

# Report on Testing of a New Water Supply Well at Pipe Spring National Monument

Dave Sharrow, Hydrologist, Zion National Park  
Larry Martin, Hydrogeologist, NPS Water Resources Division

## Introduction

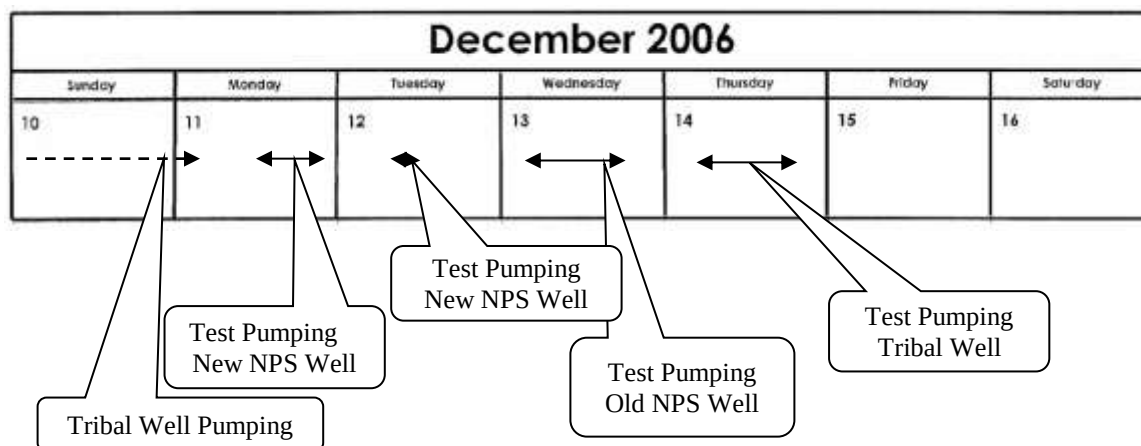
In December 2006, the National Park Service constructed a new water supply well for the joint NPS-Tribal water supply system. The well is located about 200 feet northwest of the old well and is about two miles north of the monument.

Testing was conducted during the week of December 11-15 to determine whether pumping from any of the wells in the area affects water levels in adjacent wells. The testing consisted of restricting pumping to one well at a time and monitoring water levels in the pumped well and the two wells that were not being pumped. The wells of concern in the area are; the Old NPS Well, the Tribal Well, and the New NPS Well. All of the wells are approximately 200 feet deep and obtain water from fractured bedrock of the Kayenta Formation along the West Branch of the Sevier Fault.

## Pumping Schedule

The NPS Wells (both the old and new wells) had not been pumped since Friday, Dec. 8. The Tribal well was pumped until about 8:00 Monday morning, Dec. 11. Water levels in the Tribal Well were rising during the first few days of the week as it recovered from the preceding pumping.

Test pumping of individual wells proceeded as shown in the following calendar.



The New NPS well was pumped at 160 gallons per minute (gpm) from 12:00-22:00 on Dec. 11 and again from 10:00-12:00 on Dec. 12. Electrical problems prevented pumping the well continuously for 24 hours as had been planned. The Old NPS well was pumped at a rate of 70 gpm from 07:00-19:00 on Dec. 13. The Tribal Well was pumped at a rate of 77 gpm from 07:00-19:00 on Dec. 14.

### Water Level Monitoring and Data Analyses

Manual measurements of water levels were made with electrical water level meters during the testing. Dataloggers were installed in the wells to measure and record water level data at 5 minute intervals, but did not always provide good data, for example when the depth of water over the instrument exceeded its tolerance.

Water level data for the Old NPS Well are shown in Figures 1 and 2. Water levels in the Old Well declined 6-8 inches when the New NPS well was pumped at 160 gpm. The distance between the old and new wells is 200 feet. Water levels in the Old Well declined less than 4 feet when it was pumped for 12 hours at 70 gpm. There was no observable water level change due to pumping of the Tribal Well. The Tribal Well is 700 feet southwest from the Old Well.

The datalogger in the Old Well was not operational during the period when the New Well was being pumped. Data were collected at 5 minute intervals during the pumping of the Old Well and the Tribal Well (Figure 2). No water level changes were observed due to the test pumping of the Tribal Well.

