Evaluation of Groundwater Level Data from Estancia Basin Monitoring Wells

August 2017

HydroResolutions, LLC

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Prepared for

East Torrance Soil and Water Conservation District

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August 2017 Data Evaluation

As part of the contract between the East Torrance Soil and Water Conservation District (ETSWCD) and HydroResolutions (HR), HR has assembled and evaluated groundwater level data from wells within the Estancia Basin that are being monitored as part of the Estancia Basin Water Planning Committee (EBWPC) hydrogeologic monitoring program. Data were most recently collected on August 8 and 9, 2017. This included continuous transducer-recorded data from 9 wells (data from E-9673 would not download) and manual water-level measurements from 13 wells. Instrumentation Northwest transducers are currently installed in the following 10 wells: Anaya, Bozlan-1, E-50-4, E-2034-S, E-2298, E-9673, Greene-1, Romero Windmill, Smith-1, and the Swenka Exploratory well. Four transducers are currently available as backups or for installation in new wells that become available for monitoring. The malfunctioning transducer that had been installed in E-9673 (Bernalillo County well) was sent back to Instrumentation Northwest for assessment and was replaced with a new transducer.

To date, 14 wells have been subject to continuous monitoring for some period of time. As noted above, 10 wells are currently being continuously monitored. The rise-fall effect of seasonal irrigation pumping has been observed in nine wells (3 manually monitored and 6 continuously monitored) including Magnum Steel, E-6385, E-50-1, E-50-4, E-2034-S, Romero Windmill, Smith-1, Shaw Windmill, and Anaya.

Figure 1 shows the EBWPC groundwater monitoring network (blue circles) and additional wells that are monitored by the USGS (orange circles). This map can be accessed online as an interactive Google earth map at the following URL: http://goo.gl/oWmoy7. A double left-click will zoom in and a double right-click will zoom out. Zooming can also be facilitated with the "+/-" icon on the right-hand side of the map. Holding down your left mouse button will allow you to drag map locations across your screen. Note that the functionality of this map has only been tested in the Google Chrome web browser. When accessing this URL, the default is "Map" mode. Clicking on the "Satellite button" will change the view to the satellite image shown in Figure 1. Figure 2 shows the locations of the EBWPC wells whose water levels are discussed in this report.

Near the northwest boundary of the basin, water levels in E-2298 (Figure 3) do not show any response related to irrigation pumping and were previously seen to be linearly increasing. Following the drilling of a replacement well in close proximity to E-2298 during the second half of 2012, the rate of the water level rise increased for about 6 months. The water level has been relatively constant since the beginning of 2014.

Water levels in the Bozlan-1 well (Figure 4) varied about an average level of 6665 ft AMSL from the start of monitoring in 2008 through the first quarter of 2011. Since then, water levels have generally decreased. A clear seasonal variation in water levels due to irrigation pumping is not evident in this well. Water levels have decreased about 50 ft at this location since the start of monitoring in late 2007.

Water levels measured at the Hagerman Headquarters well several miles west of Bozlan-1 are shown in Figure 5. The most recent water level measurements in this well indicate that a 13 ft rise observed last September (2016) appears to be recovering to previous levels.

South of E-2298 along the western edge of the basin, E-9673 (Figure 6) does not display seasonal water-level changes that would indicate it is affected by irrigation pumping. In May 2011, water was pumped from E-9673 for water-quality analysis. At the end of the water-quality sampling, the water level in E-9673 had decreased from about 6954 ft AMSL to 6812 ft AMSL and subsequently started to recover. The water level was relatively constant through 2012 at a level approximately 10 ft lower than it was prior to water-quality pumping. Since January 2013, however, the water level at this location has increased approximately 35 ft and is now at 6973 ft AMSL. The data download from the transducer in this well failed during the most recent attempt. That transducer has been replaced and returned to Instrumentation Northwest for evaluation.

The Anaya well, located approximately 2 miles east of Edgewood (Figure 2), was added to the monitoring network in April 2015. An initial manual water-level reading was taken in this well on April 29, 2015, and an INW transducer was subsequently installed on July 25, 2015, to begin continuous monitoring (Figure 7). The data to date suggest that water-level seasonal variations due to irrigation pumping in the basin are evident in this well. The water levels start to decrease around February of each year and this decrease ends around August/September of each year. The well shows little recovery, however, during the non-irrigation season.

Magnum Steel (Figure 8) and E-6385 (Bowman) (Figure 9) in the north central part of the basin clearly show the seasonal variations associated with irrigation pumping and both exhibit an overall long-term decline.

Wells E-50-1 (Schwebach 1) (Figure 10) and E-50-4 (Schwebach 4) (Figure 11) near the center of the basin (Figure 2) show the effect of seasonal irrigation pumping. Water-level changes often exceeded 20 ft between the start and end of the irrigation season when monitoring began in 2009. Long-term water levels in the vicinity of wells E-50-1 and E-50-4 are clearly declining, but the magnitude of the seasonal fluctuations has decreased in E-50-4 over the past three years. The apparent static water levels at about 6417 ft AMSL in well E-50-1 resulted when the water level dropped below the level of the transducer in the well. The length of time that the water level was below the transducer steadily increased each year. The peak (maximum recovery) seasonal water levels in E-50-1 decreased to the point where the transducer was barely submerged during the non-irrigation season. A previous collapse in E-50-1 prevented the transducer from being installed at a greater depth, so the transducer was removed from this well on May 1, 2014, after the final data download.

Well E-2034-S displays an attenuated irrigation pumping signal (Figure 12) relative to E-50-4, located about six miles to the northeast. The water level at E-2034-S has decreased approximately 20 ft since the start of monitoring in late 2008, but the water level has been relatively constant since January, 2014, and has even increased approximately 3 ft since January, 2016.

The Swenka Exploratory well (Figure 13) water levels have been highly variable since the start of monitoring in 2009, but there is no clear indication that they are being affected by irrigation pumping in the basin. The difference between the maximum and minimum water levels observed in this well has been approximately 20 ft.

Further south, but still on the west side of the basin, E.B. Romero windmill (Figure 14) shows both short-term windmill pumping cycles as well as the seasonal irrigation pumping cycles. The current water level at the E.B. Romero windmill is at its highest level since the start of monitoring at this location in 2009.

