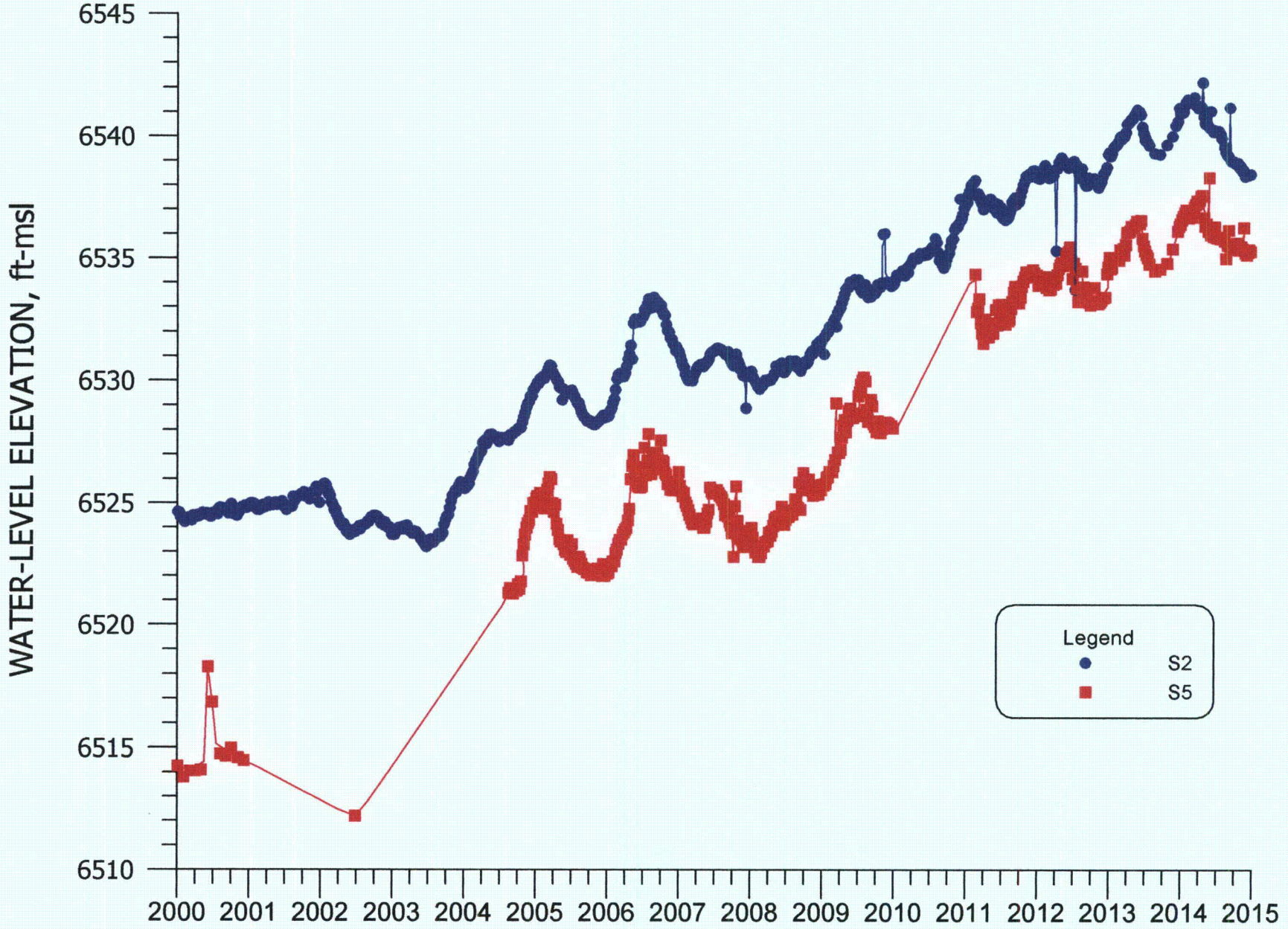


**FIGURE 4.2-5. WATER-LEVEL ELEVATION FOR WELLS S2 AND S5**

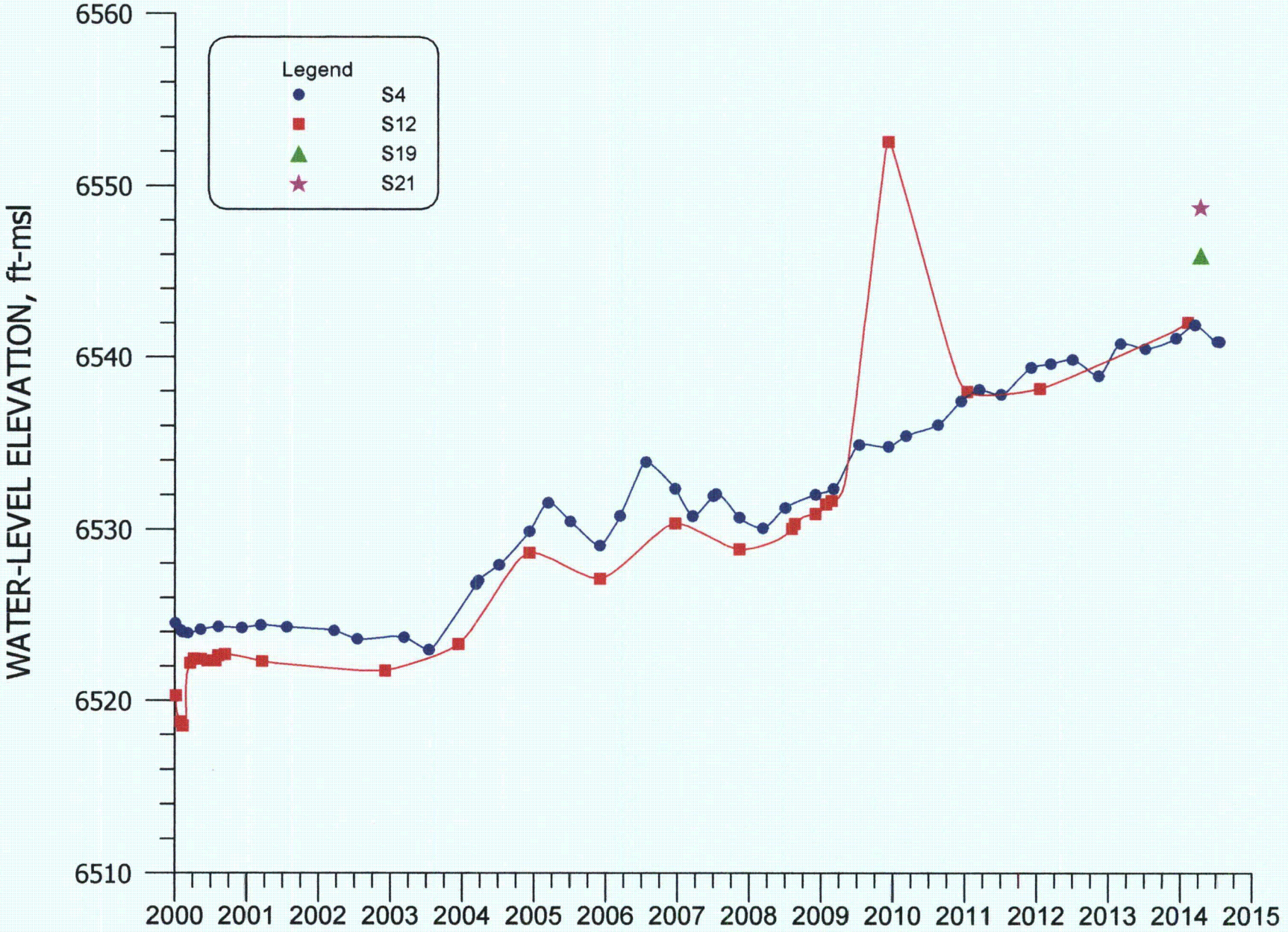


**FIGURE 4.2-6. WATER-LEVEL ELEVATION FOR WELLS S4, S12, S19, AND S21**

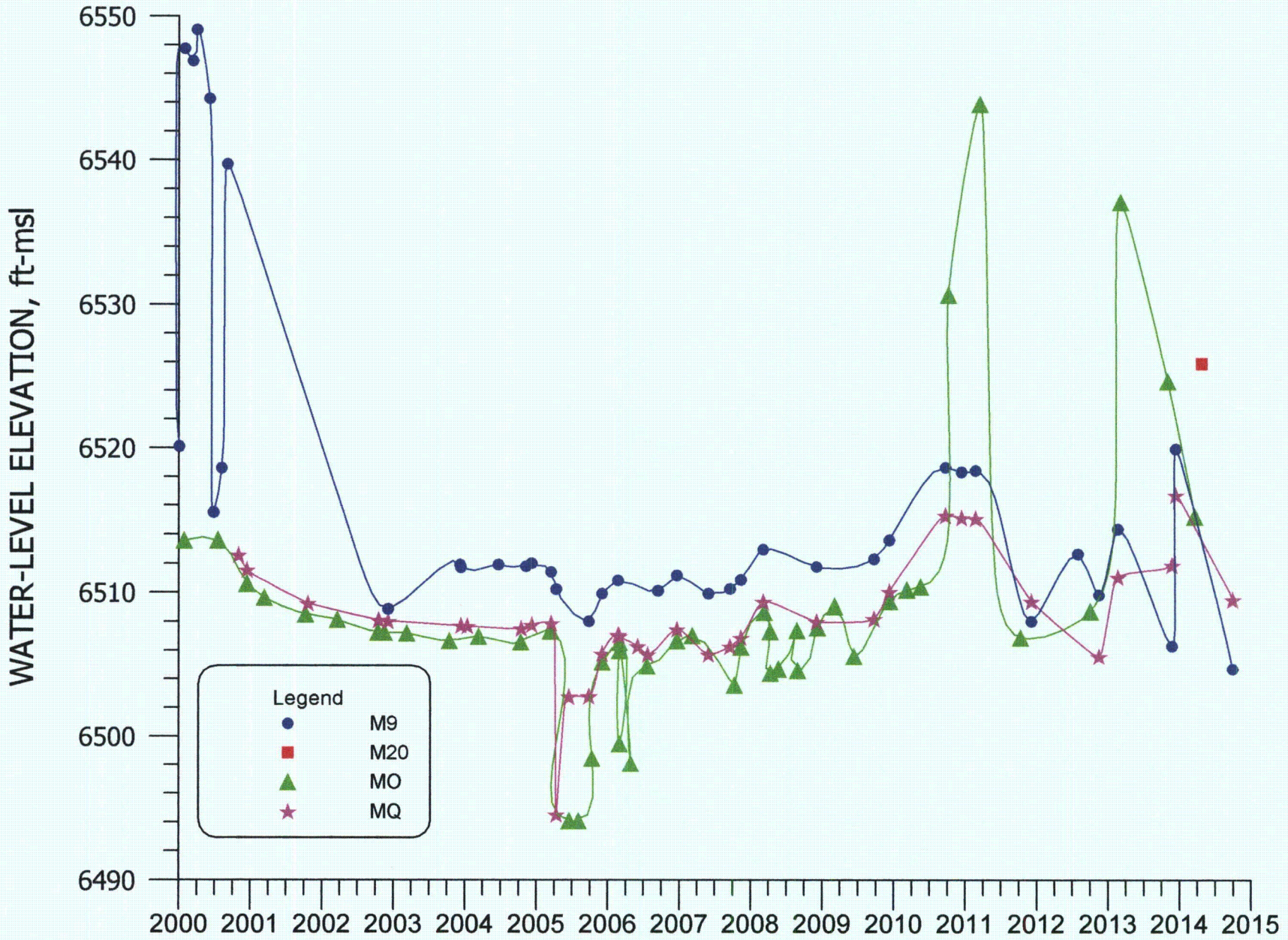


**FIGURE 4.2-7. WATER-LEVEL ELEVATION FOR WELLS M9, M20, MO, AND MQ**

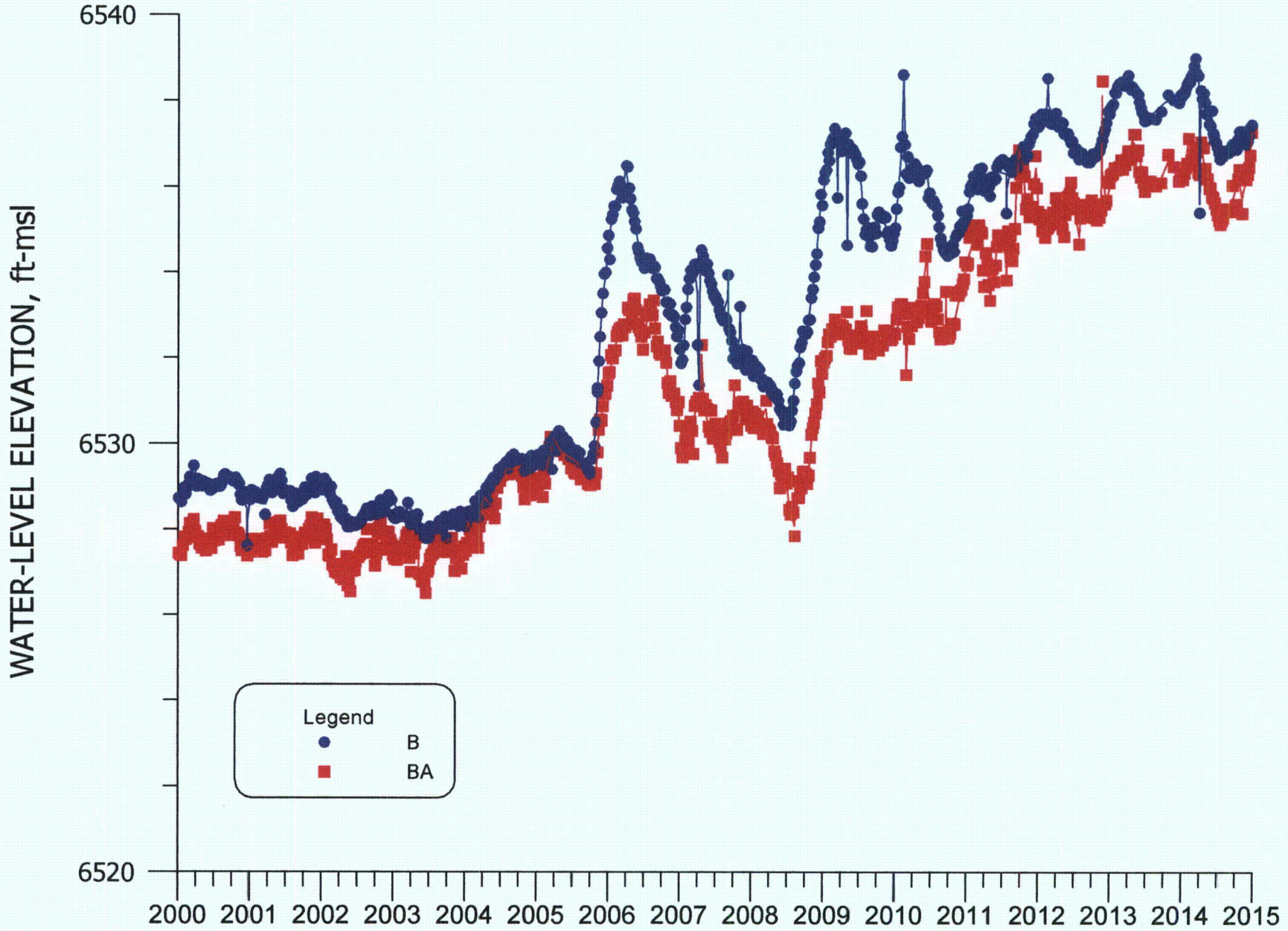


**FIGURE 4.2-8. WATER-LEVEL ELEVATION FOR WELLS B AND BA**

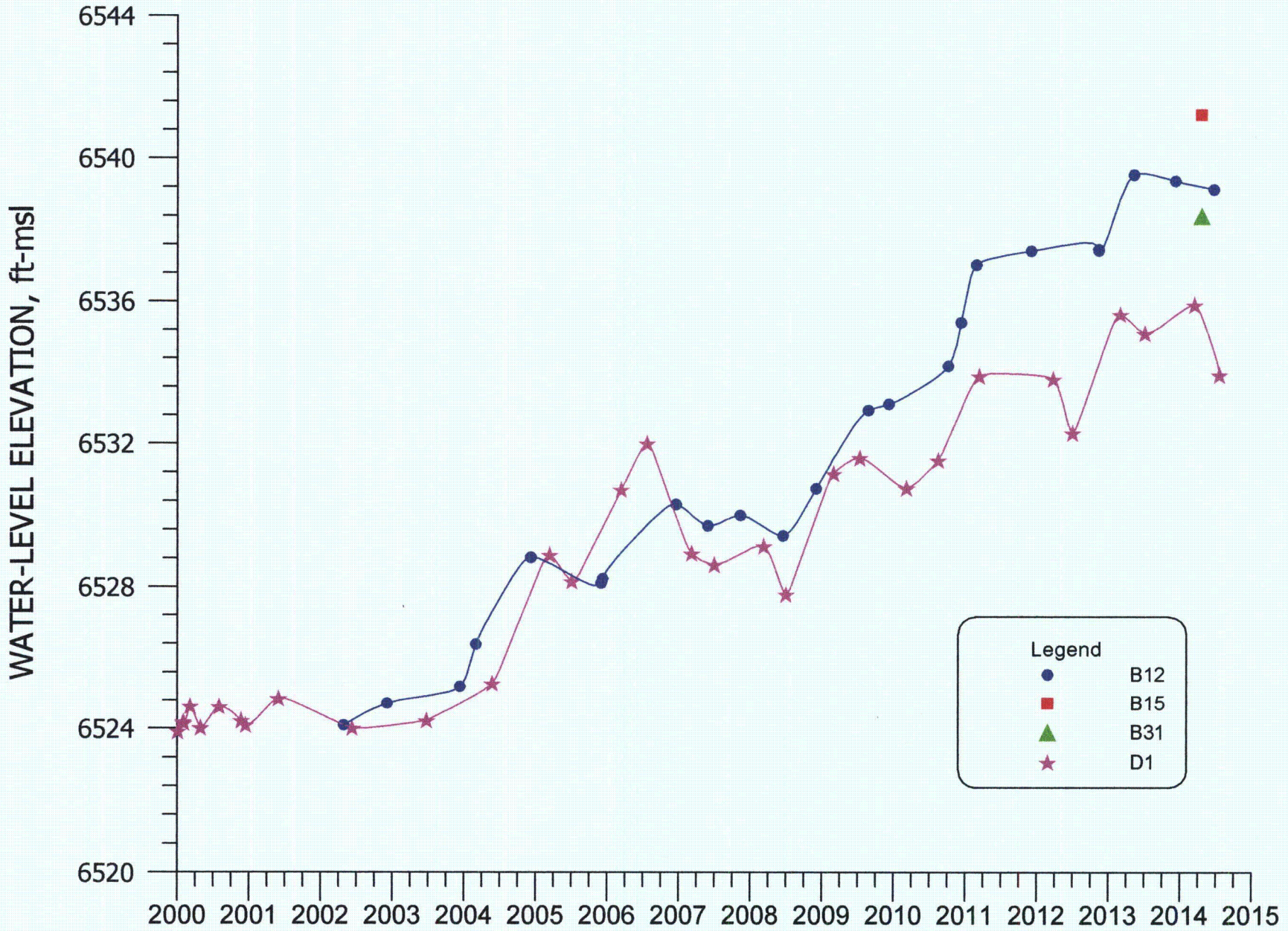


**FIGURE 4.2-9. WATER-LEVEL ELEVATION FOR WELLS B12, B15, B31, AND D1**

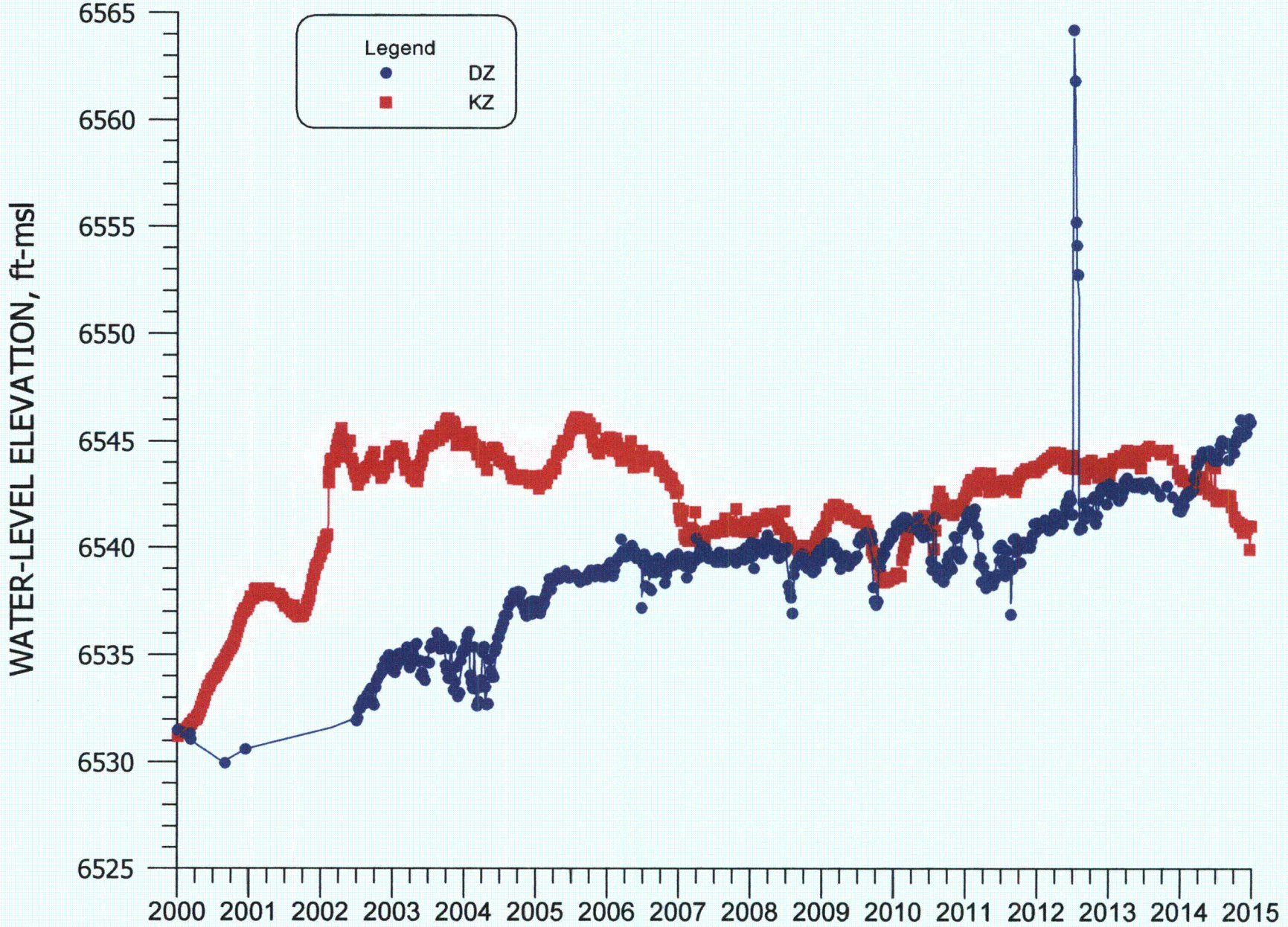


**FIGURE 4.2-10. WATER-LEVEL ELEVATION FOR WELLS DZ AND KZ**

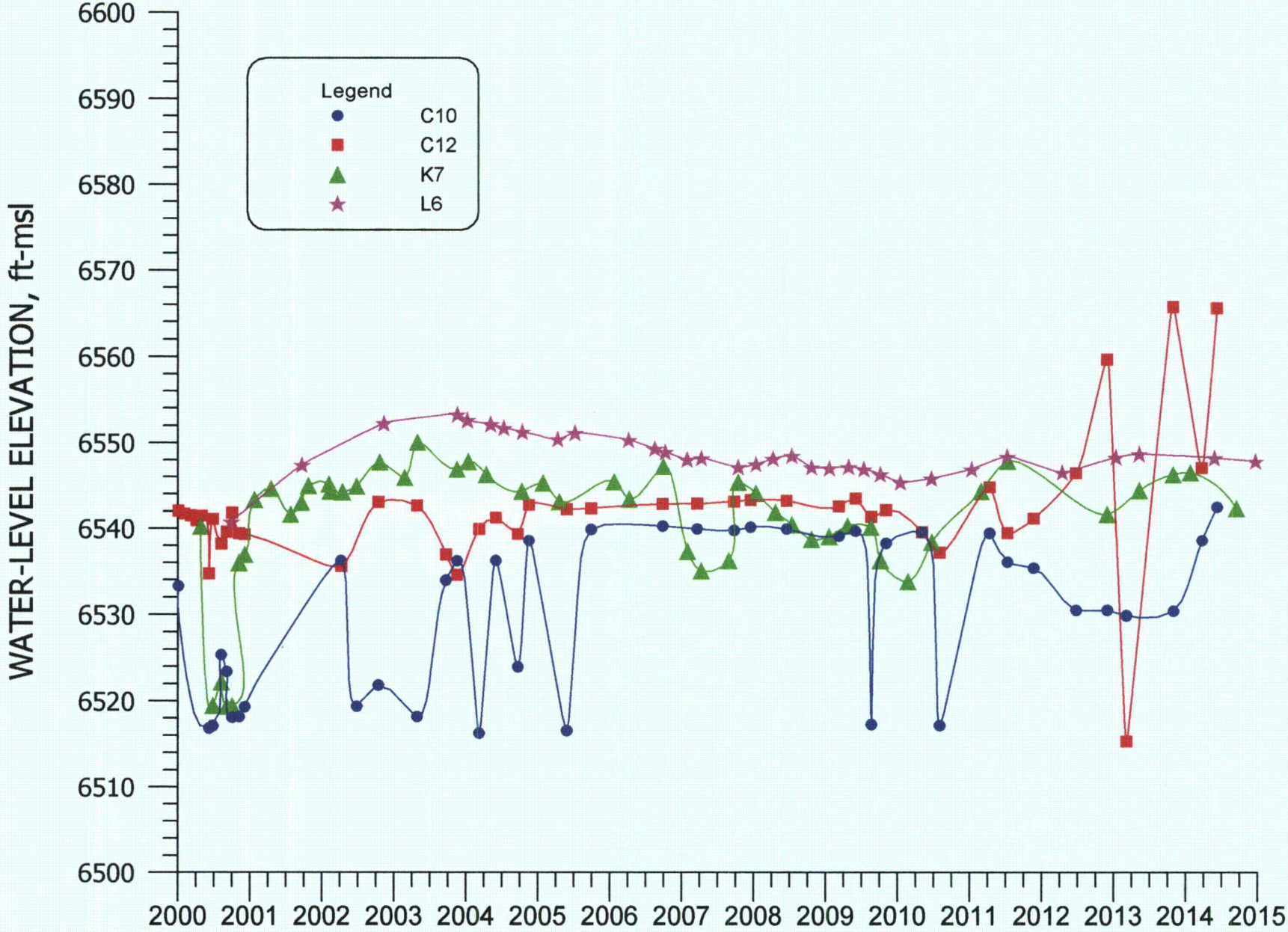


**FIGURE 4.2-11. WATER-LEVEL ELEVATION FOR WELLS C10, C12, K7, AND L6**

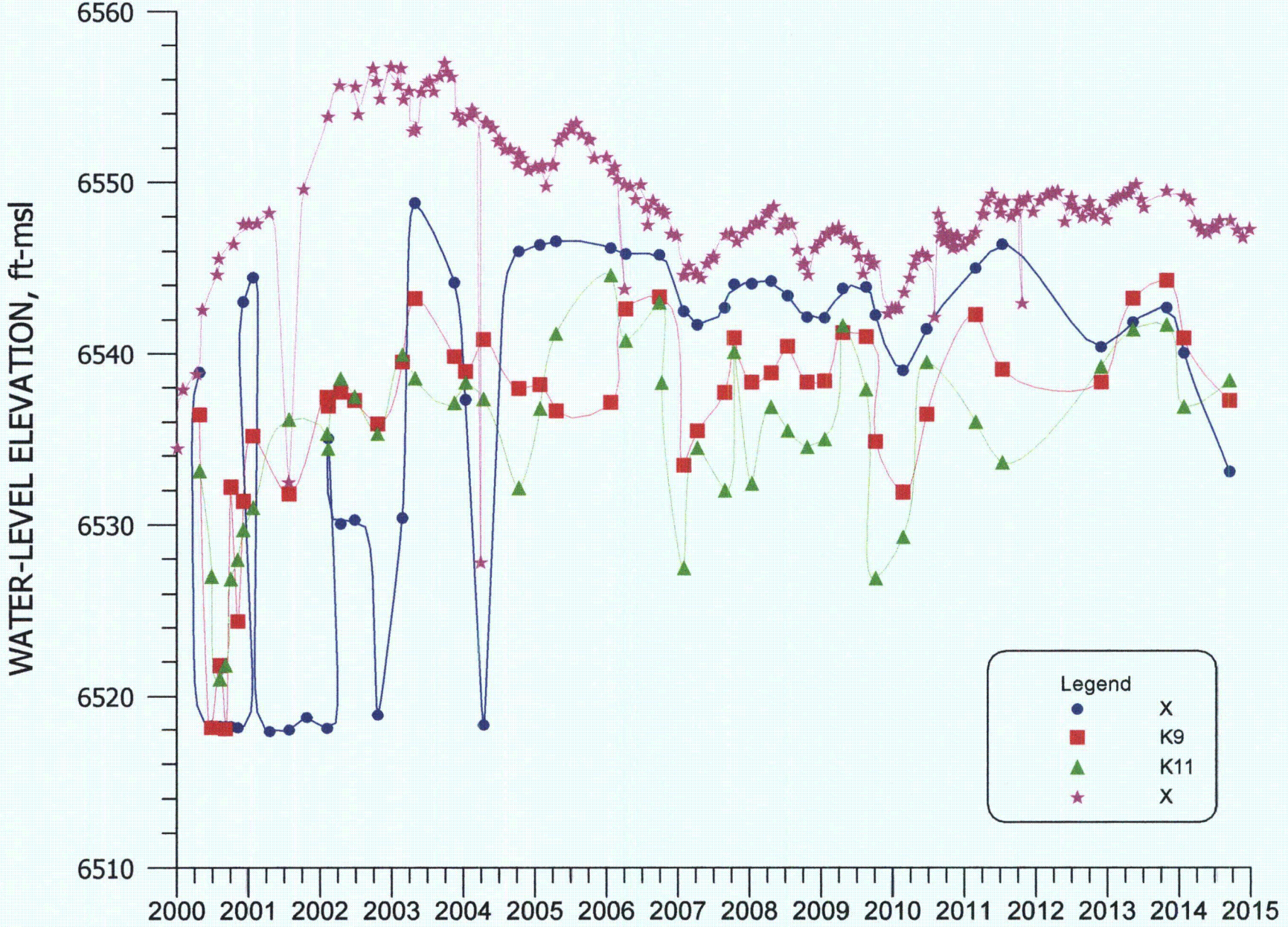


**FIGURE 4.2-12. WATER-LEVEL ELEVATION FOR WELLS K8, K9, K11, AND X**

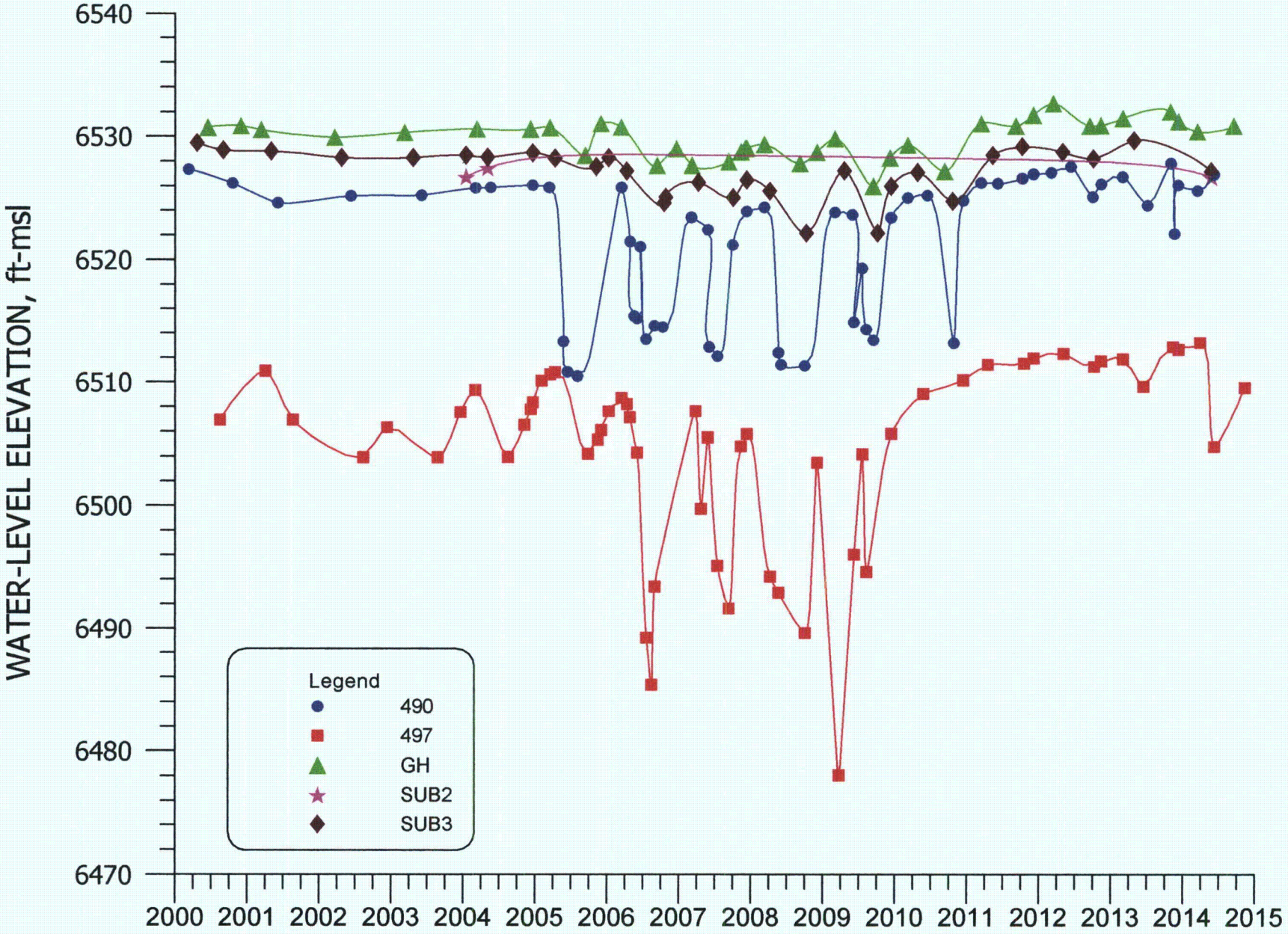


**FIGURE 4.2-13. WATER-LEVEL ELEVATION FOR WELLS 490, 497, GH, SUB2, AND SUB3**

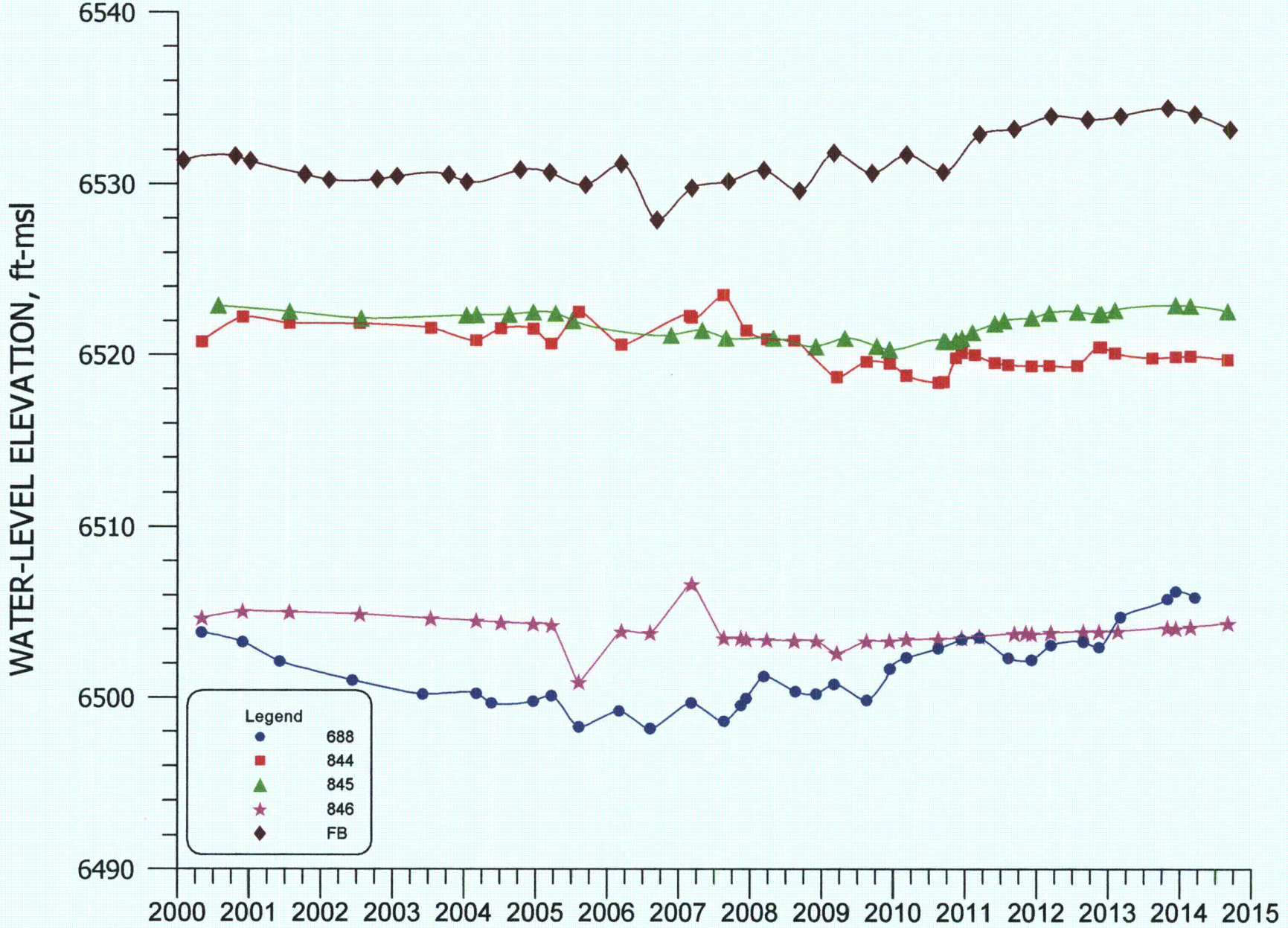


**FIGURE 4.2-14. WATER-LEVEL ELEVATION FOR WELLS 688, 844, 845, 846, AND FB**

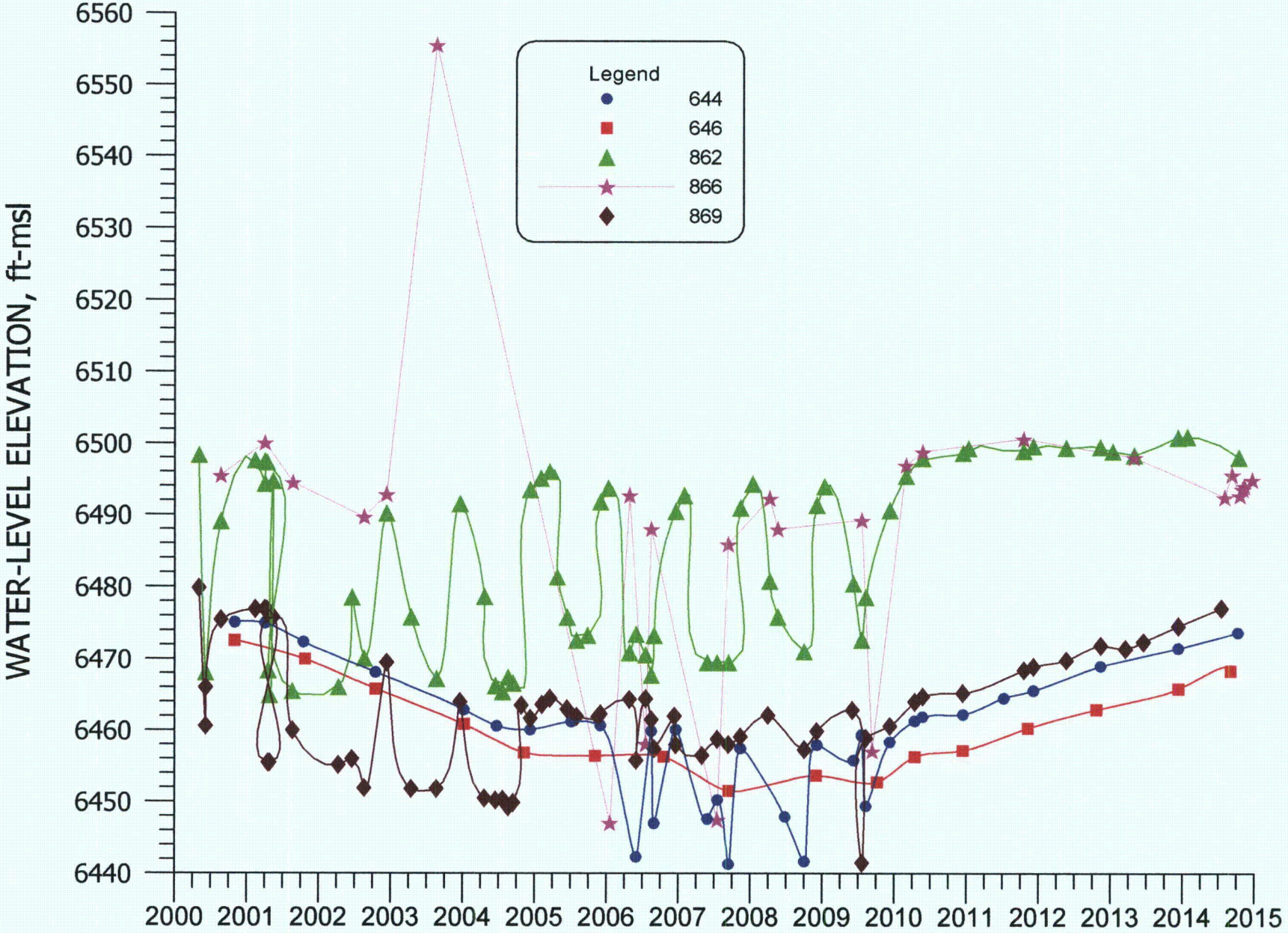


**FIGURE 4.2-15. WATER-LEVEL ELEVATION FOR WELLS 644, 646, 862, 866, AND 869**

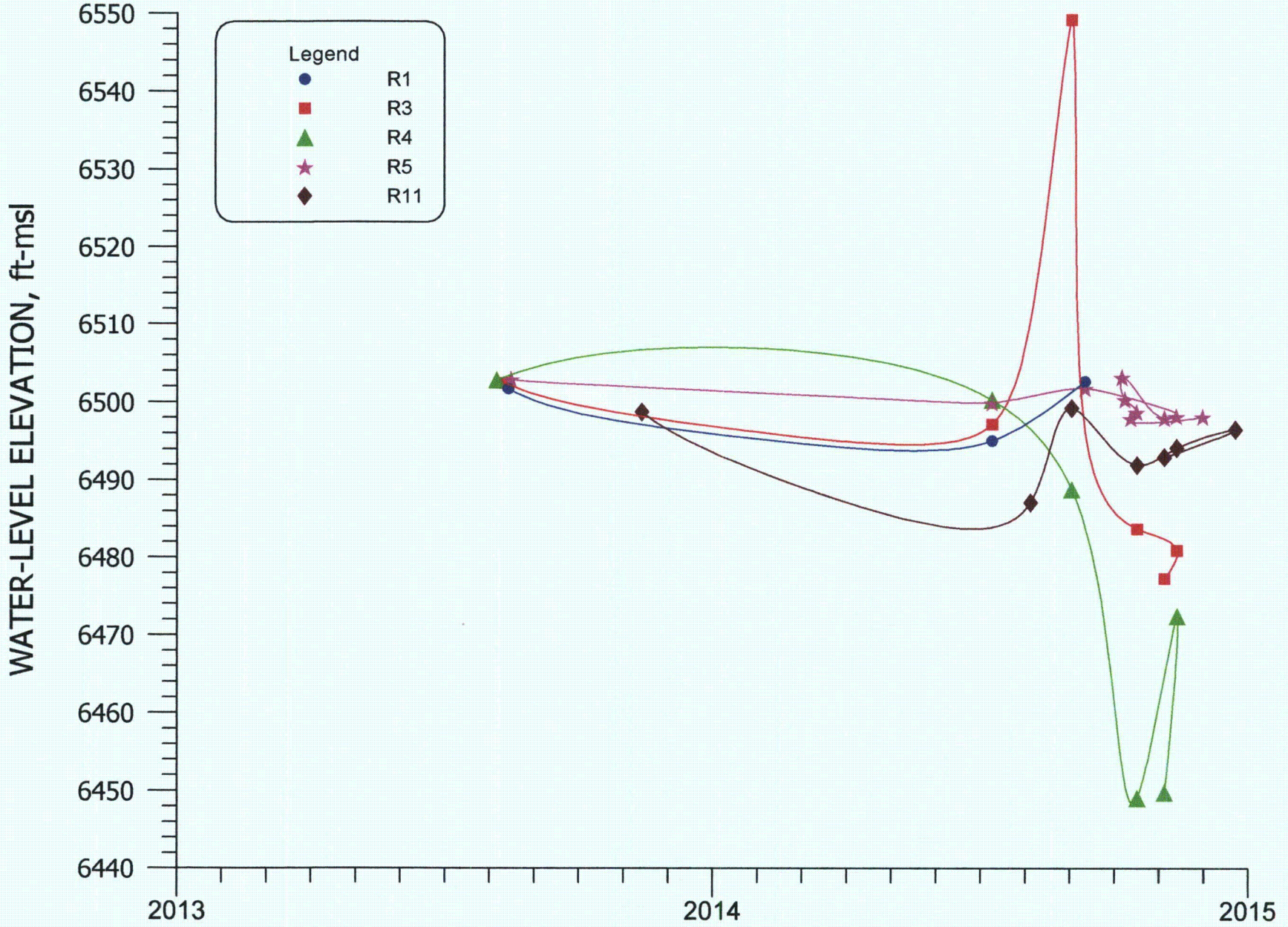


**FIGURE 4.2-15A. WATER-LEVEL ELEVATION FOR WELLS R1, R3, R4, R5, AND R11**

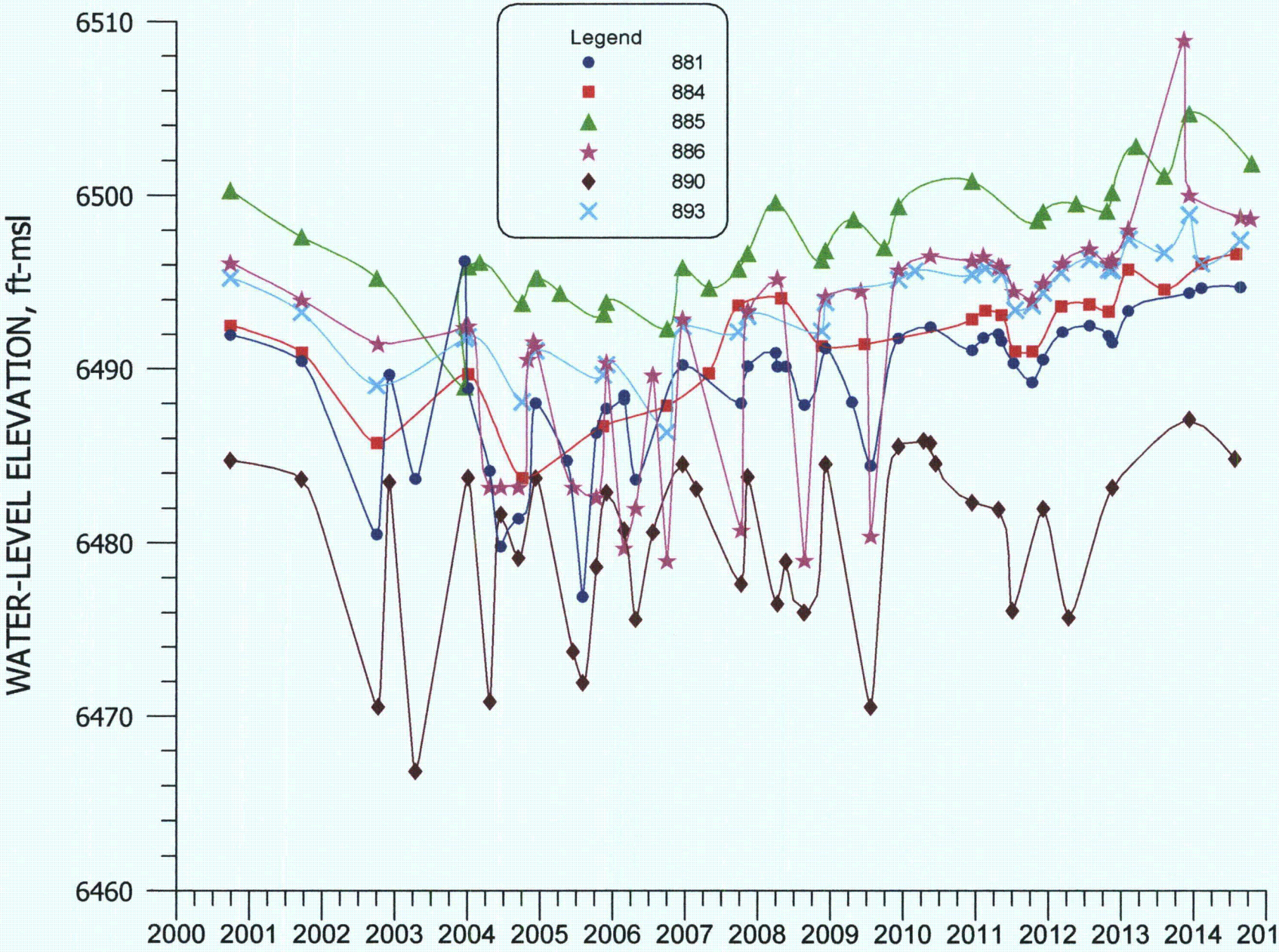