Water level data for the New NPS Well are shown on Figures 3, 4, and 5. Figure 3 shows the manual water level measurements made by Dave Sharrow and the well driller. The data show that when the well was pumped at 160 gpm the water level was drawn down from 89 to 127 feet below ground surface. When the pump was restarted the next day the water level was only drawn down to about 120 feet below ground surface. Less drawdown during the second pumping period is probably due to development of the well (pumping and removal of some of the fine-grained sediments and drilling mud, allowing water to move more freely into the well) during the initial pumping, resulting in a more efficient well.

Figure 4 shows the data collected at 5 minute intervals by the datalogger in the New NPS Well. Data collected during the test pumping of the New NPS Well are essentially identical to the manual measurements. The more frequent recording of water levels allows us to observe a slight water level decline during pumping of the Old NPS well. No water level changes were observed due to pumping of the Tribal Well.

Figure 5 shows an expanded version of the data collected by the datalogger in the New NPS Well. It shows that when the Old NPS Well was pumped there was an observed water level decline of about 3 inches in the New NPS Well. There was no observable water level change due to pumping from the Tribal Well. The distance from the New NPS Well to the Old NPS Well is about 200 feet. The distance from the New NPS Well to the Tribal Well is about 650 feet.

Figure 6 shows the manual water level measurements made in the Tribal Well. The water level declines from 88 to 100 feet below ground surface when the well is pumped at 77 gpm. The datalogger was only operational during the test pumping of the Tribal Well.

We do not have detailed datalogger measurements for the periods when the other wells were being pumped.

Figure 7 shows an expanded scale for the manual water level measurements at the Tribal Well made during test pumping of the Old NPS Well and the New NPS Well. In general, the water level was rising throughout the period as it recovered from the preceding pumping during the weekend prior to this testing. There are very small dips in the rate of recovery that might be attributed to the effects of pumping from the NPS Wells. These changes are on the order of a couple hundredths of a foot (less than  $\frac{1}{4}$  inch) and are inconsequential with respect to the production capacity of the Tribal Well.

#### Conclusions

Water table drawdown due to pumping is barely detectable at distances of 200 feet, the distance between the old and new NPS wells. No significant drawdown is detectable at distances greater than 600 feet between a pumped well and an observation well, the distance between the NPS wells and the Tribal Well.

Drawdown due to routine pumping at either of the NPS wells does not, and will not, affect the availability of water at the Tribal Well (and vice versa).