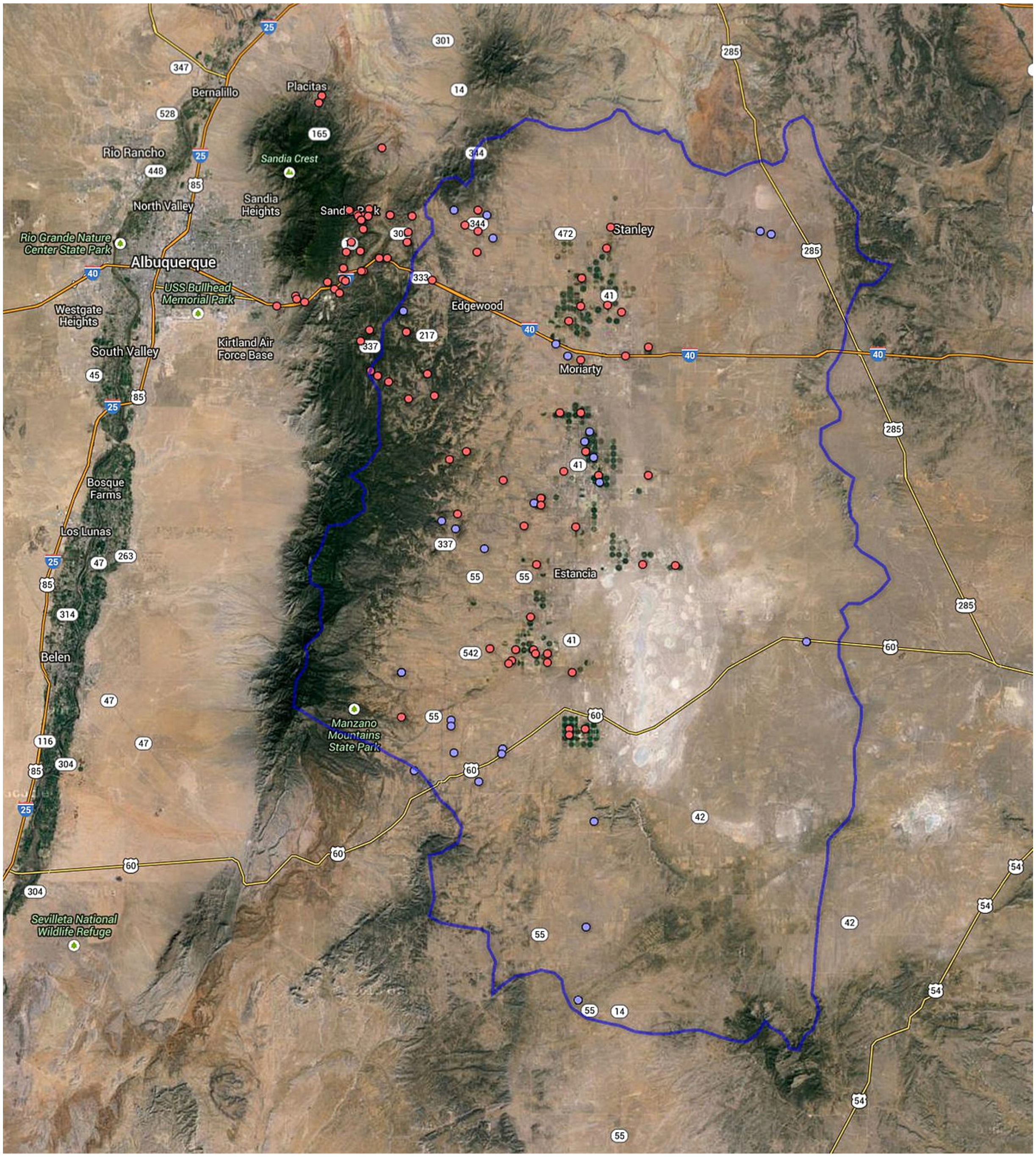
Continuing south along the west side of the basin, Smith-1 (Figure 15) shows the seasonal irrigation pumping cycles and displays a long-term water-level decline. Similar to the water levels in E-50-4, the magnitude of the seasonal fluctuations in Smith-1 had decreased since the start of 2014. The change during the most recent irrigation cycle, however, appears to be on the order of the pre-2014 magnitude.

Manual water level readings from the Ruby Shaw Windmill well are shown in Figure 16. Manual measurements since mid-2011 indicate that water-level variations at this location are minimal and exhibit no clear trend. As of December, 2014, this windmill was back in service, so monitoring has been discontinued.

Manual water-level measurements in well E-9407 (Figure 17) started in September 2012 and a pressure transducer for continuous monitoring was installed in October 2012. There appeared to be a slight downward trend in water levels at this location, with the water level decreasing about 0.6 ft since the start of monitoring. When the transducer at this well was checked on December 15, 2014, it was determined that some portion of the well had collapsed and the transducer was retrieved from under about 55 ft of mud. Monitoring of this well has been discontinued.

The Shaw WM (Figure 18) water levels show the irrigation pumping signal, but the average water level at this location appears to be relatively constant, with only about 0.2 ft net change over the past 9 years. The magnitude of the seasonal fluctuations decreased at this location between January 2014 and January 2016, similar to the responses in E-50-4, E-2034-S, and Smith-1. The most recent readings, however, suggest a return to the previous response magnitudes.

Neither Greene-1 (Figure 19) nor Greene-4 (Figure 20) in the southern part of the basin (Figure 2) shows the effects of irrigation pumping. The water levels at Greene-1 displayed a slight upward trend from 2009 through 2013, and were then relatively constant from January 2014 to January 2016. Since January 2016, a slight downward trend is apparent. As noted previously, monitoring was discontinued in Greene-4 due to its remote location. During the 3 years that Greene-4 was monitored, the total variation in the water level was about 11 ft, but the net change between the first and last data points was effectively zero.



Estancia Basin Topographic Boundary

EBWPC Monitored Wells

USGS Monitored Wells

URL: http://goo.gl/oWmoy7

Figure 1. Groundwater monitoring network showing EBWPC and USGS monitored well locations.

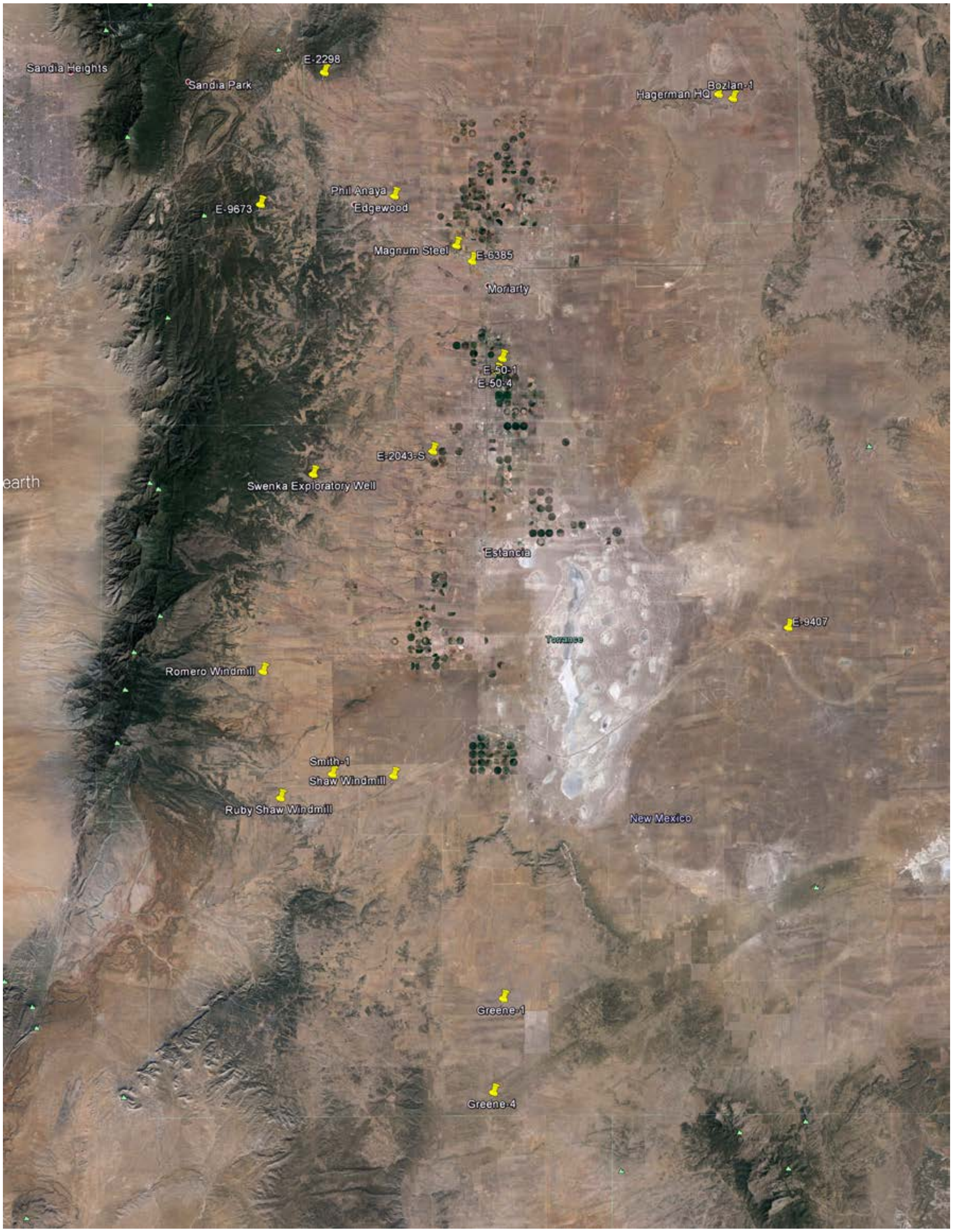


Figure 2. EBWPC groundwater monitoring network showing selected well locations.