**FIGURE 4.2-16. WATER-LEVEL ELEVATION FOR WELLS 881, 884, 885, 886, 890, AND 893**

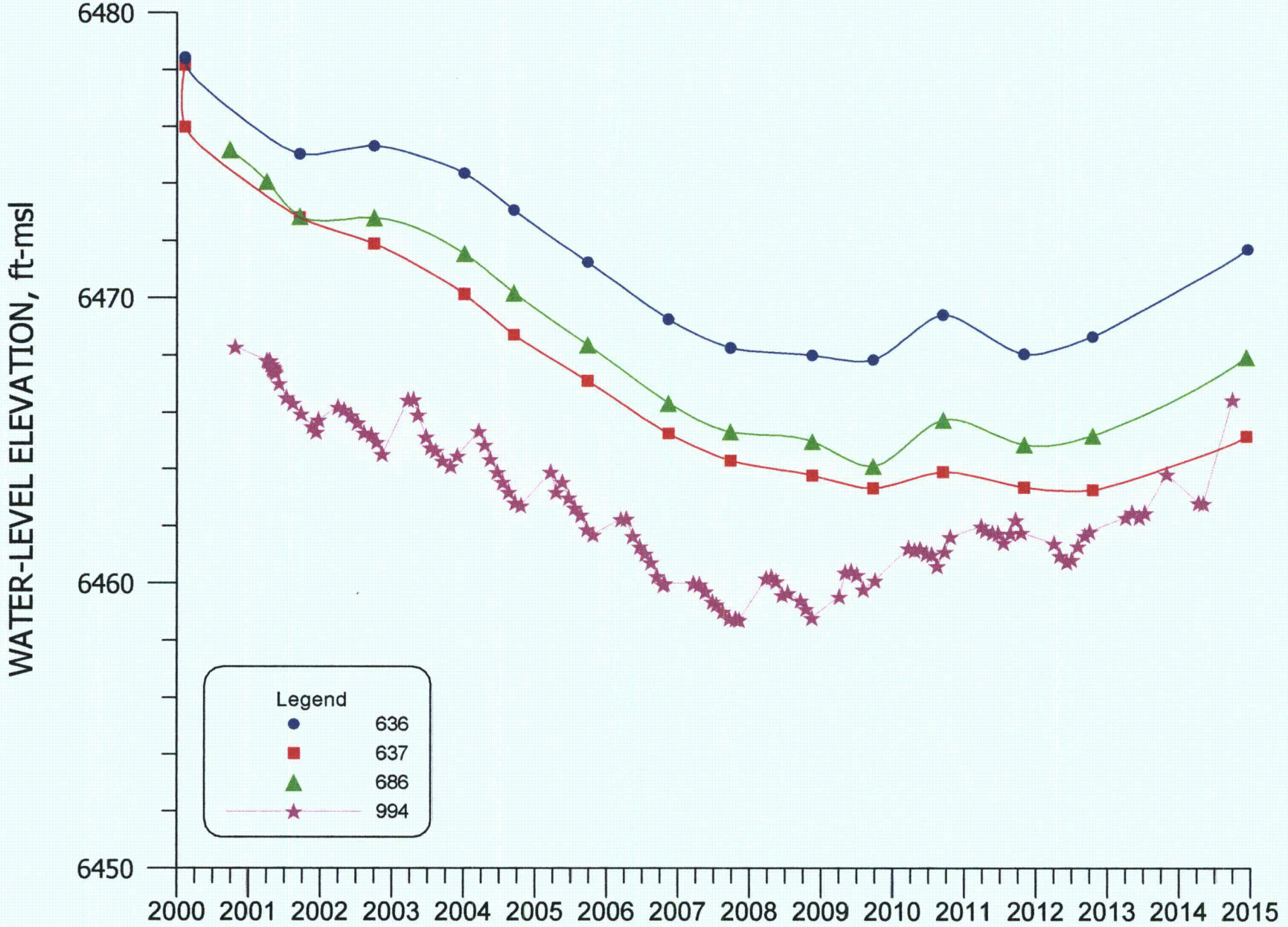


**FIGURE 4.2-17. WATER-LEVEL ELEVATION FOR WELLS 636, 637, 686, AND 994**

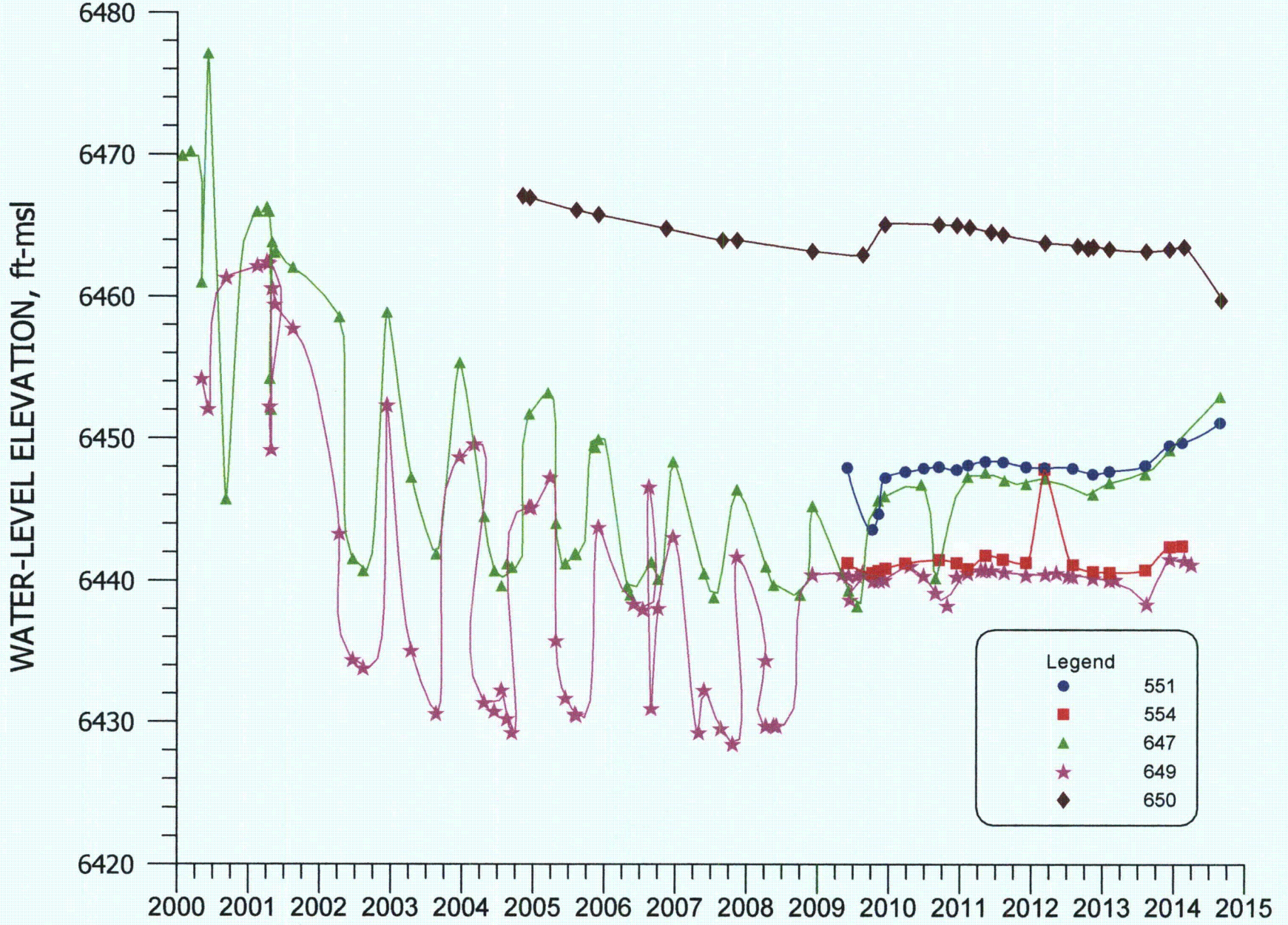


**FIGURE 4.2-18. WATER-LEVEL ELEVATION FOR WELLS 551, 554, 647, 649, AND 650**

## 4.3 ALLUVIAL WATER QUALITY

This section presents the 2014 water-quality data for the alluvial aquifer. The major general water quality constituents that are typically measured at this site are sulfate, chloride and TDS. Sulfate concentrations are used as the primary indicator where contaminant remediation remains to be completed. Selenium, uranium and molybdenum are the primary metals of concern at this site. Nitrate, radium, chromium, vanadium and thorium are also discussed in the monitoring report, but these constituents are of only minor concern at the Grants site. Tables B.4-1 through B.4-6 in Appendix B present the 2014 alluvial water-quality data for each well. The most recent monitoring values were used for the iso-concentration contour figures presented in this section.

Colored patterns are used on the figures to delineate where concentration limits exceed the NRC site standards for each of the constituents. The standard is presented in the legend of the respective figure for each parameter. A greater than sign was added in front of the numeric value to note that the pattern shows where the standard is exceeded.

