United States Department of the Interior

U. S. GEOLOGICAL SURVEY

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November 5, 2010

MEMORANDUM

To: Devin Galloway, Ground-Water Specialist, Western Region, USGS

From: Keith J. Halford, Ground-Water Specialist, Nevada WSC, USGS

Subject: AQUIFER TEST—Analysis of BS-SW single-well aquifer test of carbonate-rock aquifer, southwestern Snake Valley, HA195, near Great Basin National Park, NV

A single-well aquifer test was conducted by the U.S. Geological Survey (USGS) in southwestern Snake Valley, HA195, near Great Basin National Park to estimate the transmissivity of the carbonate-rock aquifer (BS-SW; Figure 1). Well BS-SW was pumped for about 48 hours at 170 gpm between 14:28 November 2, 2010 and 13:48 November 4, 2010 and discharge was measured with a totalizing flowmeter. Transmissivity from the well BS-SW aquifer test will help characterize flow to Big Springs, southern Snake Valley, Nevada.

Site and Geology

The aquifer test occurred in southwestern Snake Valley where groundwater development has been proposed (Welch and others, 2007). Basin-fill deposits were encountered from land surface to 215 ft below land surface. Fractured carbonate-rocks were encountered between 215 and 700 ft below land surface. Significant water-bearing intervals occurred between 500 and 700 ft below land surface. Depth to water in the completed well was about 355 ft below land surface. Thickness of the permeable carbonate rocks is unknown.

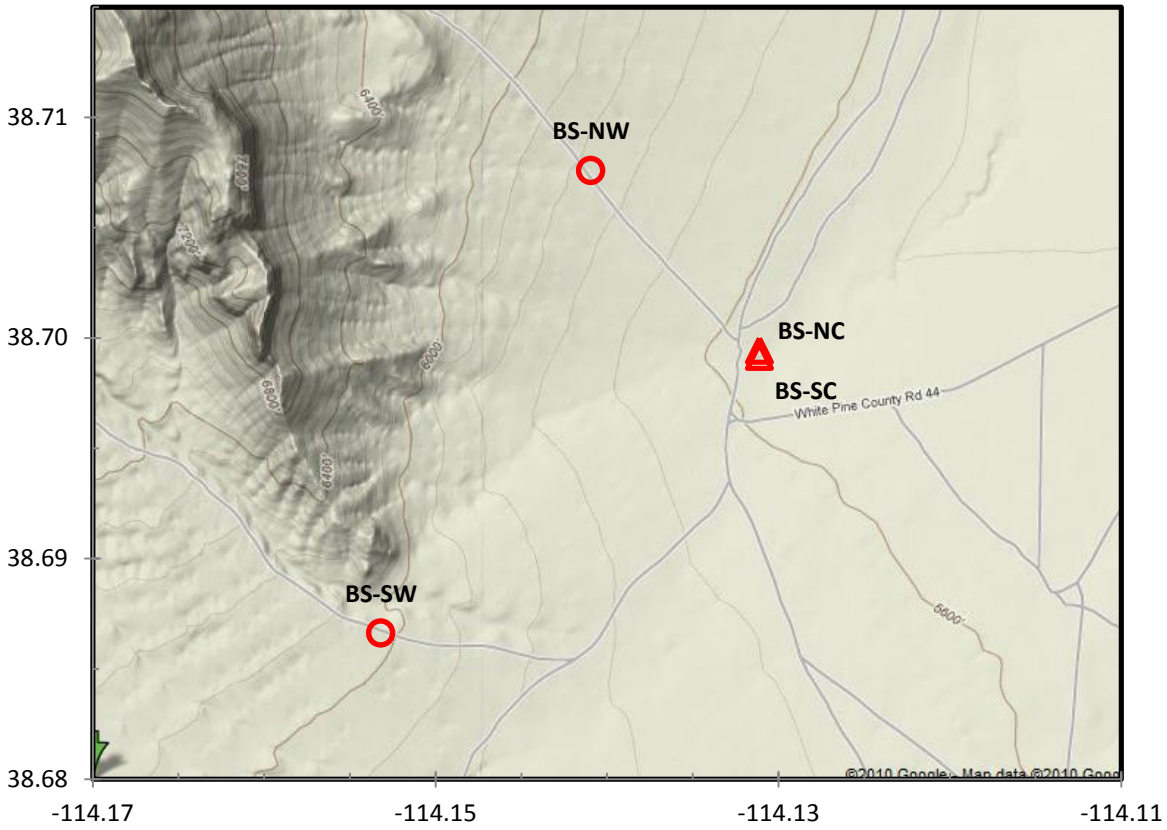

Figure 1.—Location of wells BS-NW and BS-SW and Big Springs gages, BS-NC and BS-SC, in Snake Valley, Nevada as referenced to North American Datum of 1983 (NAD 83).

Table 1.—Well location and construction data for wells near Big Springs, southwestern Snake Valley, Nevada.