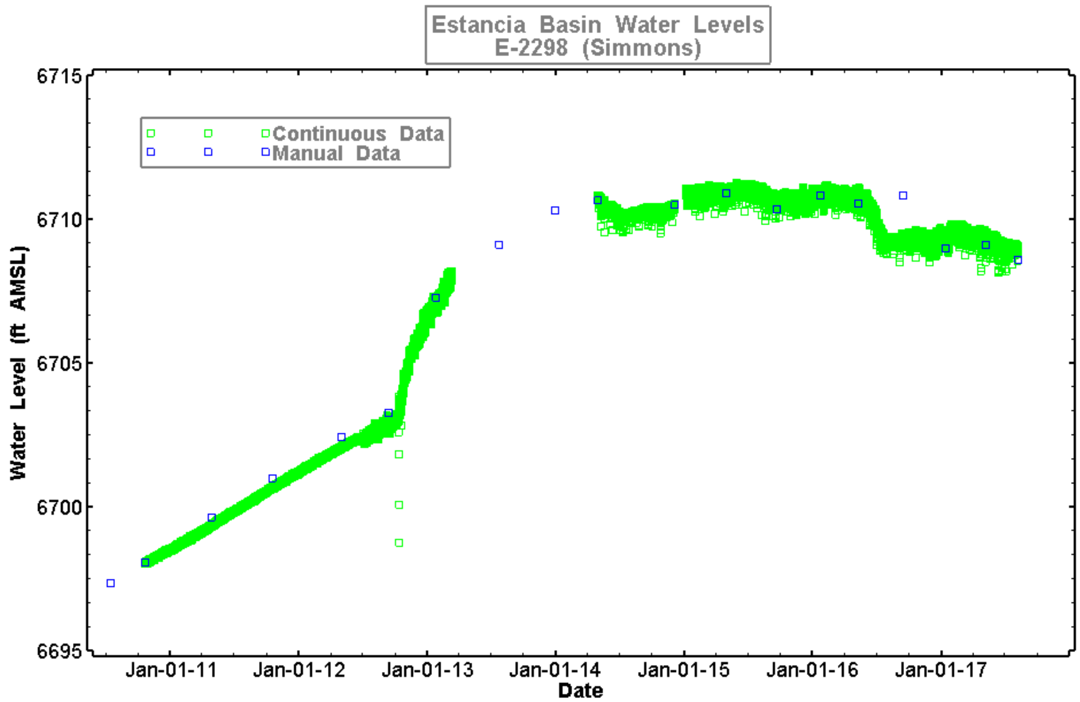


Figure 3. Water levels measured in well E-2298.

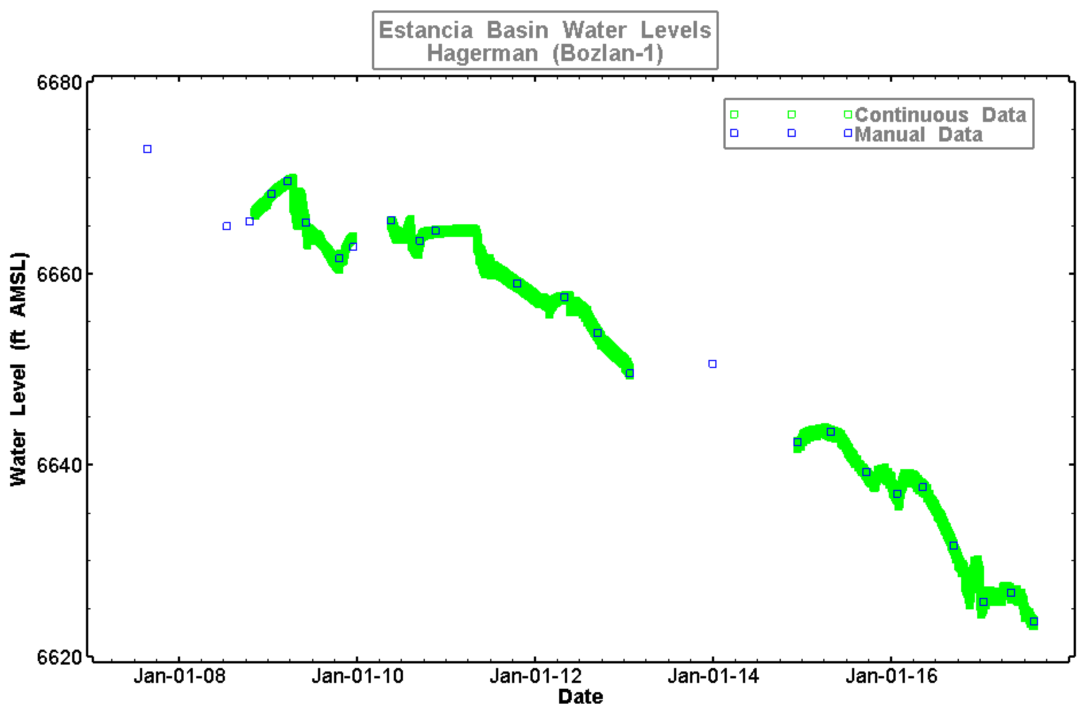


Figure 4. Water levels measured in the Bozlan-1 well.

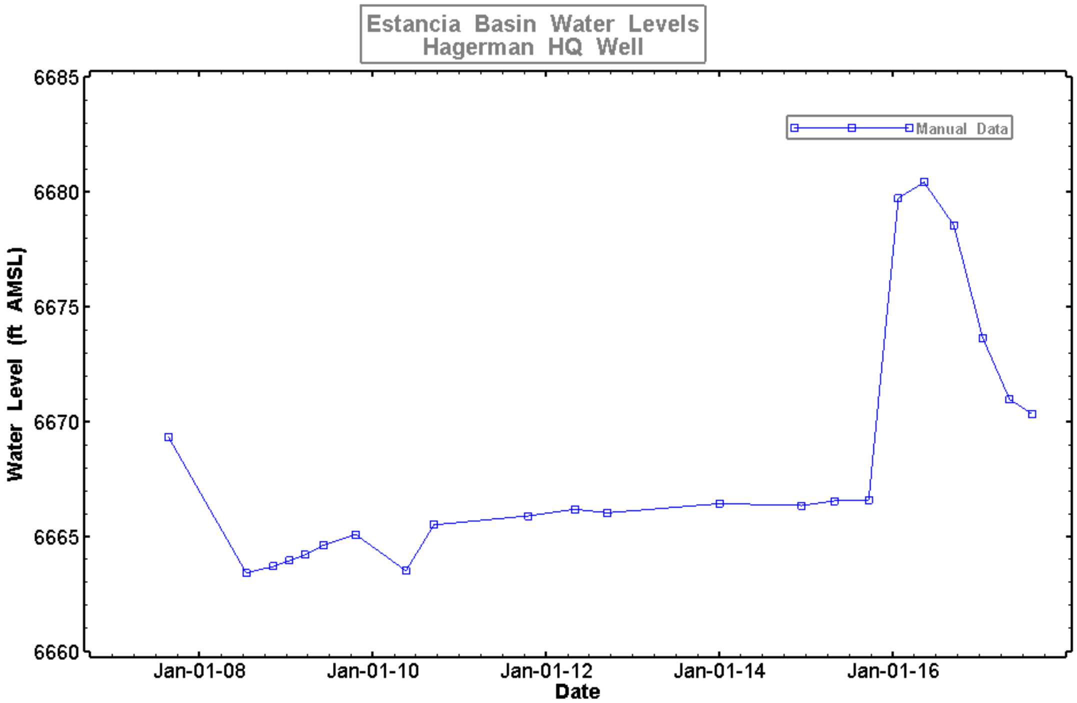


Figure 5. Water levels measured in the Hagerman Headquarters well.