### 4.3.1 SULFATE - ALLUVIAL

Sulfate has been used as the primary indicator constituent for this site, because concentrations are large in the tailings solution. Concentrations of sulfate in the alluvial aquifer for 2014 are presented on Figure 4.3-1. Upgradient background well concentrations observed in 2014 ranged from 312 to 1730 mg/l. An updated statistical evaluation of the background sulfate concentration with data for a ten year period (1995 – 2004) showed that concentrations as great as 1500 mg/l could occur naturally at this site and is, therefore, the site standard. Areas where sulfate concentrations exceed 1500 mg/l are shown with a green pattern on Figure 4.3-1. This figure shows the locations of three areas where the uranium concentrations are also posted for the On-Site (OS), the South Off-Site (SOS) and the North Off-Site (NOS) areas respectively in Figures 4.3-1A, 4.3-1B and 4.3-1C. As shown on Figures 4.3-1A, sulfate concentration in most wells on the north, east and south sides of the LTP exceeds 5,000 mg/l. The observed sulfate concentrations in the four adjacent subdivisions were less than the site standard of 1500 mg/l in 2014 except for one well in Felice Acres and two wells in Section 34. Sulfate concentrations were fairly stable in Section 3 in 2014 and a presented in Figure 4.3-1B. Sulfate concentrations exceeded 1000 mg/l in the southwest portion of Murray Acres, southern Pleasant Valley Estates,

