-Level Elevations at 181 N03 E63 27CAA 1 USGS-MX (N. Dry Lake)

carbonate-rock aquifer. The other wells for which hydrographs were constructed were identified as penetrating the basin-fill aquifer system. The other hydrographs are provided in Volume 4.

5.4.5 Coyote Spring Valley

Coyote Spring Valley contains several monitor wells completed in the early and mid-1980s as part of the MX missile-siting program and by the USGS, including test well MX-4, MX-5, CE-VF-1, and CE-VF-2. Wells MX-4, MX-5, and CE-VF-2 are completed in the carbonate-rock aquifer (Ertec Western, Inc., 1981a; Berger et al., 1988). SNWA installed eight monitor wells in and near the valley in 2003. In addition, many wells in Coyote Spring Valley and down gradient in the Muddy River Springs Area have recently been surveyed for precise location and land-surface elevations by SNWA (SNWA, 2003b).

Basin-Fill Aquifer

Depths to water in the basin-fill aquifer system generally range between 300 and 600 ft-bgs in Coyote Spring Valley. Depths to water in the vicinity of Coyote Spring, however, approach land surface in that localized area. Eakin (1964) postulated that Coyote Spring, prior to development, derived its flow from a semi-perched water-bearing zone in the older valley fill that received recharge from precipitation in the Sheep Range to the west. Eakin (1964) estimated “not more than a few hundred” acre-feet per year of ET from phreatophytes near Coyote Spring. It can be seen from Figure 5-18 that water-level elevations along the main drainage channel of the valley range from approximately