**Old NPS Well**  
**Dec. 11-15, 2006**

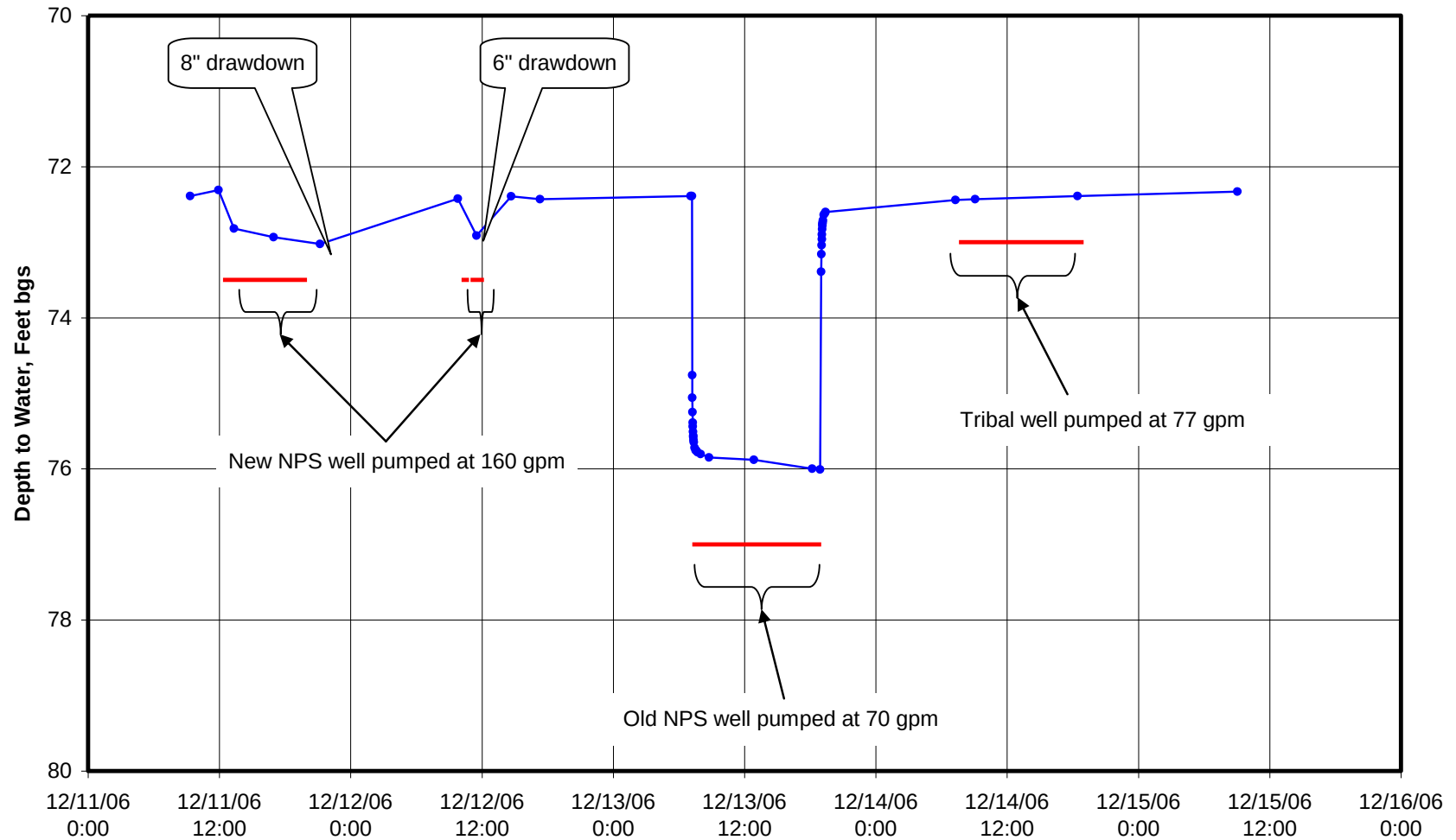


Figure 1. Manual water level measurements in the Old NPS Well.