eastern Valle Verde and to the southeast of Valle Verde. Sulfate concentrations also exceeded 1000 mg/l just north of Pleasant Valley in the northern portion of Section 27 and into the eastern edge of Section 28 (see Figure 4.3-1C). Down-gradient of the Grants Project site, the sulfate concentrations are all within the natural range of background except for the two wells south of Murray Acres and Pleasant Valley and one well in Felice Acres and, therefore, no water-quality restoration with respect to sulfate is necessary beyond the immediate Grants Project area except for these three wells. These three wells need their concentration reduced to below 1500 mg/l.

Plots of constituent concentrations versus time have been prepared for the alluvial aquifer for sulfate, TDS, chloride, uranium, selenium, molybdenum and nitrate. The groupings of wells used for these plots are shown on Figure 4.3-2. The figure numbers for each of the well groupings that correspond with the sulfate concentration versus time plots are indicated. The color and symbol used for each well are the same as those used in the time plots for each constituent. Figure numbers for the time plots of other constituents are not shown on this map; however, it is useful for the other time-concentration plots because the color, symbol and well groupings are consistent.

Figure 4.3-3 presents sulfate concentrations plotted versus time for near up-gradient background wells DD, DD2, P and P4. A gradual increase occurred in the up-gradient well DD in the 2008 through 2012 values compared to previous recent concentrations while the 2013 and 2014 concentrations were steady. Fairly steady sulfate concentrations were observed in wells DD2 and P during 2014. The historical values for these wells show similar periods of short term increasing and decreasing trends in the alluvial aquifer. The changes in sulfate concentration in these wells are well within the range previously observed for sulfate in the up-gradient wells. Some of these increases could be due to the influx of ground water with higher sulfate concentrations into this area up-gradient of Homestake's background wells.

Sulfate concentrations immediately west of the LTP in alluvial wells S2, S4, S12 and SM were fairly steady in 2014 (see Figure 4.3-4). The sulfate concentrations for well S2 decreased in 2010 through 2012 and were steady in 2013 and 2014. A larger decrease in sulfate in well SM near the edge of the LTP was observed in 2004 through 2010 and then steady concentrations. Overall steady values have been observed in wells S4 and S12 for a longer period of time.