[Latitude and longitude are in degrees, minutes, and seconds and referenced to North American Datum of 1983 (NAD 83); ft amsl, feet above North American Vertical Datum of 1988 (NAVD 88); ft bgs, feet below ground surface; na, not available.]

Map Identifier	SITE IDENTIFIER	Latitude	Longitude	Ground surface elevation, ft amsl	Depth to Static Water Level, ft bgs	Diameter Screen, in inches	Top Screen, ft bgs	Bottom Screen, ft bgs
BS-NW	384227114082701	38°42'27"	114°08'27"	5,815	228	8	300	460
BS-SW	384112114091101	38°41'12"	114°09'11"	6,020	355	8	500	700
BS-NC	102432241	38°41'58"	114°07'52"	5,571	na	na	na	na
BS-SC	10243224	38°41'57"	114°07'52"	5,571	na	na	na	na

Water Levels and Drawdowns

Water levels were measured in well BS-SW (Figure 2). Water levels in well BS-SW were 356 feet below land surface, prior to pumping. Water levels were monitored a few weeks prior to the BS-SW aquifer test and during the test. The monitoring period was prolonged so pumping effects could be differentiated from barometric changes, tidal fluctuations, and seasonal declines.

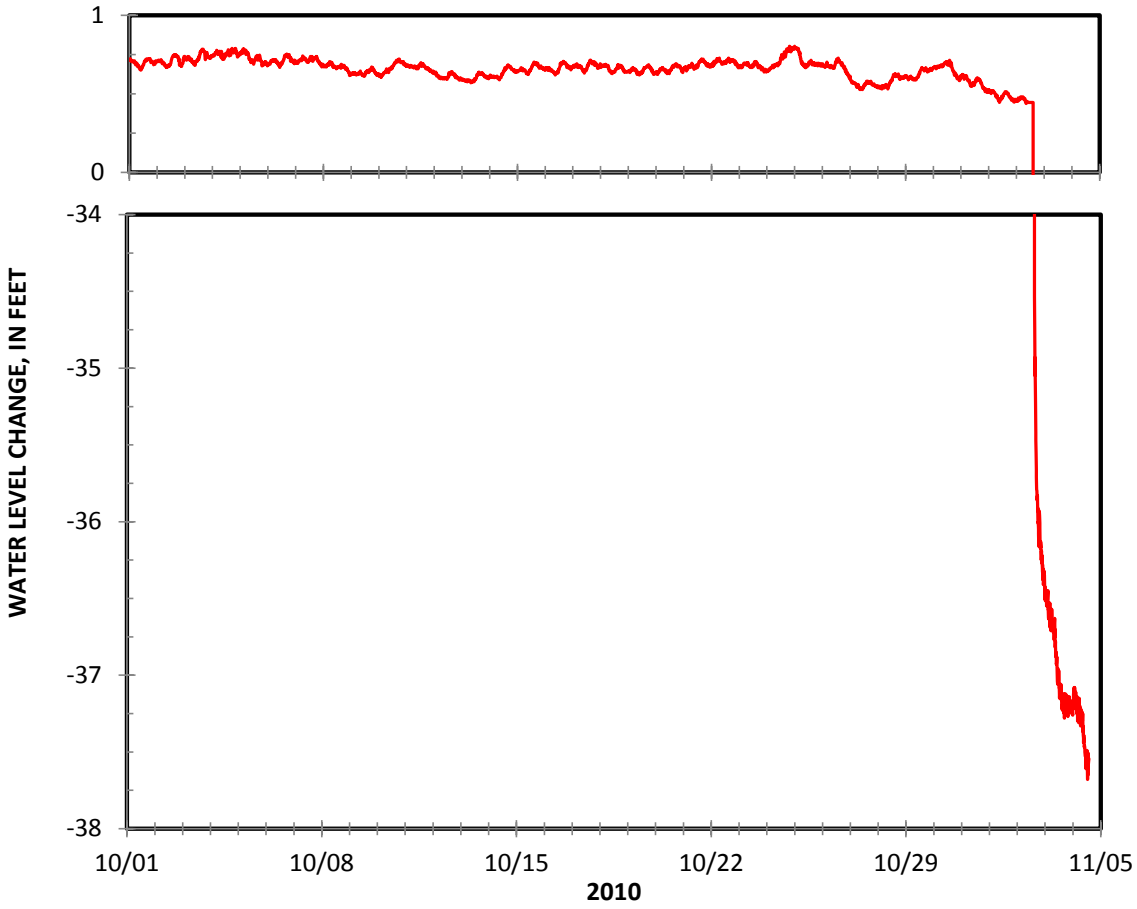

Figure 2.—Water-level changes in well BS-SW between October 1, 2010 and November 4, 2010.

Drawdowns in well BS-SW were estimated by subtracting the water level prior to pumping from measured water levels. The water-level modeling technique (Halford, 2006) was not applied because environmental fluctuations of 0.1 ft were diurnal and seasonal declines were less than 0.01 ft during the 48-hr test.