**Old NPS Well**  
**Dec. 13-15, 2006**

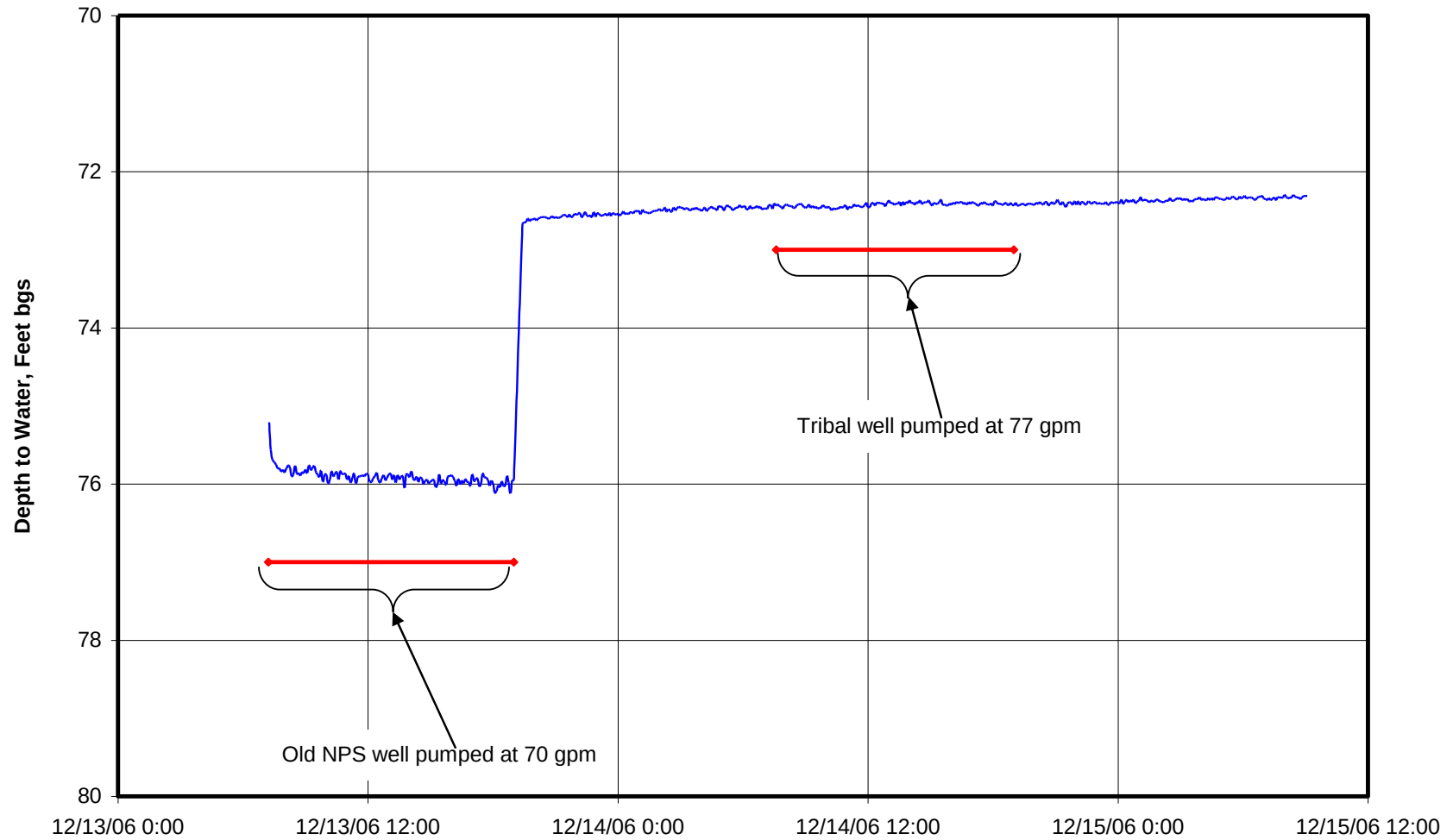


Figure 2. Water levels in the Old NPS Well recorded at 5 minute intervals.

