

October 4, 2007

L54(2380)
ROMO/General

Memorandum

To: Bill Thompson, Chief of Facility Management, Rocky Mountain National Park
Tom O'Neil, Work Supervisor, Rocky Mountain National Park

From: Larry Martin, Hydrogeologist, Water Operations Branch, WRD

Subject: Testing of new well at Alpine Visitor Center

Summary: The well at the Alpine Visitor Center was tested by pumping continuously for 24 hours. The well produced approximately 9,500 gallons at an average pumping rate of about 6½ gpm. The pumping water level stabilized at about 450 feet below ground surface after 12 hours of pumping. The drawdown was about 225 feet below the initial static water level of 225 feet below ground surface. Water level recovery was monitored for 5 hours after pumping stopped. It appears that full recovery of the water level in the well would occur within 24 hours.

This testing indicates the well could meet the full demand for water at the Alpine Visitor Center. Continuous monitoring of water levels in the well is recommended during the full-scale operational testing during the summer of 2008 to assess the long-term reliability of the well as a water supply source for the Alpine Visitor Center.

Discussion: A test well was constructed on the north side of Fall River Road, a few hundred feet east of the Alpine Visitor Center in June 2007. The well penetrates granitic and metamorphic rocks and was drilled to a total depth of 660 feet. Significant water-bearing fractures were encountered at; 258-261 feet, 341-355 feet, and 597-600 feet. The borehole was reamed to 10-inch diameter and finished with 6-inch casing and well screen. There are two sections of 0.020" stainless steel well screen from 240-260 feet and 620-640 feet. The annular space between the well casing and the borehole was filled with 8-12 silica sand to allow water to freely flow from any depth in the well to the screened intervals. A cement grout surface seal was installed from the surface to 61 feet below ground surface. The well permit number is 273781 (Colorado State Engineer).

A Goulds 7GS15 submersible pump was installed in the well at a depth of 600 feet on September 19, 2007. The pump will produce 6-9 gpm when pumping water from 225-450 feet below

ground surface. Pumping rate decreases as the depth to water increases. The pumping rate for the majority of the test was about 6½ gpm (Figure 1).

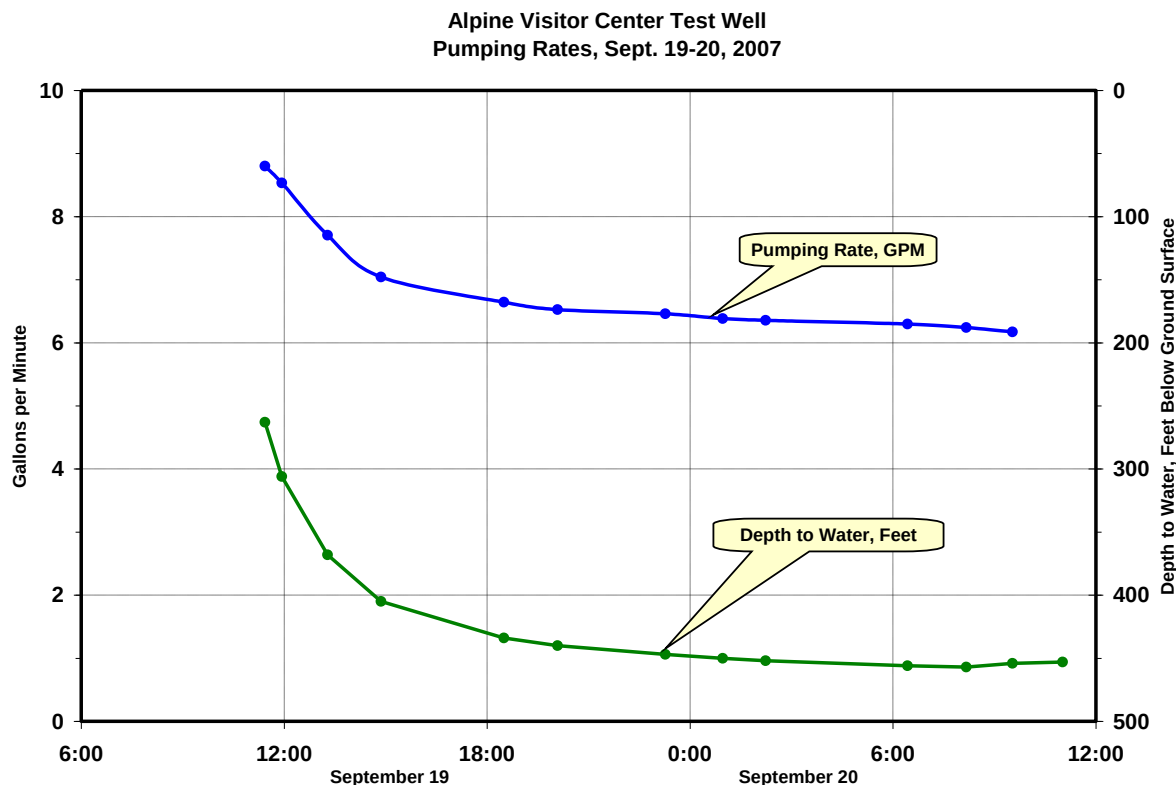


Figure 1. Correlation of pumping rate and depth to water in the test well.

The pumping test was started at 11:00 on September 19, 2007 and continued for 24 hours. The initial pumping rate was 9 gpm, but the rate decreased as the water level in the well was drawn down (Figure 1). A stable pumping rate of 6¼ to 6½ gpm was maintained for the last 18 hours of the test. A total of 9500 gallons was pumped during the 24-hour test, an average pumping rate of 6.6 gpm.