Figure 4.3-5 presents sulfate concentrations plotted versus time for alluvial wells M9, M28, MO and MQ situated further west of the LTP. Sulfate concentrations were fairly stable in alluvial wells MO and MQ in 2014. Values were variable but overall increased in well M9.

Figure 4.3-6 presents sulfate concentration versus time plots for alluvial wells B12, D1, S28 and S38. Small sulfate concentration increases in wells D1 and B12 were observed in 2014. Lower concentrations are shown for new wells S28 and S38.

Figure 4.3-7 presents time plots of sulfate concentrations for wells B15, B31, T2, T4 and T12. The sulfate concentrations in wells T4 and T12 were fairly steady during 2014. A small sulfate concentration increase was observed in collection well T2 in 2014 while sulfate concentrations in two new wells B15 and B31 are higher.

Figure 4.3-8 presents plots of sulfate concentrations versus time for alluvial wells on the west side of the STP. Sulfate concentration decreased in wells C8 and C10 in 2014. The variations observed in these two wells indicate that the restoration front is near these two wells. A small increase was measured in well C12 while steady values existed in well C6.

Figure 4.3-9 presents sulfate concentrations versus time for alluvial wells on the STP and the south side of the STP. Sulfate concentrations in these wells were all small in 2014 with small variations. Some of these small changes in sulfate concentrations are due to the switching to fresh water injection in this area in place of the R.O. product injection. R.O. product water injection had reduced sulfate concentrations in these wells to very low levels over the previous years.

Figure 4.3-10 shows the sulfate concentrations for the STP collection wells 1U, K4, K5, K7 and K8. Fairly steady sulfate concentrations were observed in these wells during 2014.

Time plots of sulfate concentrations in collection wells located southeast of the STP are presented on Figure 4.3-11. This figure shows reasonably steady sulfate concentrations in 2014 in wells 522, L, L6, L8, L9 and L10 with a general very small increase in the sulfate concentration in this area.

Figure 4.3-12 presents sulfate concentration time plots for Broadview Acres alluvial wells SUB2 and SUB3 and alluvial wells F and GH north of Broadview Acres. Similar and steady concentrations were observed in these wells in 2014.

Figure 4.3-13 presents sulfate concentrations versus time for Felice Acres alluvial wells 490, 491, 496 and 497. The sulfate concentrations in these wells were fairly steady in 2014

except for an increasing concentration in well 491. Additional monitoring with time is needed to determine the significance of the increase in concentrations in well 491.

Figure 4.3-14 contains time plots of sulfate concentrations for Murray Acres and Pleasant Valley Estates alluvial wells 688, 802, 844, 845, 846 and FB. This plot shows that sulfate concentrations in water taken from alluvial wells 844 and 846 became fairly steady in 2014 while a gradual decline was observed in well 845. Concentrations were fairly steady in alluvial wells 688, 802 and FB during 2014.

Figure 4.3-15 presents the sulfate concentration time plots for six wells in Section 3 (see Figure 4.3-2 for the location of these wells). Sulfate concentrations in each of these Section 3 alluvial wells have been fairly steady over the last several years except for the higher value from well 862 which is thought to be a lab error due to the lack of change in the TDS concentration. Figure 4.3-15A presents the sulfate concentration time plots for six new R collection wells in the northeast corner of Section 3 near wells 866, 862 and 540 (see Figure 4.3-2 for the location of these wells). Collection and fresh water injection in the R wells was started in July of 2014. This plot shows that the sulfate concentration in these collection wells did not change much due to the fresh water injection sulfate concentration being very similar.

The sulfate concentrations in water from six wells near the Section 28 center pivot irrigation system are presented on Figure 4.3-16. The decline in sulfate concentrations that occurred in monitoring well 884 during 2005 and 2006 was due to the movement of fresh water that was injected in Section 28. Sulfate concentrations well 884 were slightly higher in 2011 through 2014. A sulfate decline continued in well 886 in 2009 but increased in 2011 and 2012 and then declined in 2013 prior to a small increase in 2014. Sulfate concentrations were steady in well 881 in 2014. These small changes could be due to ceasing irrigation in this area.

Figure 4.3-17 presents sulfate concentrations with time for four wells located to the northwest and southwest of the Section 28 irrigation area. The sulfate concentrations in three Rio San Jose alluvial wells on the southern side of Section 20 and one alluvial well located on the north side of Section 32 are presented in this figure. Concentrations in these wells were fairly steady during 2014.

The time variations of sulfate concentrations in water sampled from five wells in Section 33 Center Pivot area are plotted on Figure 4.3-18. Sulfate concentrations in each of these wells were fairly steady in 2014. A gradual increase has been observed from well 551 in

the center of the Section 33 pivot. This could be due to a small effect from the past Section 33 irrigation but is well within the natural variations that have been observed for this area.

### 4.3.2 TOTAL DISSOLVED SOLIDS - ALLUVIAL

Total dissolved solids (TDS) concentration contours for the alluvial aquifer during 2014 are presented on Figures 4.3-19, 4.3-19A, 4.3-19B and 4.3-19C. The alluvial background TDS concentrations measured up-gradient of the LTP in 2014 varied from 707 to 3030 mg/l. Based on an updated statistical analysis, TDS concentration must exceed 2734 mg/l before it is considered elevated beyond the naturally occurring range. A light green pattern is shown on Figures 4.3-19, 4.3-19A, 4.3-19B and 4.3-19C to indicate where the TDS concentrations exceed the 2734 mg/l site background standard. None of the observed concentrations in the west half of Figure 4.3-19 exceed this level. The TDS concentrations near the tailings exceed 2734 mg/l for a distance of approximately 500 feet to the west of the LTP. A significant portion of the alluvial aquifer underlying the Large Tailings area exceeds 10,000 mg/l (see Figure 4.3-19A). A zone of 2000 mg/l or greater TDS concentration extends to the west of the LTP into the western portion of Section 28 (see Figure 4.3-19C). Additional areas of TDS concentrations greater than 2000 mg/l exists in the southern portion of Pleasant Valley Estates, the southern portion of Murray Acres, the eastern portion of Valle Verde and to the south and southwest of this area (see Figure 4.3-19). The only other areas of TDS concentrations above 2000 mg/l are two small areas in Felice Acres and one in Section 3. Only the areas closely proximal to the two tailings piles and a small area west of the Large Tailings and areas east of Valle Verde and south of the Murray Acres require ground water quality restoration to meet the site TDS background standard.

TDS-time concentration plots were developed for the same grouping of wells as those prepared for sulfate (see Figure 4.3-2 for groupings of wells with TDS plots). Figure 4.3-20 presents the TDS concentrations versus time for the up-gradient wells. TDS concentrations were steady in well DD in 2013 and 2014 after gradually increasing the previous few years. TDS concentrations in the remainder of the upgradient wells remained fairly steady in 2013.

Figure 4.3-21 presents TDS concentrations plotted versus time for wells S2, S4, S12 and SM. This plot shows steady concentrations in 2014 for these wells.

TDS concentrations were relatively stable in water collected from wells MO and MQ during 2014 (see Figure 4.3-22). Variable concentrations were observed in 2014 in well M9. The value measured for new well M28 is very similar to the value in well MO.

TDS concentrations in water sampled from wells B12, D1, S28 and S38 are presented in Figure 4.3-23. TDS concentrations increased in 2014 in well D1 and have been variable in recent years in well B12. Slightly smaller concentrations were observed in new wells S28 and S38 in 2014.

Figure 4.3-24 presents TDS concentrations for wells B15, B31, T2, T4 and T12. Fairly steady concentrations were observed in wells T2, T4 and T12 in 2014, while higher concentrations were measured in two new wells on the south side of the LTP.

Figure 4.3-25 presents time concentration plots for wells C6, C8 and C10 on the west side of the STP and well C12 on the north side of the STP. The concentrations in wells C8, C10 and C12 were variable in 2014 while the values in well C6 were fairly steady.

TDS concentrations versus time for three well on the STP and one well just south of the STP are presented in Figure 4.3-26. This figure shows continued low and slightly variable concentrations in 2014. Previous recent increases are thought to be due to changing from RO product to fresh water injection near these wells.

Figure 4.3-27 presents plots of TDS concentrations for four wells on the south side of the No. 1 Evaporation Pond and on top of the STP and one well to the east of the STP. Samples from these alluvial wells were steady in 2014 except for a decline in well 1U.

TDS concentrations in water taken from the L line of wells are presented in Figure 4.3-28. TDS concentrations generally show a very gradual increase in 2014 in these L wells and in well 522.

Figure 4.3-29 presents the TDS concentrations versus time for two Broadview Acres wells and two wells north of Broadview Acres. This plot shows fairly steady TDS concentrations in 2014 in these wells.

The TDS concentrations in the Felice Acres alluvial wells 490, 491, 496 and 497 were overall steady in 2014 (see Figure 4.3-30) except for a higher concentrations in well 491.

TDS concentrations for the Murray Acres and Pleasant Valley Estates alluvial wells are presented in Figure 4.3-31. Steady TDS concentrations were observed in these wells in 2014 except for a gradual increase in well 844. The increases in TDS concentrations in recent years in

wells 844 and 845 could be due to the flood irrigation in this area but are within the higher concentrations observed prior to irrigation in well 846.

Figure 4.3-32 presents time plots of TDS concentrations for five wells located in Section 3. Overall, TDS concentrations have been relatively steady over the last few years in these wells. Figure 4.3-32A presents time plots of TDS concentrations for five new R collection wells located in the northeast corner of Section 3. These TDS concentrations have been steady due to a very similar TDS that is being used for the fresh water injection adjacent to these collection wells.

TDS concentrations for the Section 28 monitoring wells were also fairly stable in 2014 (see Figure 4.3-33) but with small declines in wells 881, 884 and 886. The observed changes in these wells in 2013 and 2014 could be due to ceasing irrigation in Section 28 but could be due to freshwater injection proximal to these wells. The TDS in the freshwater injection source increased in 2012 due to the switch from San Andres well 951 to well 951R. The total change in the TDS due to the freshwater injection appears to have occurred in well 884 in 2006. Some of the TDS variations could be due to past irrigation in this area.

TDS concentrations in alluvial wells in Sections 20 and 32 adjacent areas are presented on Figure 4.3-34. TDS concentrations in these wells in 2014 were steady.

Figure 4.3-35 presents TDS concentrations in the Section 33 alluvial wells. This plot shows fairly steady concentrations in the Section 33 wells in 2014 with a small increase in wells 551 and 649. These concentrations are within the natural variations observed in this area but could be showing a very small effect from the past Section 33 irrigation.

### 4.3.3 CHLORIDE - ALLUVIAL

Chloride concentration is another important indicator of tailings seepage because of the conservative nature of this constituent and the fact that up-gradient concentrations are low. Chloride concentrations measured during 2014 in the alluvial aquifer near the tailings are presented on Figures 4.3-36, 4.3-36A, 4.3-36B and 4.3-36-C. Up-gradient chloride concentrations in the alluvial aquifer varied from 42 to 89 mg/l in 2014. The fresh-water injection systems have used water with chloride concentrations of approximately 200 mg/l, whereas the R.O. product chloride concentration is less than 10 mg/l. The alluvial aquifer around and underlying the Large and STPs contains chloride concentrations in excess of the

State drinking water standard of 250 mg/l (site standard). Measurement of chloride concentration in alluvial ground water is useful in defining areas where the R.O. product water has migrated in the alluvial aquifer. A light green pattern on Figures 4.3-36, 4.3-36A, 4.3-36B and 4.3-36-C is used to illustrate where concentrations exceed 250 mg/l. The limited areal extent of the green pattern on these figures show that the need for ground water-quality restoration with respect to chloride is limited to the immediate area of the tailings, two wells in eastern portion of Section 34, one well in Felice Acres and one well in Section 3. The chloride concentration in the well in Felice Acres exceeded 250 mg/l in 2014 and this value is not representative of chloride concentrations from this well. Chloride concentrations in the alluvial water in the western half of Figure 4.3-36 have not typically exceeded 250 mg/l. Chloride concentrations in two alluvial wells northeast of Pleasant Valley exceed the site standard in 2014 (see Figure 4.3-36A) while one value north of Pleasant Valley exceeds the site standard (see Figure 4.3-36C) but this value is thought to be an outlier.

Figure 4.3-37 presents chloride concentrations versus time for four up-gradient wells. Analysis of the data on this figure shows overall steady chloride concentrations in 2014 in these wells.

Figure 4.3-38 presents time plots of chloride concentration for wells S2, S4, S12 and SM. Fairly steady chloride levels were measured in these four wells in 2014.

Chloride concentrations in wells M9, M28, MO and MQ are presented in Figure 4.3-39. A higher value from well M9 in 2014 was measured similar to the higher value in 2013.

Plots of chloride concentration for wells B12, D1, S28 and S38 are presented on Figure 4.3-40. The chloride concentration in well D1 is similar to the fresh water injection concentration but gradually increased in 2013 and 2014. The chloride concentration in new wells S28 and S38 are similar to the values in wells B12 and D1.