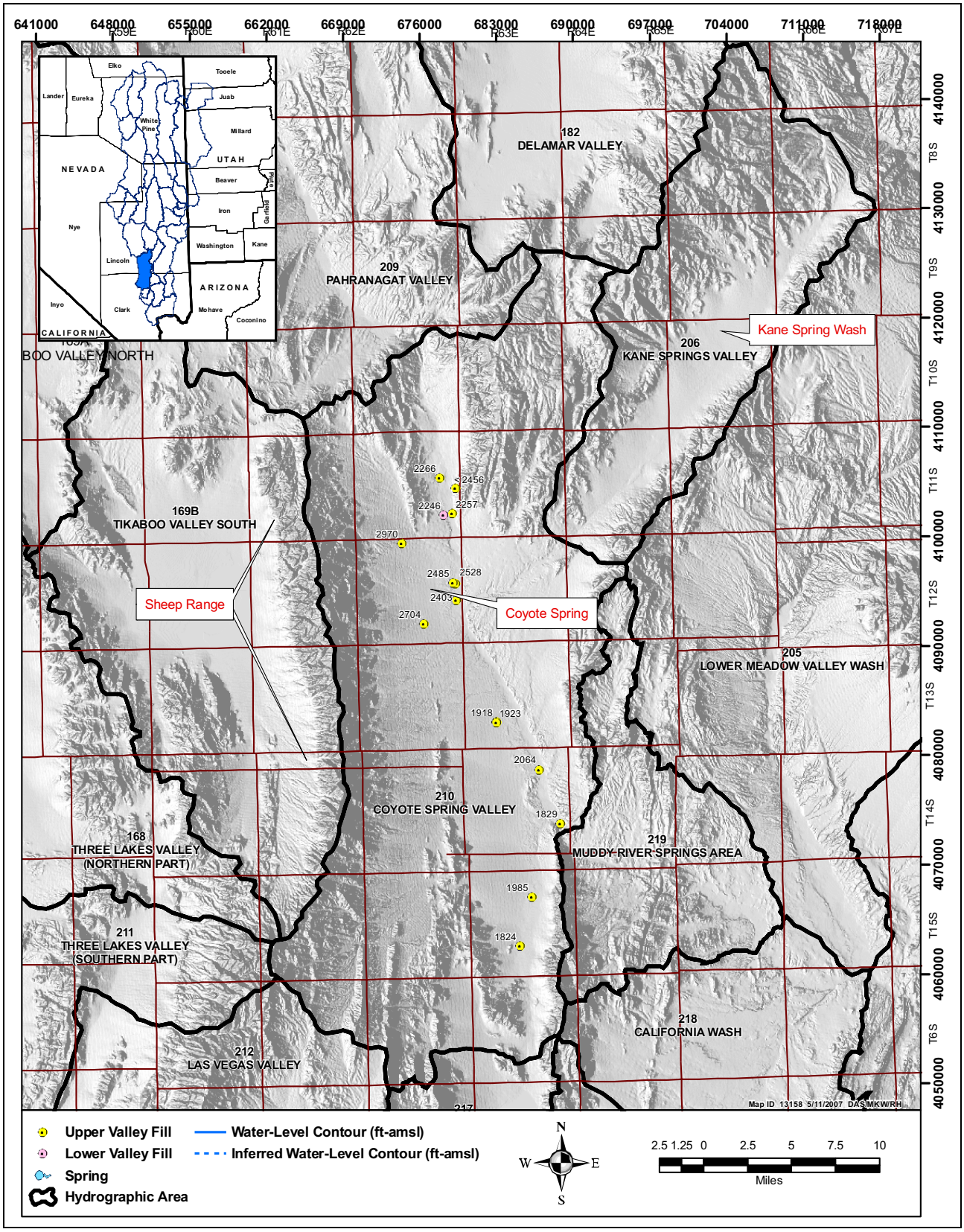

Figure 5-18
Coyote Spring Valley Water-Level Elevation Map

2,300 ft-amsl in the northern portion of the valley to approximately 1,800 ft-amsl in the southeast portion of the valley. This suggests that a general southeastward groundwater gradient off of the Sheep Range into the Muddy River Springs hydrographic area exists in the valley (Figure 5-18). The higher water-level elevations for the wells that are near Coyote Spring are likely the result of either inflow into Coyote Spring Valley from Kane Springs Valley or the result of the semi-perched water-bearing zone identified by Eakin (1964). Current data are not sufficient to generate water-level elevation contours for the basin-fill aquifer system.

Inspection of the driller's logs for the basin-fill wells in Coyote Spring Valley show typical alluvial materials including sandy clays, gravel-boulders, and sands and gravels.

Carbonate Aquifer

Water-level elevations for wells penetrating the carbonate aquifer range from approximately 2,200 ft-amsl in the northern portion of the valley to approximately 1,800 ft-amsl near the hydrographic divide with the Muddy River Springs Area. These water-level elevations suggest that a north-to-south hydraulic gradient generally coincident with Pahranagat Wash exists in the regional carbonate aquifer in this area. Water-level gradients in the carbonate aquifer become very flat near the center of the valley and extending southeast to the Muddy River Springs Area (Figure 5-1).

Water-Level Trends

Water levels for wells completed in the carbonate aquifer in the east-central part of Coyote Spring Valley near the Muddy River Springs Area declined approximately 1.5 to 2.5 ft beginning in early 1999. For example, Figures 5-19 and 5-20, for wells CE-VF-2 and USGS-MX CE-DT-4, respectively, show that water-level elevations declined approximately 1.5 to 2.5 ft. These declining water-level elevations have been interpreted to be the result of climatic factors (i.e., the regional drought starting in 1999) or pumping from the carbonate aquifer at the Arrow Canyon well in the Muddy Rivers Springs Area (Smith et al., 2004). It can be seen from the figures, however, that a recovery of the water-level elevations began in late 2004 and early 2005. Inspection of the hydrographs for wells 210 S10 E62 25AD 1 CSVM-3, 210 S13 E63 11BC 1 CSVM-6, and 210 S13 E63 26AAAA1 USGS-MX CE-DT-5 found in Volume 4 reveals a similar water-level increase for the wells beginning in late 2004. Several of the hydrographs shown in Volume 4 for Coyote Spring Valley, however, have shown an observable decline in water-level elevations beginning in early-to-mid 2006 including 210 S13 E63 11BC 1 CSVM-6, 210 S13 E63 25AD 1 CSVM-1, and 210 S15 E63 03BB 1 CSVM-2.

Piezometers in the east-central portion of the valley (i.e., CE-VF-1 and CE-VF-2) indicate that the basin-fill aquifer has water levels approximately 61 ft higher than the potentiometric water level in the underlying carbonate aquifer (downward gradient), at least for the east-central part of the valley.