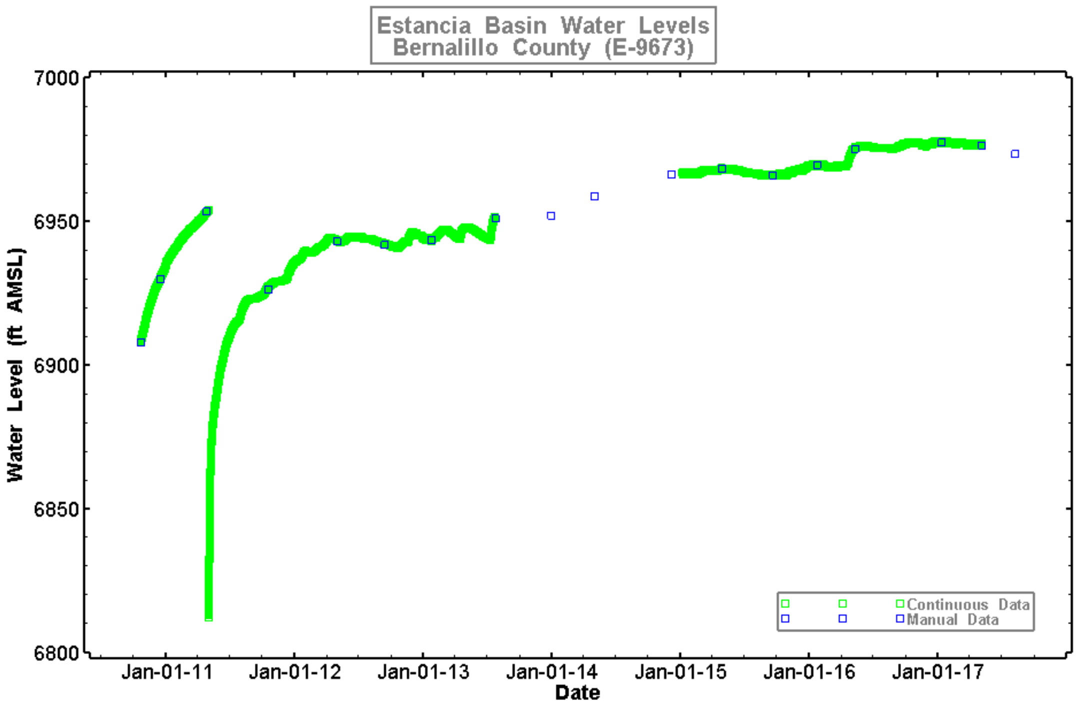


Figure 6. Water levels measured in well E-9673.

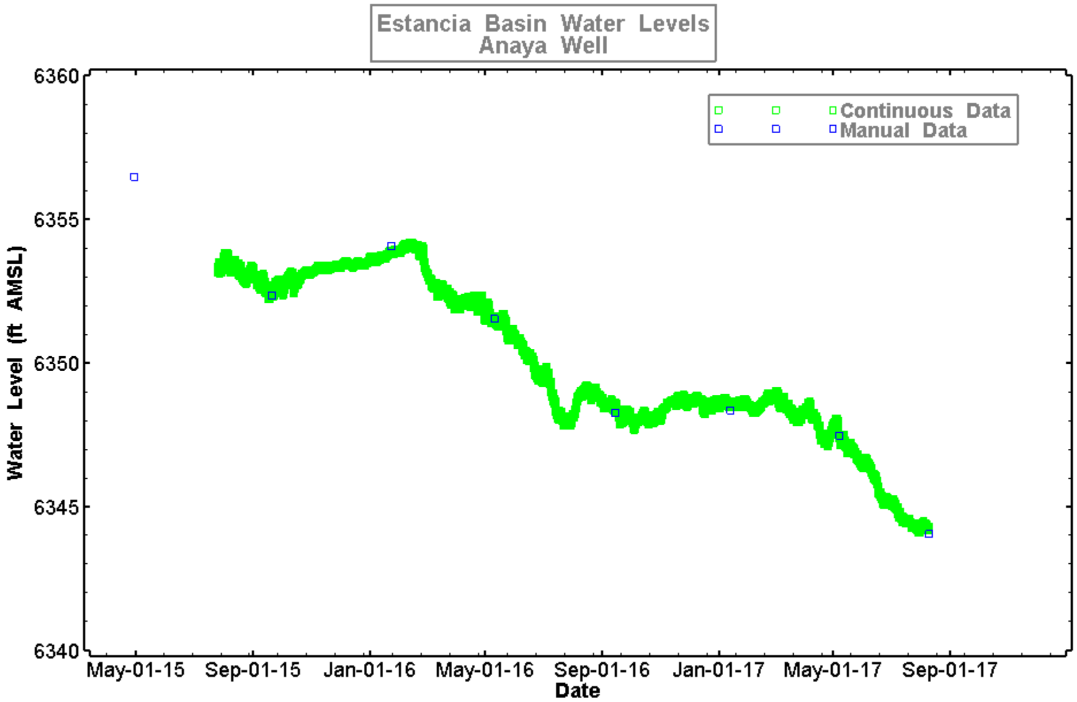


Figure 7. Water levels measured in the Anaya well.

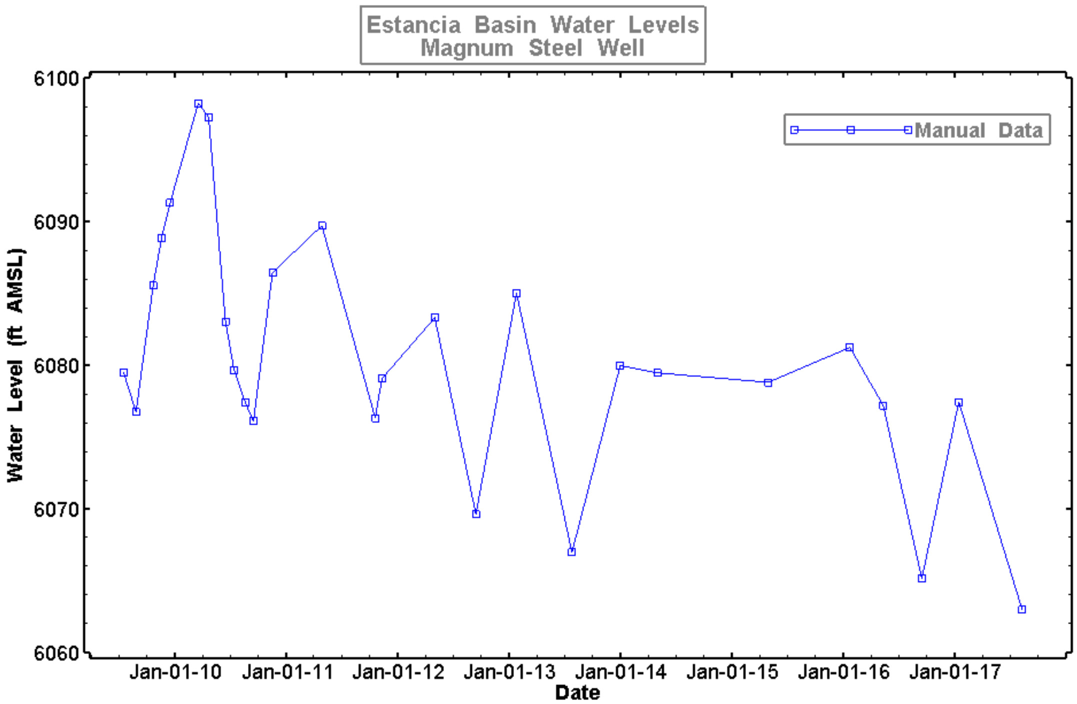


Figure 8. Water levels measured in the Magnum Steel well.