Chloride concentrations in wells B15, B31, T2, T4 and T12 are presented on Figure 4.3-41. Chloride concentrations in the three T wells were fairly steady in 2014. The chloride concentrations are higher in the two new wells to the south on the south side of the LTP.

Chloride concentrations in alluvial wells on the west and north sides of the STP are presented on Figure 4.3-42. This figure shows a decrease in wells C8 and C10 for 2014 while a steady value is observed in well C6.

All of the chloride concentrations on the top of the STP and south side of the STP remained very low in 2014 but overall have gradually increased in the last ten years due to the switch to fresh water injection. This reflects the changes from the removal of R.O. product water injection in this area (see Figure 4.3-43). The chloride concentrations in water from the remainder of the K wells on top of the STP (see Figure 4.3-44) have been steady in 2014. A decrease in chloride concentration was observed in well 1U in 2014 after steady values that followed a large decline in 2008.

The chloride concentrations in water collected from the L line wells and well 522 east of the highway are presented in Figure 4.3-45. The 2014 chloride concentrations in these wells are generally slightly larger than they were several years ago due to switch from RO product water to fresh water to the northwest of this area.

Figure 4.3-46 presents time plots of chloride concentrations in wells near or in Broadview Acres with the concentrations very similar to the fresh water chloride concentration.

Figure 4.3-47 presents the chloride concentration-time plots for the four Felice Acres wells. The 2014 chloride concentrations are fairly similar to previous chloride concentrations observed in 2013 except for the increase in well 491. The large increase in well 491 in 2014 is supported by other parameters from this sample and was re-sampled.

Chloride concentration plots for the Murray Acres and Pleasant Valley Estates wells are presented on Figure 4.3-48. Chloride concentrations are very similar to the fresh water injection concentration with steady values in 2014, except chloride concentration increase in wells 844 and 845. The higher values in the last three years in these two wells could possibly be due to the flood irrigation in this area.

The plots of chloride concentration versus time in Section 3 wells are presented on Figure 4.3-49. Chloride concentrations were similar in 2014 in these wells to their historic values. The chloride concentrations for five collection R wells show that their values were fairly steady during their pumping in the second half of 2014 (see Figure 4.3-49A).

Figure 4.3-50 presents plots of the variation of chloride concentrations with time in Section 28 wells. Decline in chloride concentration was observed in well 886 through 2009 but increased in 2011 and 2012. These recent increases in the Section 28 wells could possibly be due to previous irrigation in Section 28 which ceased after 2012. Chloride concentrations in wells 881, 884, 886 and 893 in the Section 28 Center Pivot area had increased in 2012 but were

steady or slightly declining in 2013 and 2014. If the recent increase was due to irrigation, it shows that the effects on chloride concentrations were small and short lasting.

Chloride concentrations in the Section 29 monitoring wells are presented on Figure 4.3-51. Chloride concentrations in recent samples from wells 686 and 994 are steady.

Figure 4.3-52 presents time plots of chloride concentrations in the Section 33 wells. The 2014 chloride concentrations slightly increased in wells 551, 554 and 658 while concentrations in the remainder of these wells were fairly steady. Overall the chloride concentrations in these wells are slightly higher in 2009 through 2014 than observed in previous years. These slightly higher chloride concentrations could be showing a very small effect from the Section 33 irrigation but it also could be a small natural change.

### 4.3.4 URANIUM - ALLUVIAL

Uranium is considered an important ground water constituent at this site due to the significant levels in the tailings seepage. Uranium data and contours for 2014 are presented on Figure 4.3-53. Background uranium concentrations during 2014 varied from less than 0.003 to 0.23 mg/l; the alluvial background site standard is 0.16 mg/l. The light green pattern on Figure 4.3-53 shows where uranium concentrations exceed 0.16 mg/l, the statistical upper range of background from previous statistical analysis of the 1995-2004 data. The uranium values inside three areas outlined on Figure 4.3-53 are posted on additional uranium figures due to the density of the new wells in these three areas. Figures 4.3-53A, 4.3-53B and 4.3-53C present the OS, SOS and NOS areas respectively.

Uranium concentrations exceed background in the area of the Large and STPs with numerous additional values measured in new wells on the LTP and south and west of the LTP (see Figure 4.3-53A). Uranium concentrations extend to the west of the LTP into the western half of Section 27 and Section 28 with numerous new wells in the NOS area (see Figure 4.3-53C). Uranium concentrations in Sections 29 and 32 also reflect a contribution from the Rio San Jose alluvial system in Section 20, but these levels have decreased to less than 0.16 mg/l. The zones of moderately elevated concentrations join together and the combined area extends down-gradient approximately one mile into Section 33.

Uranium concentrations greater than 0.16 mg/l are also present near the L collection wells south of the STP. Uranium concentrations in the L wells were overall similar in 2014 to values observed in 2013.

Additional areas, where uranium concentrations in the alluvium are greater than 0.16 mg/l, exist in Felice Acres and to the southwest into Section 3 (see Figure 4.3-53B). Several new wells were added to this area in 2014. The area of elevated concentrations extends approximately 3500 feet to the southwest of the southwest corner of Felice Acres. Significant progress toward restoration was made in the northeast corner of Section 3 with the collection and injection into the R well field in 2014. The uranium concentrations in another small area in the northeast portion of Murray Acres at well 802 exceed 0.16 mg/l. Concentrations in this area decreased in 2014. Additional restoration is needed in each of these areas with respect to uranium concentrations.

Uranium concentration plots were prepared in order to illustrate changes that result from the corrective action program and other factors. Figure 4.3-2 shows the grouping and location of the alluvial wells used for the uranium-time plots. The figure numbers shown on Figure 4.3-2 correspond to the sulfate time plots. The same grouping of wells was used for the uranium plots, and their symbols and colors are the same as those used on other time plots.

Figure 4.3-54 presents uranium concentrations plotted versus time for up-gradient wells DD, DD2, P and P4. The uranium concentrations in well P have been fairly steady during the last few years. Data for new upgradient well DD2 which is near well DD has had a slightly higher uranium concentration than the site standard but concentrations in these two wells gradually declined in 2014. A small decline was also observed in wells DD and P4. The site standard of 0.16 mg/l is shown in the legend on Figure 4.3-53.

A decrease in uranium concentrations was observed in 2010 through 2014 for well S2 (see Figure 4.3-55). Uranium concentrations remained small and have been steady the last several years in well S4. Uranium concentrations decreased in well SM while they were steady in well S12 in 2014.

Figure 4.3-56 presents the uranium concentration time plots for alluvial wells west of the LTP. Uranium concentrations declined in well MO in 2014 and were variable in collection wells M9 and MQ. A similar 2014 value was measured in new well M28 to those in collection wells M9 and MQ.

Figure 4.3-57 presents time plots of uranium concentrations for alluvial wells B12, D1, S28 and S38. Uranium concentrations were variable in wells B12 and D1 in 2014 showing that additional restoration is needed in this area. Uranium concentration in new wells S28 and S38 are smaller in their area.

Plots of uranium concentration versus time are presented on Figure 4.3-58 for alluvial wells B15, B31, T2, T4 and T12. The uranium concentration in 2014 in well T2 was steady while a small decline was observed in wells T4 and T12. New wells, B15 and B31for the B collections line have higher concentrations even though they are south of the LTP. This shows that the LTP flushing program has decreased the uranium concentrations in the alluvial aquifer in the LTP area.

Figure 4.3-59 presents plots of uranium concentration versus time for collection wells C6, C8, C10 and C12 on the west side of the STP. Uranium concentrations in these wells are variable showing that they are near the restoration front. Uranium is the main parameter that requires additional restoration in this area.

Figure 4.3-60 presents uranium concentrations for wells on the STP and the south side of the STP in wells K9, K10, K11 and X. Uranium concentrations were fairly steady in each of these wells in 2014 with a small increase in well K9.

Uranium concentrations in wells 1U, K4, K5, K7 and K8 were reasonably steady in 2014 (see Figure 4.3-61). A large decrease in concentrations in well 1U was observed prior to the small concentrations measured the last five years. A small amount of additional restoration is needed in this area.

Uranium concentrations in water from alluvial wells 522, L, L6, L8, L9, and L10 are presented on Figure 4.3-62. Uranium concentrations were fairly steady in 2014 in all of these wells except for an increase observed in well 522. This time plot shows that additional restoration is also needed in the L collection area.

Figure 4.3-63 presents uranium concentrations versus time for four wells in or near Broadview Acres alluvial wells: F, GH, SUB2 and SUB3. Uranium concentrations in each of these wells were steady in 2014. The uranium concentrations in each of these wells are below the site standard.

Figure 4.3-64 presents the uranium concentration time plots for Felice Acres wells 490, 491, 496 and 497. Fairly steady levels in these wells were measured in 2014. Additional

restoration from the South collection and injection in the alluvial aquifer in the Felice Acres area is needed.

Figure 4.3-65 presents uranium concentrations for wells in the Murray Acres and Pleasant Valley Estates subdivision areas. Uranium concentrations declined in well 802 in 2014 and are expected to continue to gradually decrease with time to below the site standard. Uranium concentrations in the remainder of the wells in this area are low and below the site standard.

The uranium concentrations for five wells in Section 3 southwest of Felice Acres are plotted on Figure 4.3-66. The uranium concentrations in the western well 631 have been low throughout the period of record but gradually increased in 2010 through 2014. Uranium concentrations increased in 2012 in wells 540 and 866 likely due to the lack of collection for irrigation from this area and declined in 2014 due to the R collection in this area in the second half of 2014. The steady concentrations in well 869 show that additional restoration is needed in central Section 3.

The uranium concentrations for five of the R collection wells in northeast corner of Section 3 are presented on Figure 4.3-66A. This plot shows the decrease in uranium concentrations in the second half of 2014 due to the collection of alluvial water in the northeast portion of Section 3. Some additional restoration is needed in this portion of the alluvial aquifer mainly in the area of collection wells R3, R4 and 866.

Uranium concentrations from five Section 28 wells are plotted on Figure 4.3-67. A declining trend had been observed in concentrations in well 884 followed by fairly steady values the last several years. An overall decline was observed in well 886 in 2014. Concentrations from collection wells 881 and 890 slightly declined in 2014. Collection from the western H wells and well 890 in 2015 should cause result in the restoration of this area.

Uranium concentration time plots for wells in the southern portion of Section 20 and the northern portion of Section 32 are presented on Figure 4.3-68. The uranium concentrations in southern Section 20 (wells 636, 637 and 686) have been steady the last few years. These wells are completed in the Rio San Jose alluvium upgradient of the confluence with the San Mateo alluvium in Section 29. Steady and small concentrations in well 994 in the northern portion of Section 32 have been observed.

Uranium concentrations in wells located in Section 33 are relatively small and are plotted on Figure 4.3-69. Concentrations have remained low with steady values in wells 551, 554, 647, 649 and 658 during 2014. No increase was observed in the Section 33 wells for uranium.

### 4.3.5 SELENIUM - ALLUVIAL

Selenium is an important constituent at the Grants Project site because, like uranium, it is present in significant concentrations in the tailings water. Figures 4.3-70, 4.3-70A, 4.3-70B and 4.3-70C present maps of the spatial distribution of selenium concentrations throughout the site. The background site standard for selenium is 0.32 mg/l. Selenium concentrations upgradient of the site varied from less than 0.005 to 0.60 mg/l in 2014. A green pattern is superimposed on the concentration contour figures to show where concentrations exceed 0.32 mg/l. A 0.1 mg/l selenium concentration contour exits in the central portion of Section 27 (see Figures 4.3-70, 4.3-70A and 4.3-70C). All selenium concentrations measured west of this area are less than 0.1 mg/l. Selenium concentration in well 846 in western Section 34 slightly exceeded 0.1 mg/l in 2014. All selenium concentrations in the alluvial aquifer in all of the nearby subdivisions are less than 0.1 mg/l except for one value above 0.1 mg/l in Felice Acres that is thought to be an outlier.

Selenium concentrations exceeding 0.32 mg/l were measured in wells around the Large and STPs and extend approximately 700 feet to the west of the LTP and also extend to the south of the STP in the area east of the L collection wells and east of Highway 605. This shows that only the area near the tailings pile and the area near some of the L collection wells require additional restoration in order to reduce selenium concentration.

Figure 4.3-2 presents the location and grouping of wells for selenium concentration plots. The symbols and colors used on Figure 4.3-2 are the same as those used on each constituent time plot.

Figure 4.3-71 presents plots of selenium concentration versus time for up-gradient wells DD, DD2, P and P4. There has been a small amount of variation in the selenium concentrations in up-gradient wells P and P4 for last few years but these small values are below the site standard. The 2014 concentrations in wells DD and DD2 were steady.