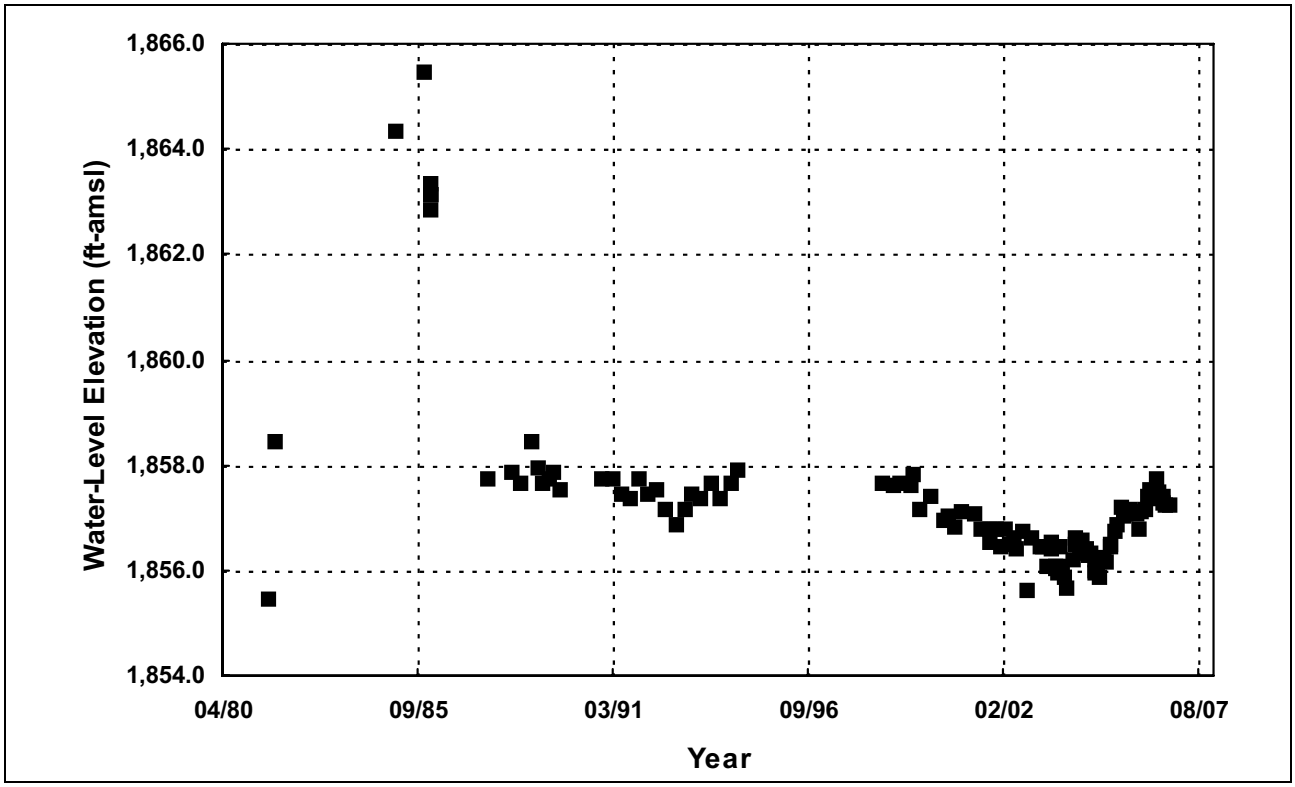

Figure 5-19
Historical Water-Level Elevations at 210 S12 E63 29DABC1 USGS-MX CE-VF-2

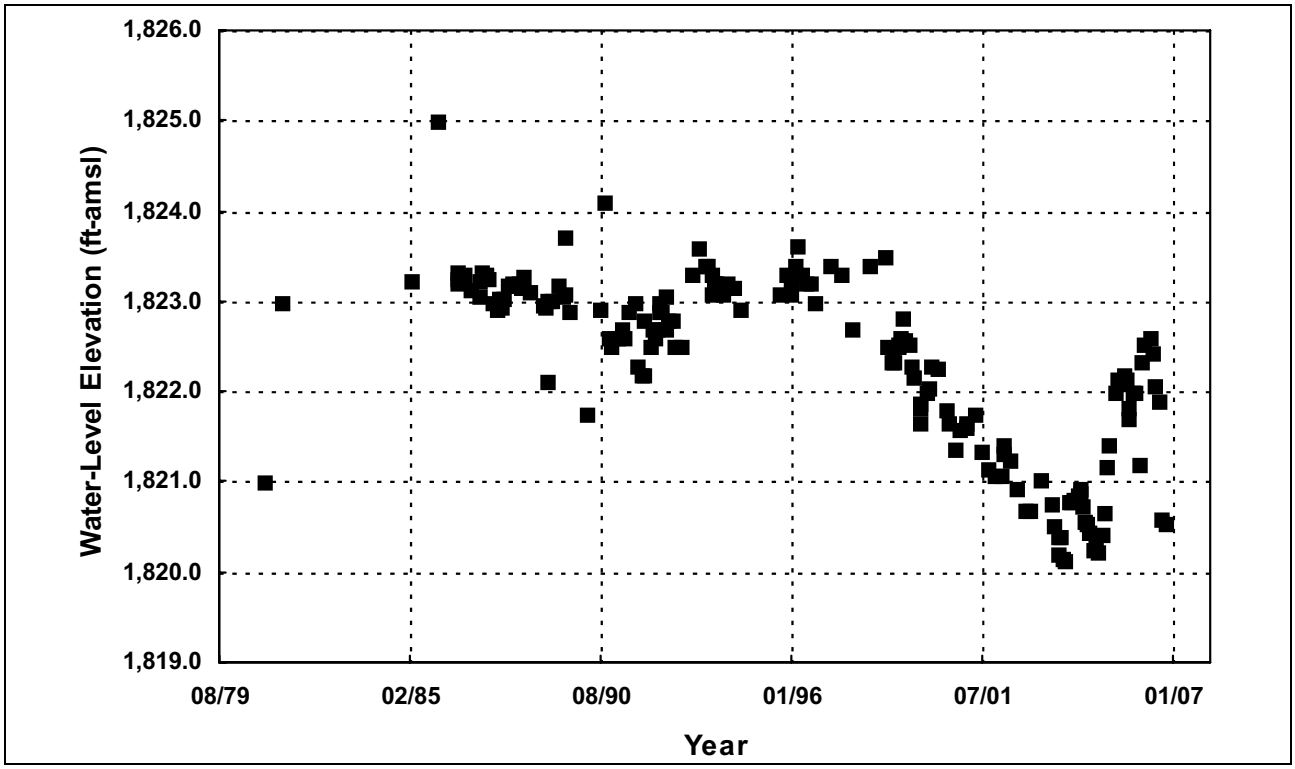

Figure 5-20
Historical Water-Level Elevations at 210 S13 E63 23DDDC1 USGS-MX CE-DT-4