**New NPS Well  
Dec. 11-15, 2006**

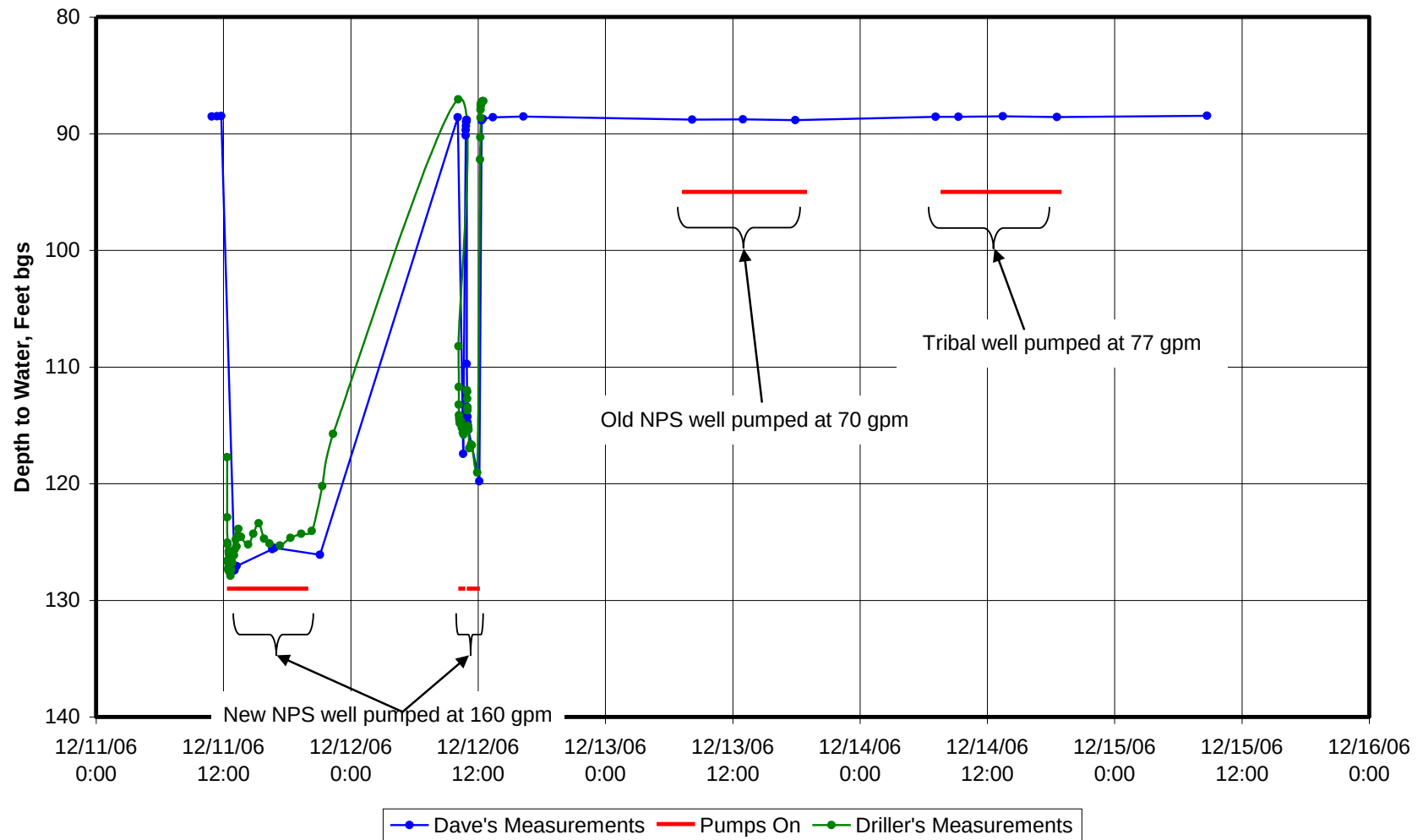


Figure 3. Manual measurements in the New NPS Well.