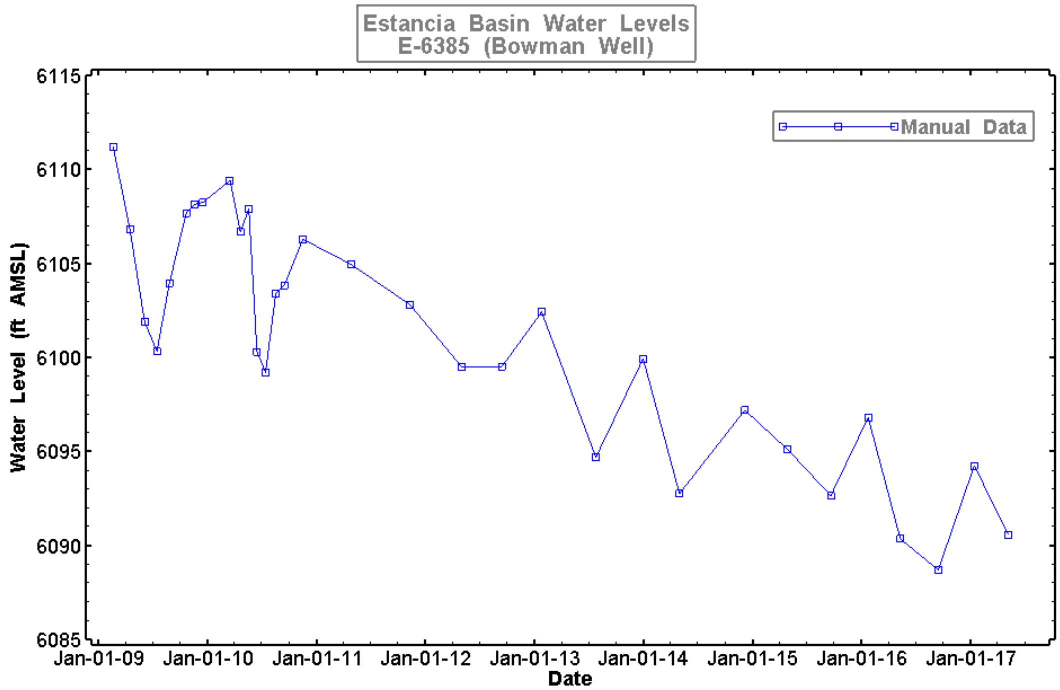


Figure 9. Water levels measured in well E-6385.

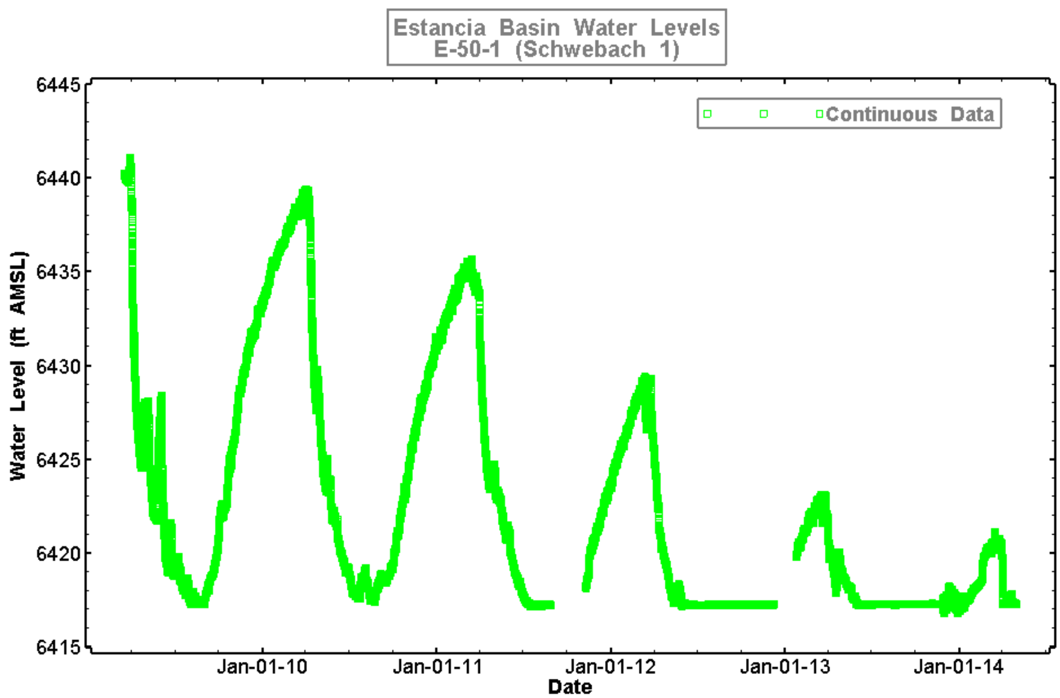


Figure 10. Water levels measured in well E-50-1.

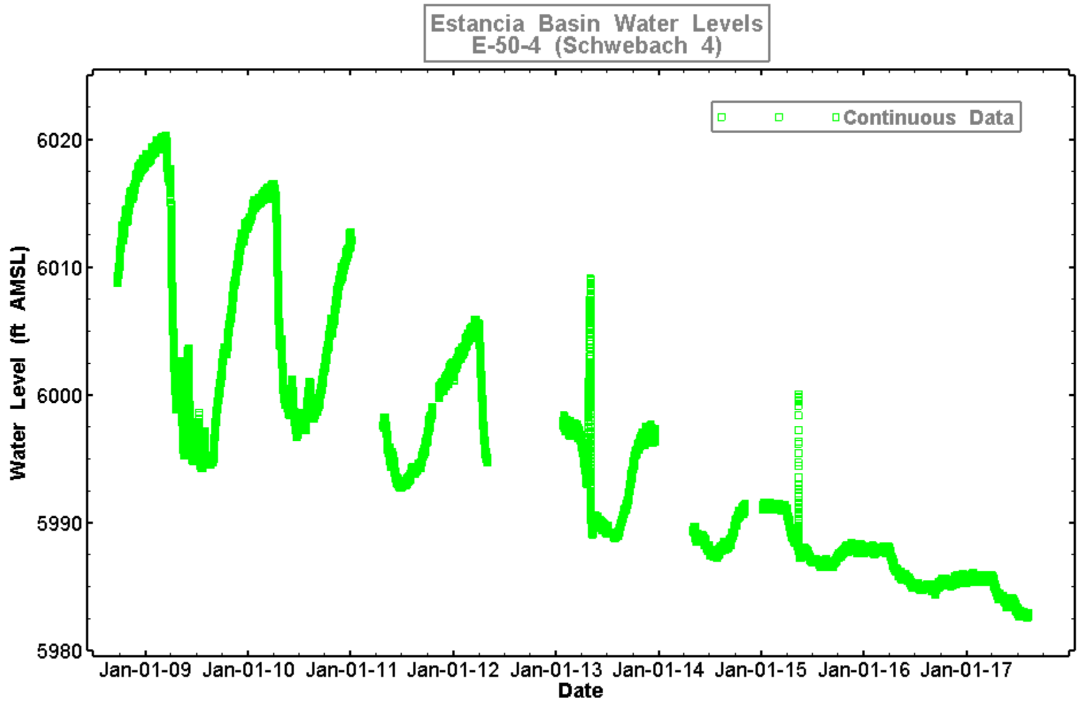


Figure 11. Water levels measured in well E-50-4.