Analysis

The estimated transmissivity of the carbonate-rock aquifer was 4,000 ft²/d (Figure 3). Drawdowns in well BS-SW were interpreted with the Cooper-Jacob method (Cooper and Jacob, 1946) as implemented by Halford and Kuniansky (2002). Drawdowns exhibited a confined response for the duration of the aquifer test. The full thickness of the carbonate-rock aquifer likely was investigated because the aquifer is confined (Halford and others, 2006).

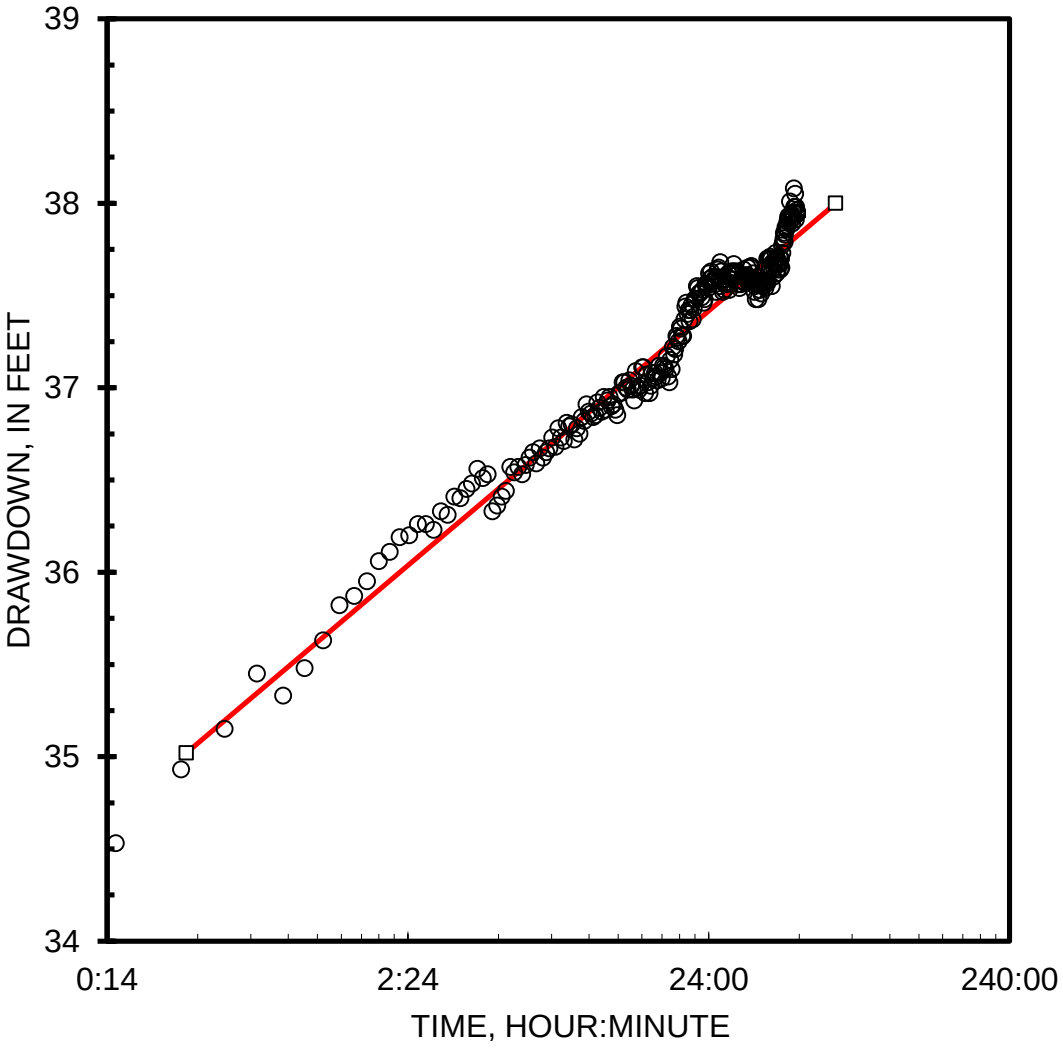

Figure 3.—Drawdowns and straight-line approximation in well BS-SW during 48-hour aquifer test.

References

Cooper, H.H., and C.E. Jacob. 1946. A generalized graphical method for evaluating formation constants and summarizing well field history. American Geophysical Union Transactions 27: 526–534.

Halford, K.J., and Kuniansky, E.L., 2002, Spreadsheets for the analysis of aquifer-test and slug-test data, version 1.1: U.S. Geological Survey Open-File Report 02-197, 51 p., http://water.usgs.gov/pubs/of/ofr02197/

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Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage: Am. Geophys. Union Trans., vol. 16, pp. 519-524.

Welch, A.H., Bright, D.J., and Knochenmus, L.A., 2007, Water resources of the Basin and Range carbonate-rock aquifer system, White Pine County, Nevada, and adjacent areas in Nevada and Utah: U.S. Geological Survey Scientific Investigations Report 2007-5261, 96 p.