**New NPS Well  
Dec. 11-15, 2006**

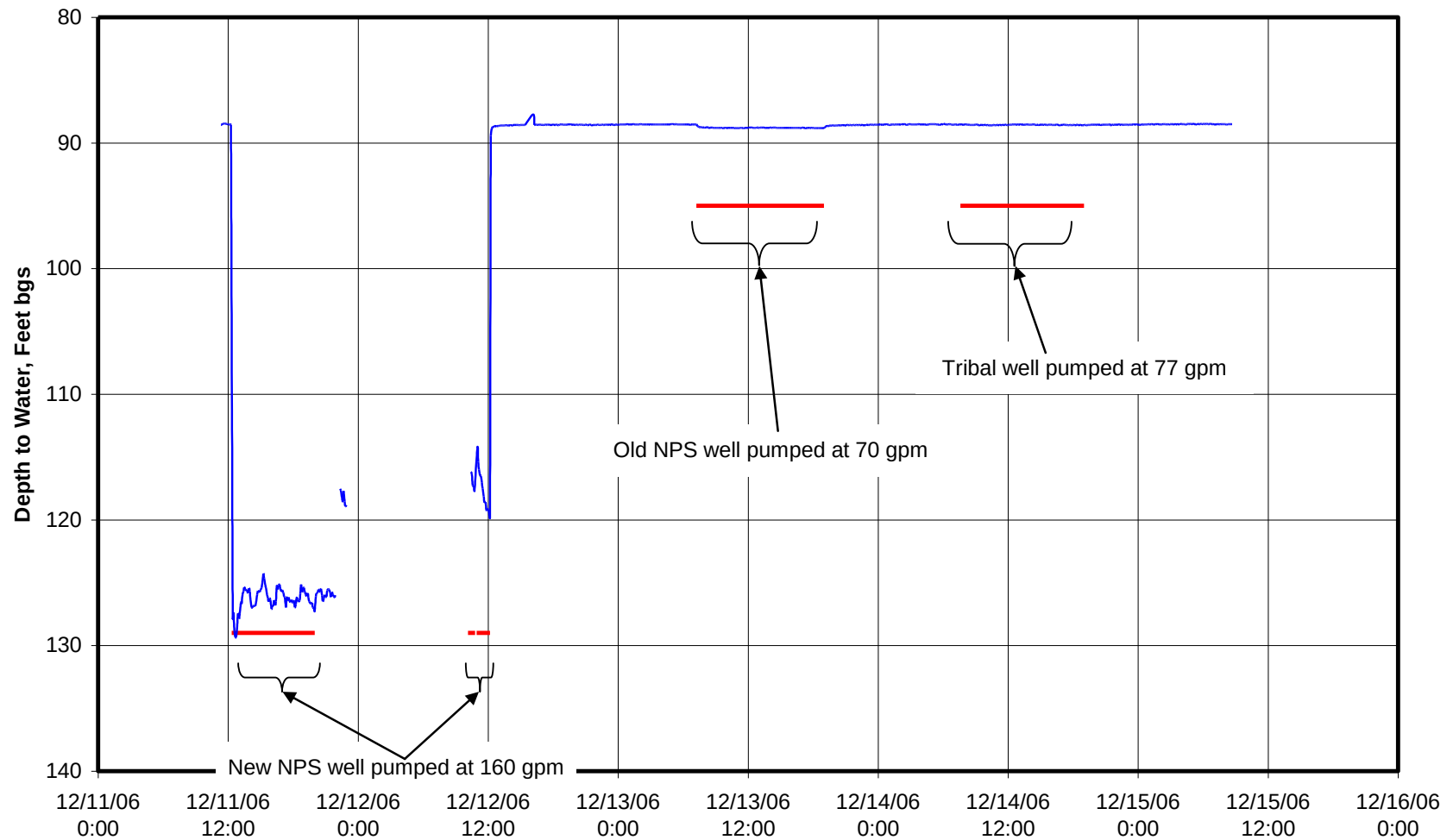


Figure 4. Water levels in the New NPS Well recorded at 5 minute intervals.

**New NPS Well  
Dec. 13-15, 2006**

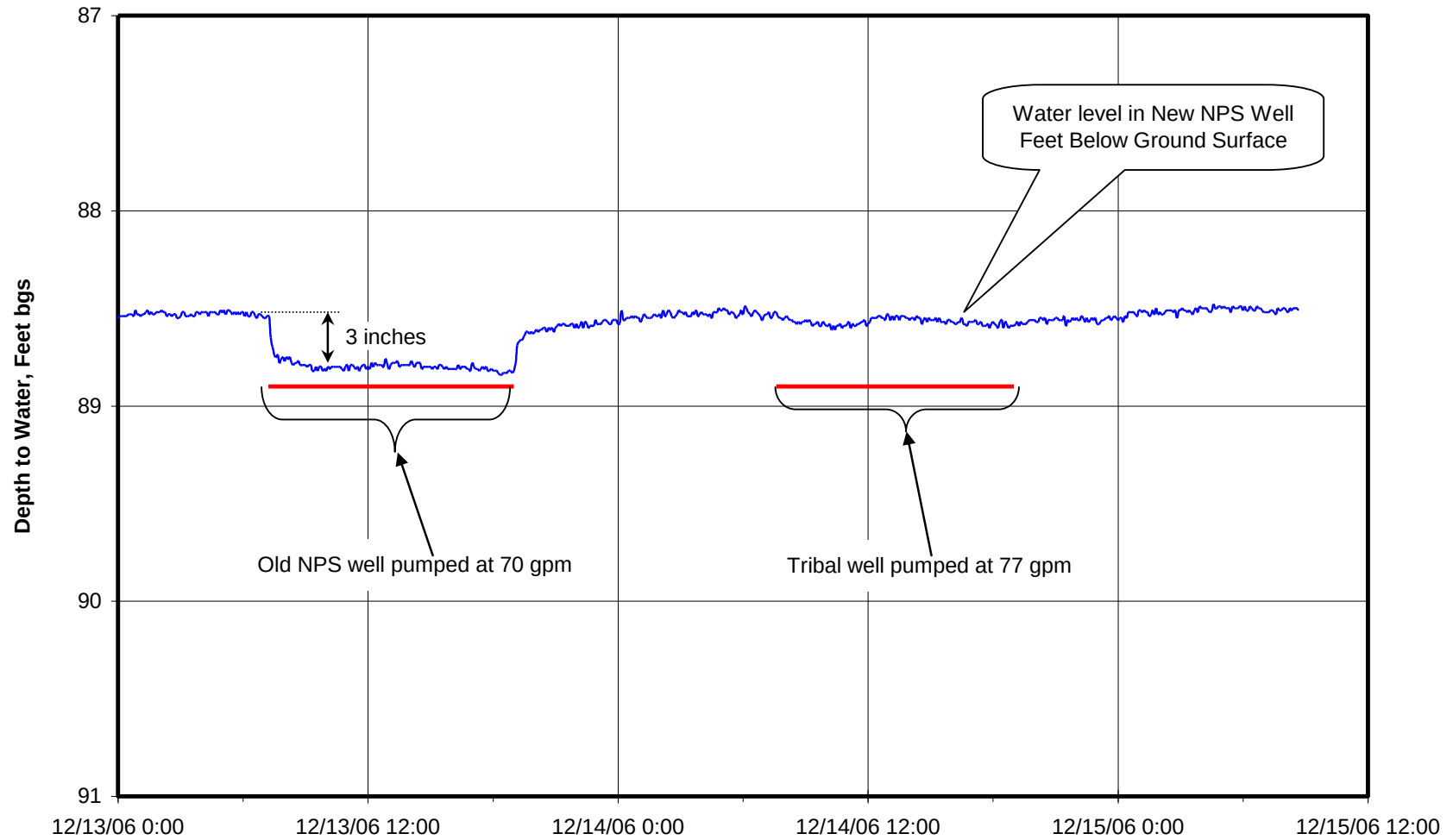


Figure 5. Detailed view of water level data showing water level decline in the New NPS Well due to pumping from the Old NPS Well.