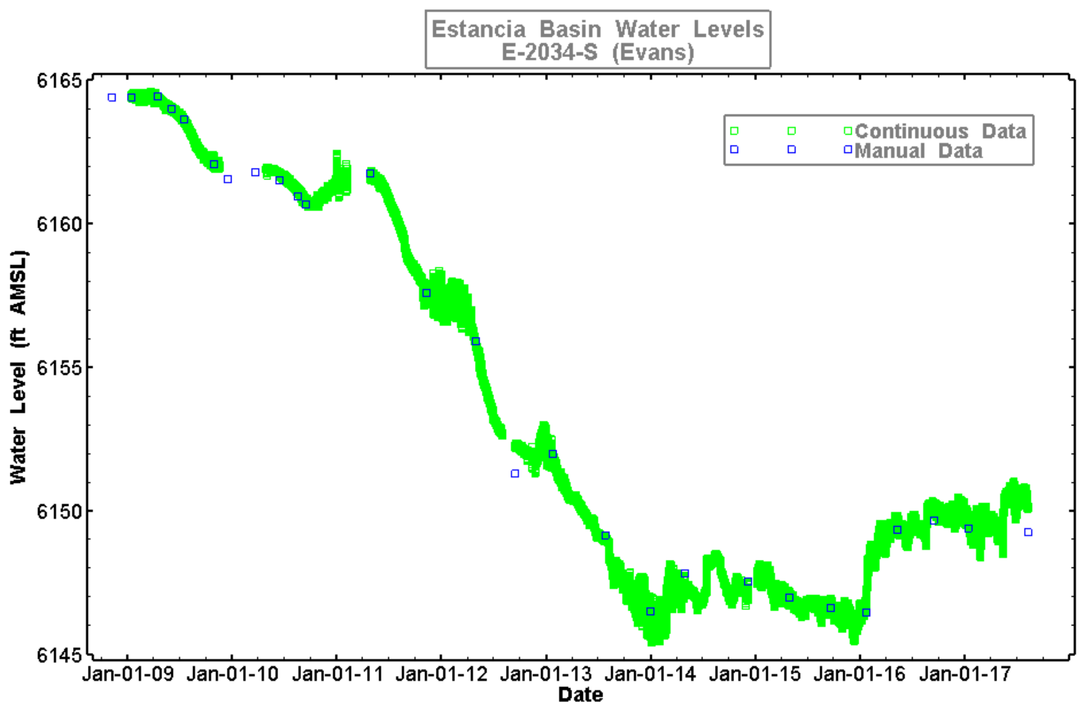


Figure 12. Water levels measured in well E-2034-S.

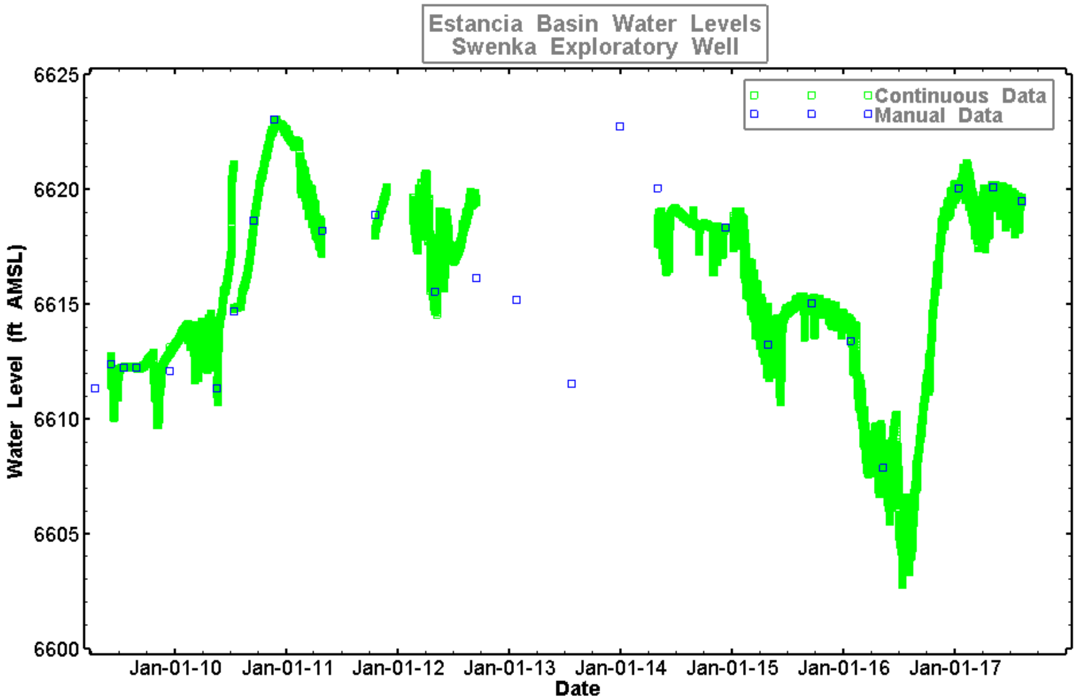


Figure 13. Water levels measured in the Swenka Exploratory well.

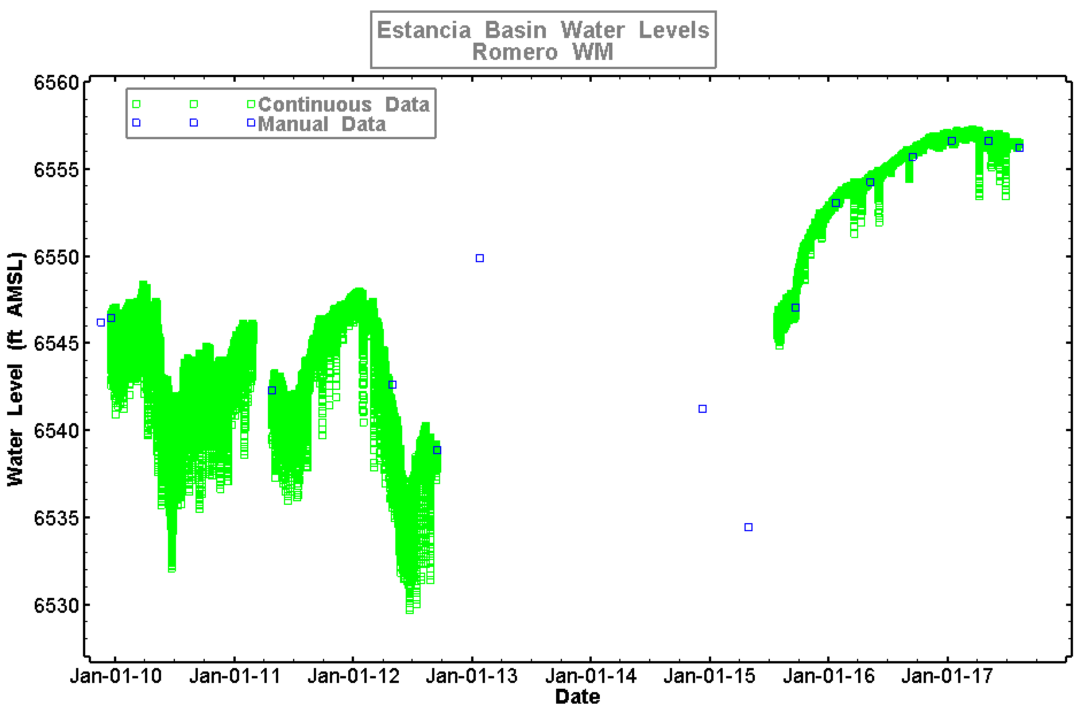


Figure 14. Water levels measured in the E.B. Romero WM well.