Static water level in the well at the start of the test was 224 feet below ground surface at the start of the test. Most of the drawdown occurred in the first 6 hours of pumping when the water level was drawn down 200 feet, from 225 to 425 feet below ground surface (Figure 2). During the remaining 18 hours of test pumping, the water level was drawn down an additional 25 feet to a final pumping level of 452 feet below ground surface.

Water level recovery was monitored for 5 hours after pumping stopped. There was 80% recovery during this time and it appeared that full recovery would occur within 24 hours. The drawdown and recovery curves are near “textbook” examples for data from a pumping test.

The pump motor was drawing 9.8 and 10.2 amps on lines 1 and 2 at the end of the 24-hour test when the water level was 452 feet below ground surface.

I have advised the staff of the Water Rights Branch of WRD of the need to establish a water right for use of water from this well. That task has been assigned to Bill Hansen. I will occasionally check with Bill to keep that moving forward.

It appears that the next step toward testing this well is to put it into operation and monitor its performance throughout a full season of use. A water level datalogger could be installed in the well to monitor water levels during pumping and recovery for an entire summer season. The data should provide a clear indication of whether water levels recover to nearly the same elevation after each pumping period or if there is a gradual decline of the water level due to pumping. The data will provide a basis for assessing the long-term sustainability of groundwater pumping from the well.

WRD staff have been migrating toward using Level Troll by InSitu Corp for water level monitoring (<http://www.in-situ.com/In-Situ/Products/LevelTROLL/LevelTROLL300.html>). A complete setup for monitoring water levels in this well will be approximately \$1000. WRD staff could install the datalogger, measure water levels and retrieve data once a month, and provide park staff with a summary and analyses of the data during the 2008 pumping season.

If there are any questions regarding this report, or if I have failed to provide adequate explanation, please call me at (970)-225-3515 to discuss it.

Alpine Visitor Center Test Well

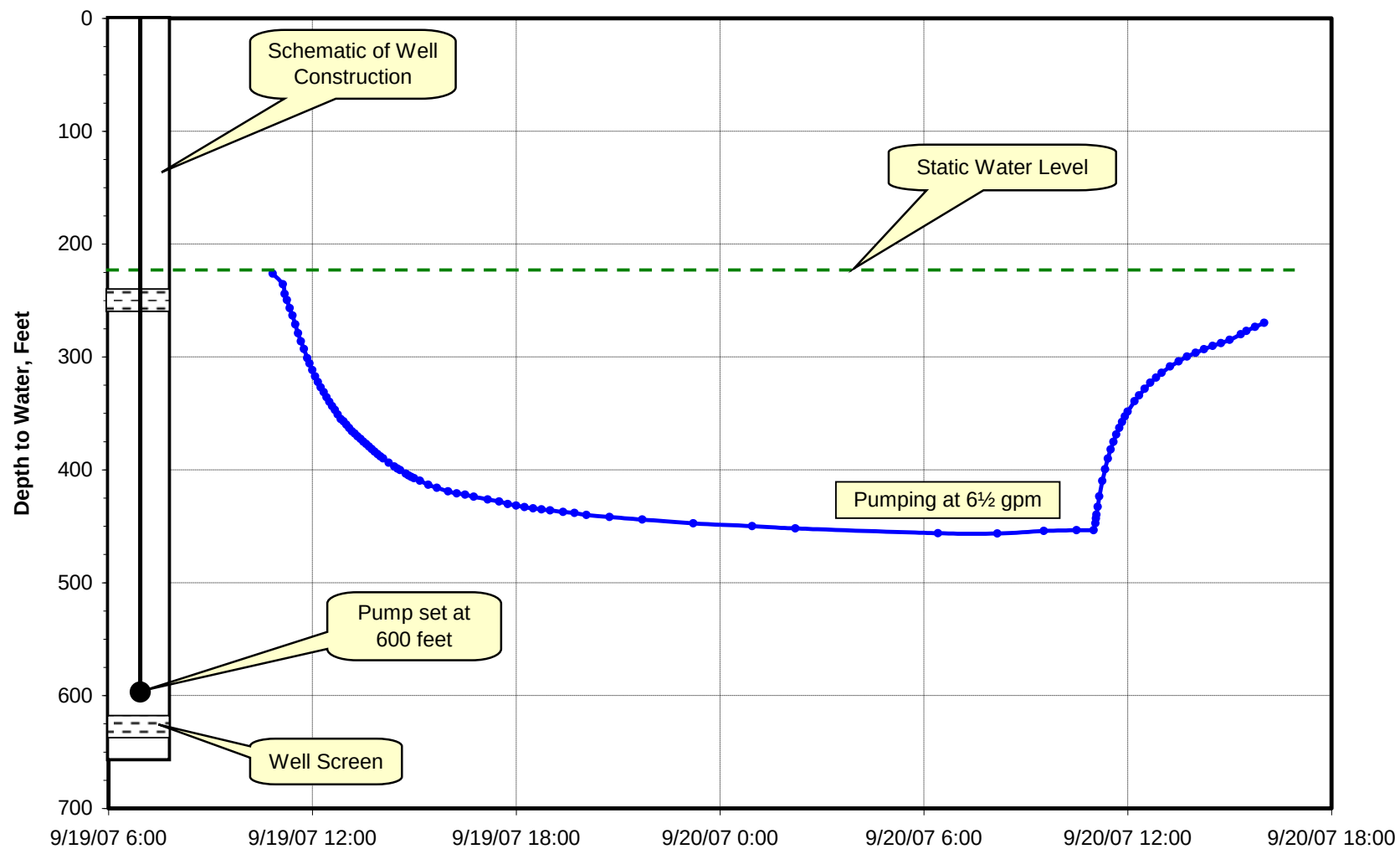


Figure 2. Water level in the test well during the 24-hour pumping test and 5-hours of monitored recovery.