**Tribal Well**  
**Dec. 11-15, 2006**

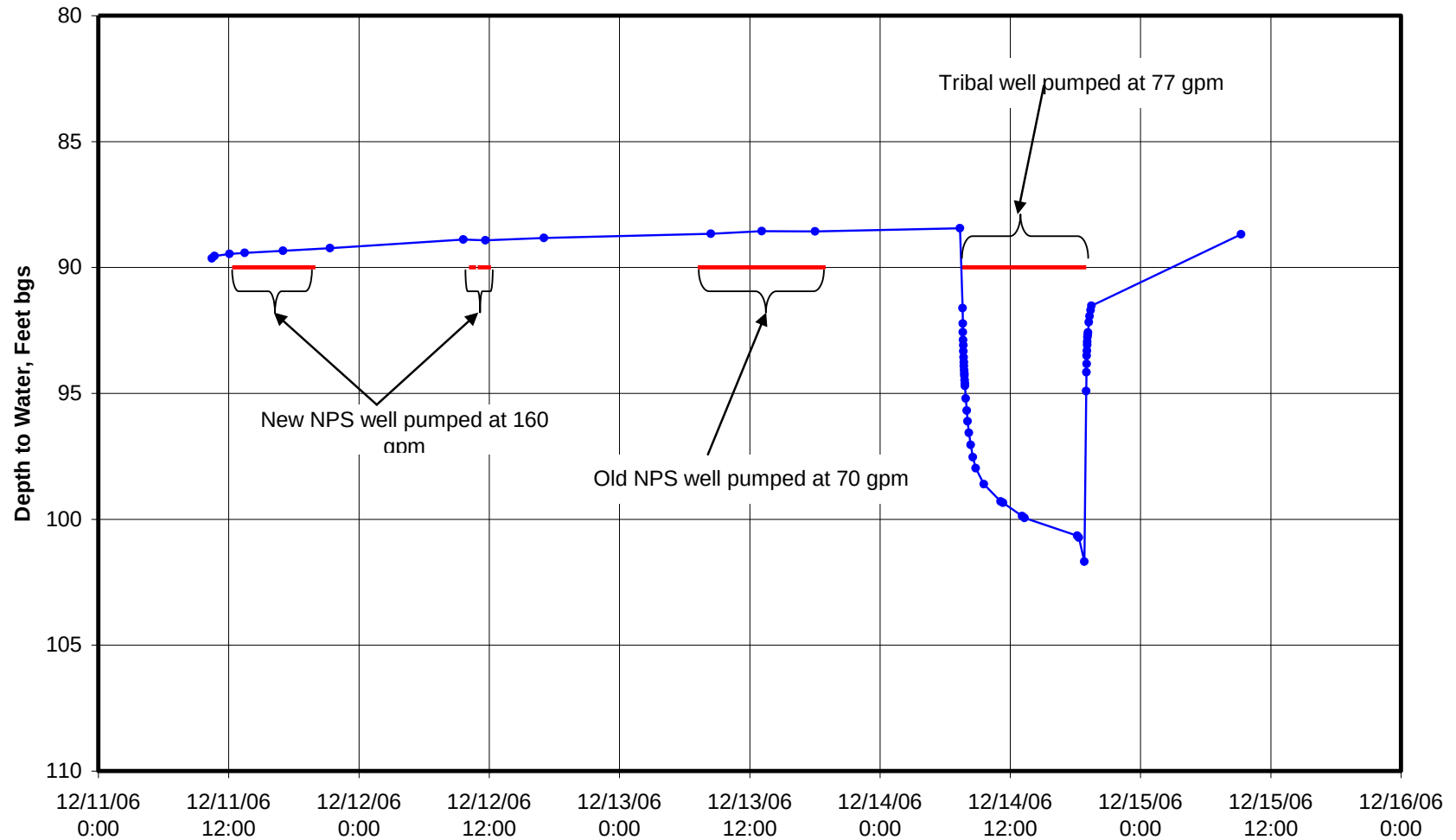


Figure 6. Manual water level measurements in the Tribal Well.