Figure 4.3-72 shows low selenium concentrations in wells S4, S12 and SM during 2014. Larger selenium concentrations were observed in well S2 with a declining trend in the last two years. Additional collection from the S wells in 2015 should cause the selenium concentration to continue to decrease in well S2. Steady and small selenium concentrations continue in wells S4, S12 and SM.

Figure 4.3-73 presents selenium concentrations for wells M9, M28, MO and MQ. Selenium concentrations have remained low in all of these wells. The 2014 sample for well M9 shows a small increase.

Selenium concentrations in water from alluvial wells located southwest of the LTP are plotted on Figure 4.3-74. This figure shows a small selenium concentration for wells B12, S28 and S38 in 2014 and a slightly higher value from well D1. Additional pumping B wells in 2015 in this area should cause the selenium concentration to continue to decline in well D1, even though it is presently below the site standard.

Figure 4.3-75 presents plots of selenium concentrations for wells B15, B31, T2, T4 and T12. Variable but overall steady selenium concentrations have been measured for well T4 in the last several years. Selenium concentrations in collection well T2 slightly increased in 2014 but has stayed at a low level. Fairly steady and small selenium concentrations were observed in well T12 which is completed in the alluvial aquifer under the LTP. The selenium concentration is larger to the south of the LTP in the two new B wells.

The selenium concentrations for collection wells located on the west side of the STP are plotted on Figure 4.3-76. A very small decrease in concentrations was observed in wells C6, C8 and C10 in 2014 while steady to small decline was observed in well C12.

Figure 4.3-77 presents selenium concentrations for wells K9, K10, K11 and X, which are located on top of the STP and to the south side of the STP. Only small concentrations were measured in water taken from these wells in 2014.

Selenium concentrations in wells K4, K5, K7 and K8 were fairly steady in 2014 (see Figure 4.3-78). The selenium concentration decreased in 2008 in well 1U and has stayed very low for the last six years.

Figure 4.3-79 presents selenium concentration for wells 522, L, L6, L8, L9 and L10. Fairly steady selenium concentrations with time were observed in these wells during 2014 with slightly higher values in well 522.

Figures 4.3-80 and 4.3-81 present selenium concentration plots for four wells to the north and in Broadview Acres and four wells in Felice Acres. These plots show that the selenium concentrations have been reduced and maintained at low levels for the last several years in these two subdivisions except for a small increase in selenium in well 491 in 2014.

Selenium concentrations are presented for wells in the Murray Acres and Pleasant Valley Estates areas on Figure 4.3-82. This plot shows continuing low selenium concentrations in monitoring wells in this area of the alluvial aquifer. Fairly steady values were observed in these wells in 2014 with the levels remaining below the site standard of 0.32 mg/l.

Selenium concentrations for five wells in Section 3 are plotted on Figure 4.3-83. Well 631 is located in the western portion of Section 3. Selenium concentrations in this well gradually decreased in the last few years. Concentrations in wells 540, 631, 862, 866 and 869 were steady and remained low in 2014.

Selenium concentrations for five wells in the northeast corner Section 3 are plotted on Figure 4.3-83A. The selenium concentration in these R collection wells was small prior to the start of the collection in this area in 2014 and they stayed low during this pumping.

The selenium concentrations in alluvial water in Section 28 have been fairly steady with time. Figure 4.3-84 presents the selenium concentrations from the Section 28 alluvial wells. A significant decline was observed in concentration in well 884 in 2006 due to the fresh water injection in this area, this decline leveled off in 2008 and since have been fairly steady.

Figure 4.3-85 displays selenium concentrations in wells in Sections 20 and 32 wells, which are located on the south side of Section 20 and the north side of Section 32. Fairly steady and small selenium concentrations were observed in 2014 in these wells.

Selenium concentrations from wells in Section 33 are presented on Figure 4.3-86. The data demonstrated small and steady selenium concentrations in 2014 in these wells.

### 4.3.6 MOLYBDENUM - ALLUVIAL

This section discusses the molybdenum concentrations in the alluvial aquifer at the Grants Project during 2014. Figures 4.3-87, 4.3-87A, 4.3-87B and 4.3-87C are spatial presentations of the concentration data and contours. Molybdenum concentrations in alluvial water in the west area of Figure 4.3-87 have typically been less than 0.03 mg/l and, therefore, samples from the western wells are not routinely analyzed for molybdenum. Numerous samples

were taken from these wells in 2014 to update the molybdenum database. The movement of molybdenum in the alluvial aquifer is dramatically attenuated in comparison to that of selenium and uranium. Molybdenum concentrations only exceeded 100 mg/l at one location under the LTP in 2014 with only a few values above 50 mg/l. A 10 mg/l contour extends around most of the LTP and to the west side of the STP (see Figure 4.3-87A).

The light green patterns on these four figures show the area where molybdenum concentrations exceed 0.10 mg/l, the site standard. A molybdenum concentration of 0.10 mg/l is considered the threshold of significance for this constituent at this site. Significant molybdenum concentrations extend to just north of Pleasant Valley west of the LTP (see Figures 4.3-87A and 4.3-87B) and also to the southeast of the STP to the L collection wells (see Figure 4.3-87). Concentrations in five wells in the west half of Section 27 exceed the molybdenum site standard of 0.10 mg/l. None of the concentrations in alluvial wells in the subdivisions exceed 0.10 mg/l of molybdenum.

Figure 4.3-88 presents molybdenum concentration for the up-gradient wells DD, DD2, P and P4. Concentrations have remained low in these four wells in 2014.

Steady molybdenum concentrations were fairly steady in wells S4 S12 and SM in 2014, while the molybdenum concentrations in well S2 decreased (see Figure 4.3-89).

Figure 4.3-90 presents time plots of molybdenum concentration for wells M9, M28, MO and MQ. Molybdenum concentrations in well MO were small in 2014 while the concentrations in collection well M9 increased and decreased in collection well MQ. The concentration from new well M28 is similar to the concentration in well MQ.

Figure 4.3-91 displays molybdenum concentrations for wells B12, D1, S28 and S38. Higher molybdenum concentrations in wells B12, D1 and S38were observed while small concentration exists in well S28. Additional collection from the S and D collections wells in 2015 should cause the molybdenum concentrations in these wells to decline.

Figure 4.3-92 presents molybdenum concentrations for wells B15, B31, T2, T4 and T12. The molybdenum concentrations in wells T2, T4 and T12 were steady in 2014. Similar but slightly higher concentrations exist in new wells B15 and B31.

Molybdenum concentrations in wells on the west side of the STP are presented on Figure 4.3-93. Molybdenum concentrations were steady or less in the water in these wells in

2014. A larger decrease in molybdenum concentration was observed in well C8 indicating that the restoration front is near this well.

Figure 4.3-94 presents molybdenum concentrations for wells on top of the STP and to the south side of the STP. Small molybdenum concentrations were measured in well X during the last year. Slightly larger and steady values were observed in wells K10 and K11 while an increase in concentration was observed in well K9.

Figure 4.3-95 shows small molybdenum concentrations in wells 1U, K4, K5, K7 and K8 in 2014 with fairly steady concentrations. The molybdenum concentrations in well 1U had a large decrease in 2008 and 2009.

Figure 4.3-96 present molybdenum concentrations in wells 522, L, L6, L8, L9 and L10, which are located further to the southeast of the STP. Molybdenum concentrations were steady and small in these wells in 2014.

Molybdenum concentrations in alluvial wells located in Broadview Acres and Felice Acres are plotted on Figures 4.3-97 and 4.3-98, respectively. The molybdenum concentrations in Broadview wells F, GH, SUB2 and SUB3 have been low for the last several years. Molybdenum concentrations in wells 490, 491, 496 and 497 in Felice Acres remained low and were reasonably steady for 2014.

Figure 4.3-99 presents the molybdenum concentrations for wells in the Murray Acres and the Pleasant Valley Estates areas. This plot shows that molybdenum concentrations have remained low in these alluvial wells.

Molybdenum concentration plots for the Section 3 wells are presented in Figures 4.3-100 and 4.3-100A and both show low concentrations. The western area wells values are plotted on Figures 4.3-101 through 4.3-103 time plots for the Section 28, Section 20/32 and Section 33 wells, respectively. All of the molybdenum concentrations have remained low in wells located in these areas in 2014. Molybdenum concentrations have migrated into Section 27 and could possibly have migrated into eastern Section 28 in a small area.

### 4.3.7 NITRATE - ALLUVIAL

The presence of relatively large nitrate concentrations up-gradient of the Grants site has resulted in a site background standard of 12 mg/l (see Table 3.1-1). A statistical analysis of the up-gradient data 1995 through 2004 produced the nitrate concentration of 12 mg/l based on

the 95th percentile of background. Upgradient nitrate concentrations varied from less than 0.1 to 16.0 mg/l in 2014. Figures 4.3-104 and 4.3-104A present nitrate concentrations measured in 2014 in the alluvial aquifer. Figure 4.3-104A list the nitrate values for the new wells drilled in the western portion of the LTP. The nitrate concentrations north and up-gradient of the tailings ultimately impact the nitrate concentrations down-gradient of the LTP in the northern portion of Sections 27 and 28. It is difficult to determine whether seepage from the tailings has any significant impact on the nitrate concentrations in this area, because the naturally higher concentrations up-gradient of the LTP makes modestly elevated nitrate concentrations indistinguishable from background. The nitrate concentrations in the northeast portion of Section 27 may exceed 12 mg/l. This larger nitrate concentration could be caused by the higher historical nitrates upgradient of the site.

Nitrate concentrations exceed 12 mg/l in an area between the Large and STPs which are likely due to seepage from the tailings. Nitrate concentration above 12 mg/l also exists in a small area south of Pleasant Valley. Nitrate concentrations in all of the alluvial subdivision wells are below 12 mg/l except for one well in Felice Acres which was 16 mg/l. Areas where water-quality restoration is required with respect to nitrate are shown by the green patterns on Figure 4.3-104. Restoration of nitrate will likely occur prior to the restoration of some other key parameters in these areas.

Plots of nitrate concentration over time were prepared for the alluvial wells that are listed on Figure 4.3-2. Figure 4.3-105 presents the nitrate concentrations for the background wells. Concentrations in these wells have been relatively stable in 2014. Nitrate concentrations in upgradient wells farther to the north have been larger and have exceeded the site standard which shows that higher nitrate concentrations upgradient of the site are entering the near-up-gradient area.

The nitrate concentrations in wells S2, S4, S12 and SM, immediately west of the LTP, are plotted on Figure 4.3-106. This figure shows small and steady concentrations in 2014 for these wells.

Figure 4.3-107 presents the nitrate concentrations for wells M9, M28, MO and MQ. Nitrate concentrations were similar in 2014in well MO to the value observed in 2013.

Nitrate concentrations in the group of wells southwest of the LTP are presented as time plots on Figure 4.3-108. The 2014 nitrate concentration in well D1 was steady.

Figure 4.3-109 presents nitrate concentrations in wells B15, B31, T2, T4 and T12. Nitrate concentrations were fairly steady in these wells in 2014.

Nitrate concentrations in wells on the west side of the STP are plotted on Figure 4.3-110. An increase in nitrate concentrations was observed in these wells in 2013. This trend is opposite to other constituent trends for these wells.

Figure 4.3-111 shows nitrate concentrations for wells on top of the STP and to the south side of the STP. The nitrate concentrations in wells C6 and C8 have been variable but decline in 2014. The nitrate concentrations in the other two wells are low and steady.

The nitrate concentrations in the K and L series wells are presented on Figures 4.3-112 and 4.3-113, respectively. Concentrations in recent samples have been very small in all of these wells.

Nitrate concentrations in the Broadview Acres wells are presented on Figure 4.3-114. Small and relatively steady nitrate concentrations were measured in water from these wells with time in the last few years.

Nitrate concentrations for the Felice Acres wells are presented on Figure 4.3-115, with reasonably steady concentrations over time except for an increase in well 491 in 2014.

Nitrate concentrations in Murray Acres and Pleasant Valley Estates wells are presented on Figure 4.3-116. Nitrate concentrations in well 846 are higher than the other five wells shown on this figure and shows an overall increase in 2008 through 2012 and a decrease from this peak in 2013 and 2014. The nitrate concentration in the remainder of these wells was fairly steady in 2014 except for a small increase in well 844.

Nitrate concentrations in Section 3 wells are presented on Figure 4.3-117. The nitrate concentrations in these wells were low in 2014.

Nitrate concentrations for the Section 28 wells are presented on Figure 4.3-118. The nitrate concentrations in these wells were reasonably steady in 2014 except for some small changes.

Figure 4.3-119 presents nitrate concentrations in wells 636, 637, 686 and 994. The nitrate concentrations were steady in these wells.

Nitrate concentrations in the Section 33 wells are presented on Figure 4.3-120 and were steady in 2014.