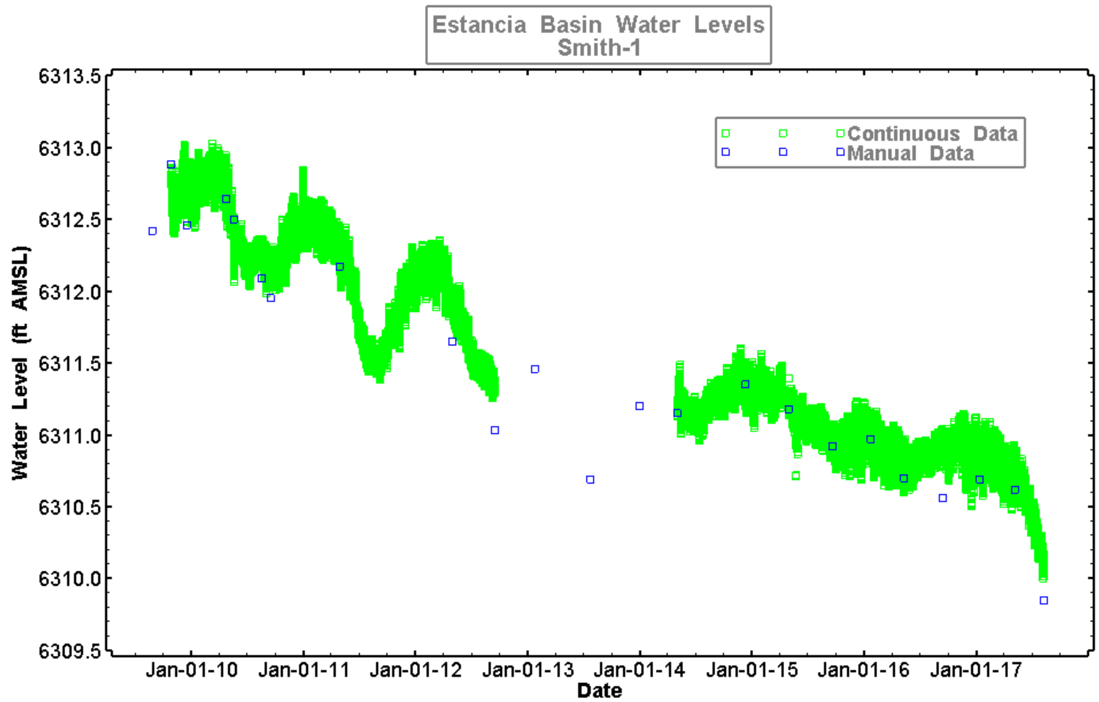


Figure 15. Water levels measured in the Smith-1 well.

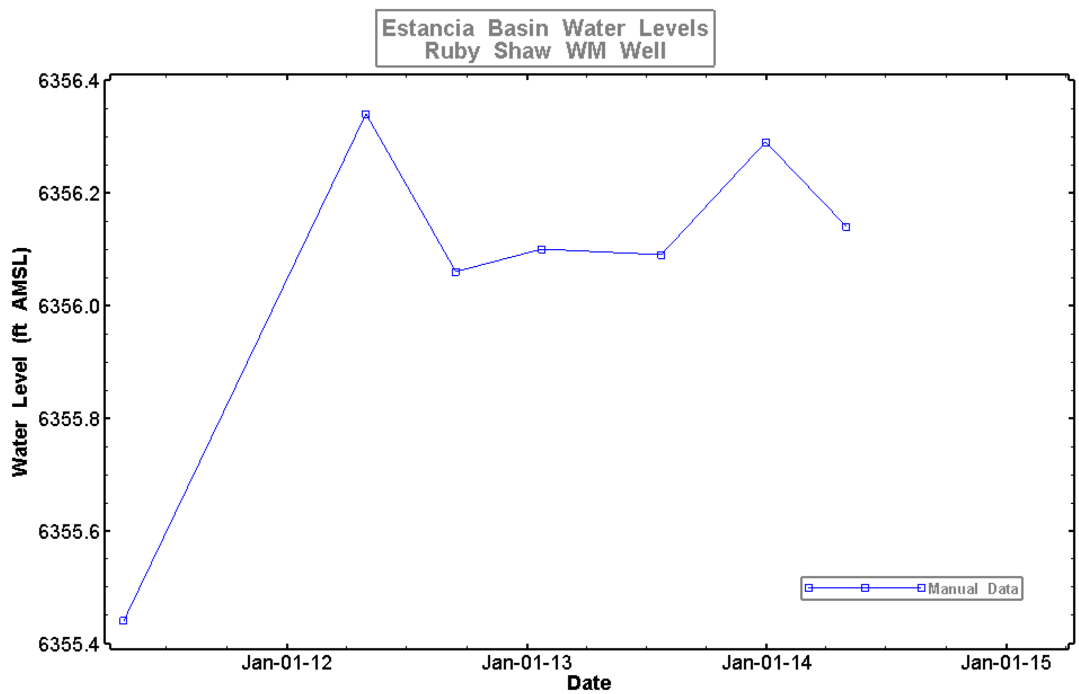


Figure 16. Water levels measured in the Ruby Shaw windmill well.

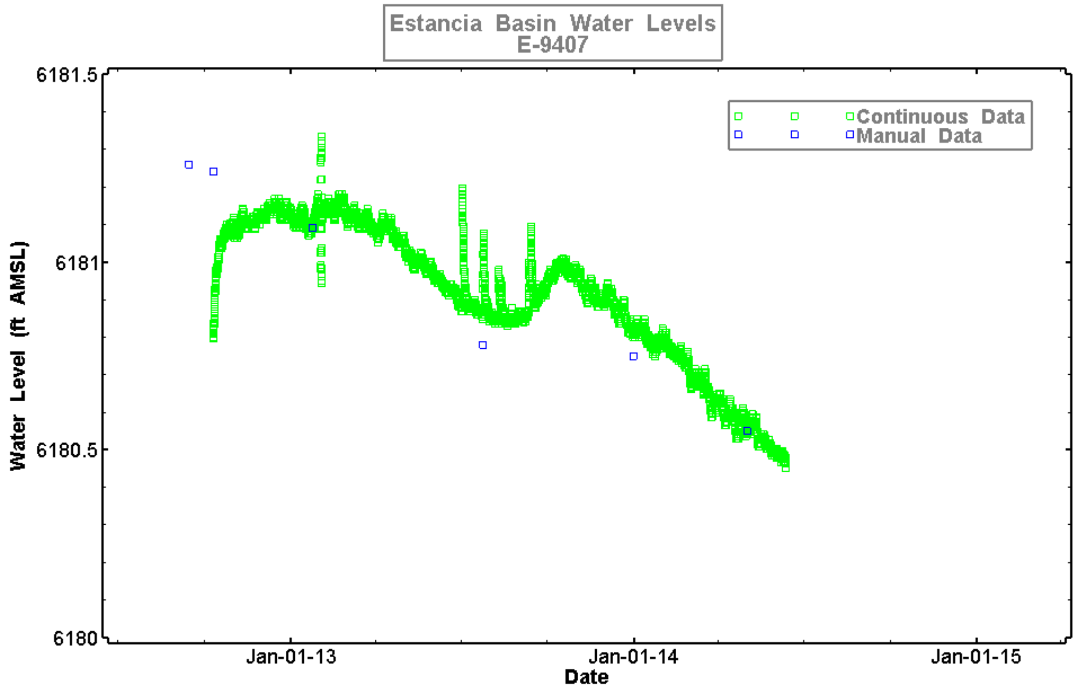


Figure 17. Water levels measured in well E-9407.