**Tribal Well**  
**Dec. 11-15, 2006**

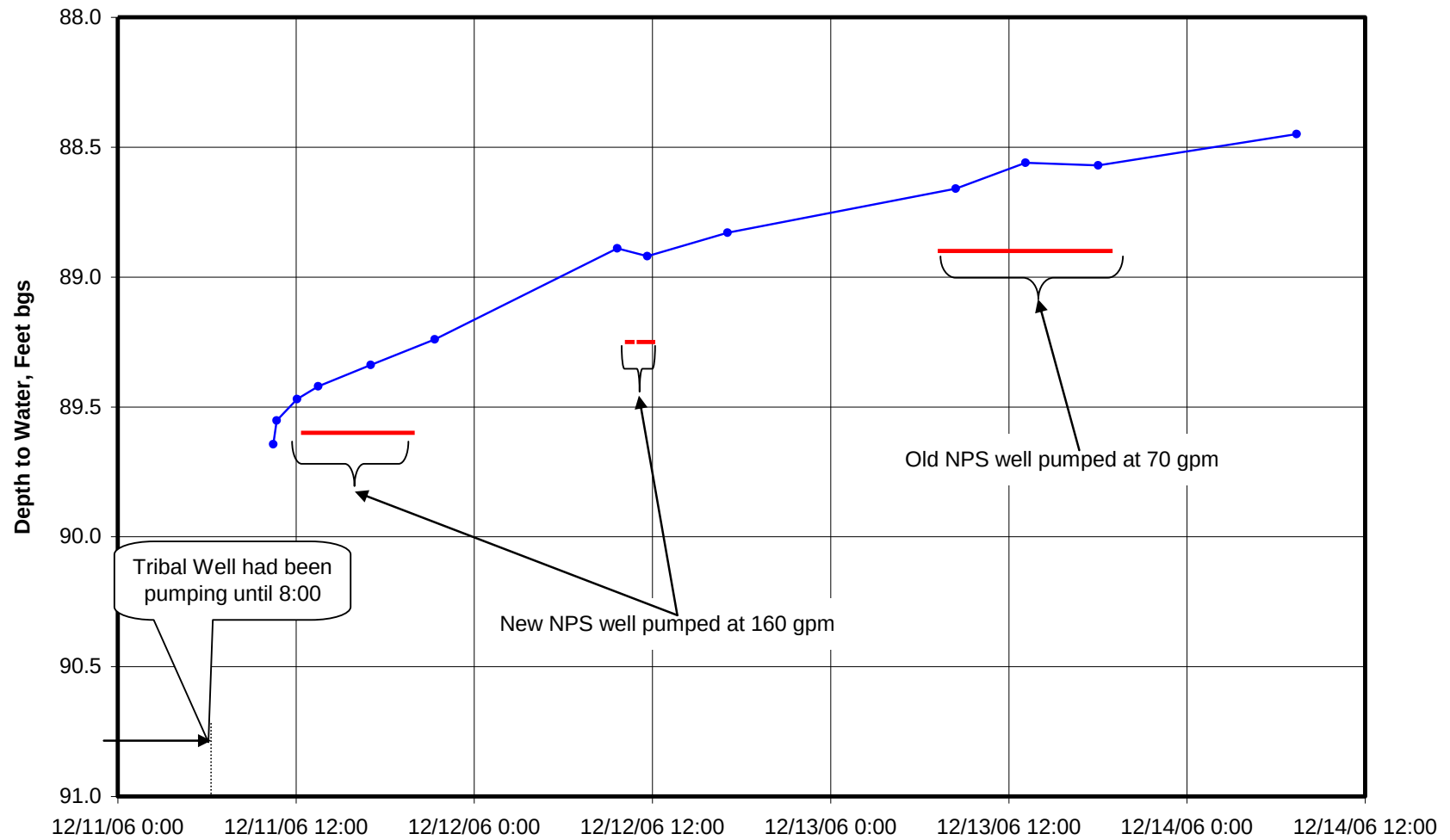


Figure 7. Expanded view of water level data for the Tribal Well showing effect of pumping at NPS wells.