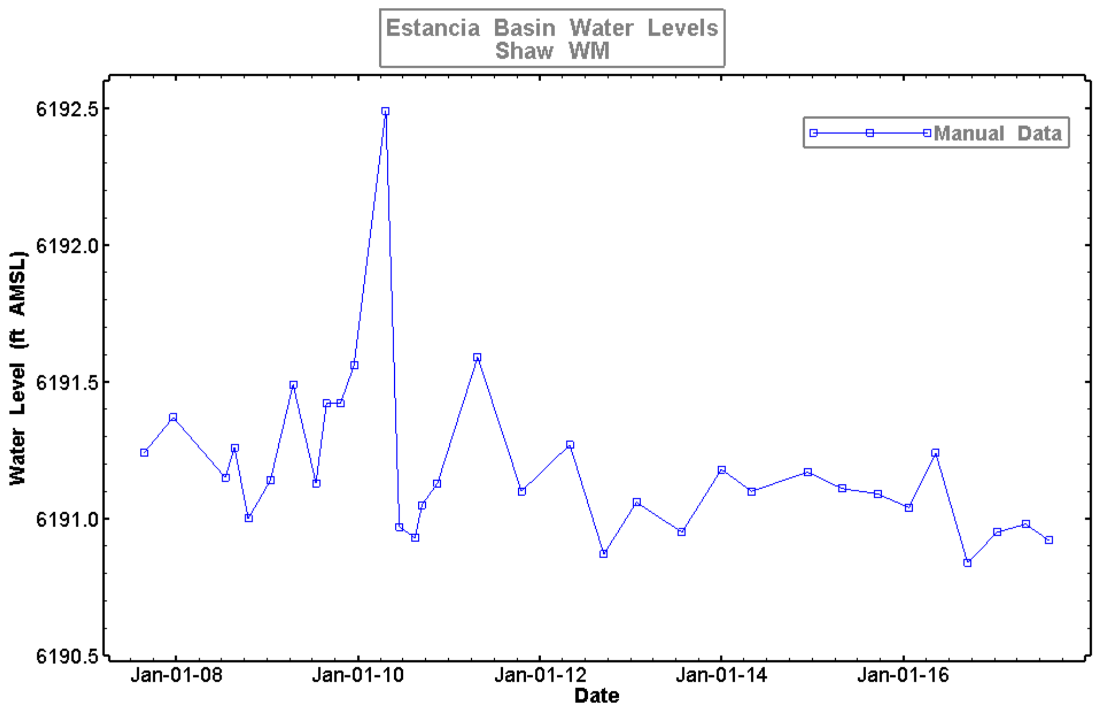


Figure 18. Water levels measured in the Shaw WM well.

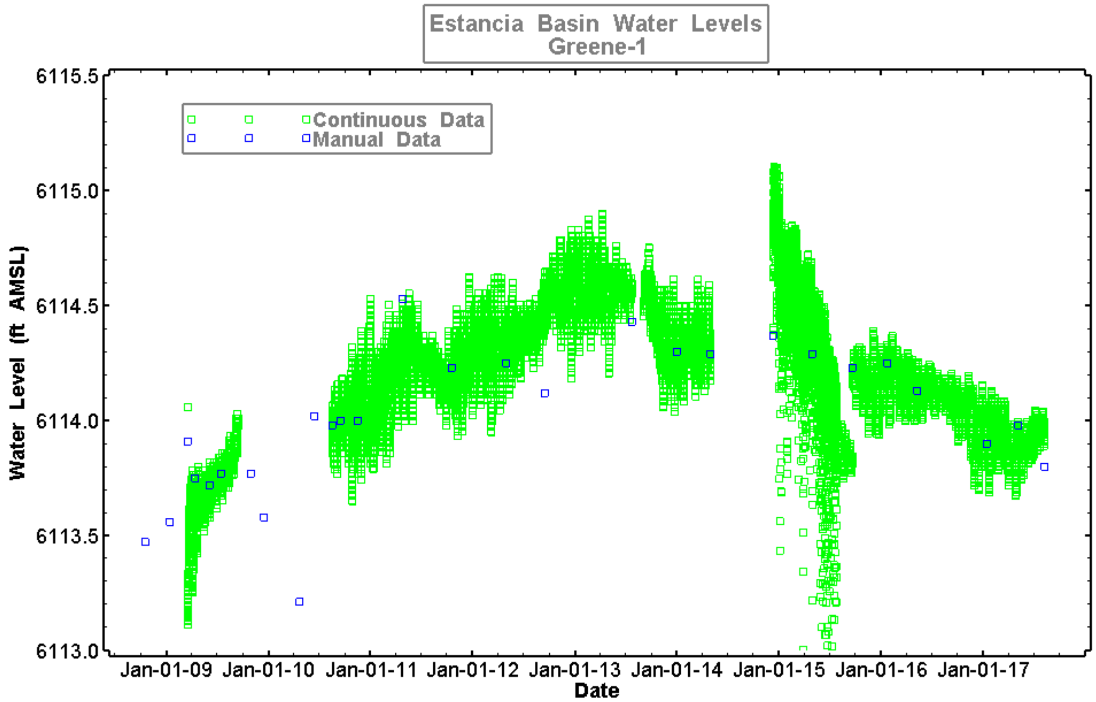


Figure 19. Water levels measured in the Greene-1 well.

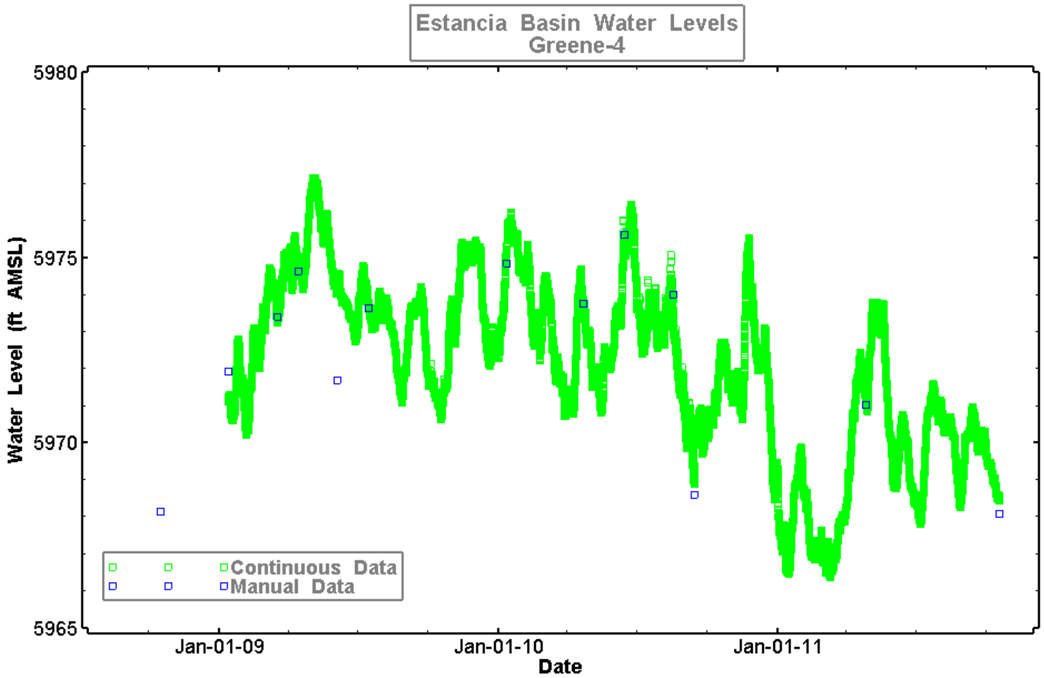


Figure 20. Water levels measured in the Greene-4 well.