United States Department of the Interior

U. S. GEOLOGICAL SURVEY

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MEMORANDUM

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

From: Tracie R. Jackson, Graduate Student, University of Nevada Reno
Keith J. Halford, Ground-Water Specialist, Nevada WSC, USGS

Subject: AQUIFER TEST—Analysis of single-well aquifer test along Snake Creek, Snake Valley, White Pine County, Nevada

A single-well aquifer test was done in Snake Valley, Nevada, to estimate the hydraulic properties of basin-fill deposits in the vicinity of a preexisting Nevada Department of Wildlife (NDOW) well used for domestic supply adjacent to Snake Creek (Figure 1). The NDOW well was pumped for 5 hours at 17 gallons per minute (gpm) on June 23, 2009. The aquifer test was part of a larger study funded by the National Park Service through the Southern Nevada Public Lands Management Act (SNPLMA) Round 8 Conservation Initiative Project. The purpose of the study was to characterize the hydraulic connection between the groundwater and surface water along an 8-km section of Snake Creek by estimating streambed and underlying aquifer hydraulic properties from the Great Basin National Park boundary to the Nevada-Utah border (Jackson, 2010). Hydraulic property estimates from the aquifer test will constrain calibration of a regional U.S. Geological Survey groundwater flow model used to determine the hydraulic properties of the basin-fill deposits near the southern Snake Range mountain front and their connection to surface water resources. The hydrological study was prompted by proposed export of groundwater from Snake Valley to southern Nevada by the Southern Nevada Water Authority (SNWA, 2008).

Google Earth image of aquifer test (accessed October

Figure 1—Location of single-well aquifer test, Snake Valley, Nevada.

SITE AND GEOLOGY

The aquifer was tested at the Spring Creek Rearing Station on NDOW land in Snake Valley (Figure 1). The well is about 240 ft south of Snake Creek, about 1.5 mi east of the Great Basin National Park boundary, and about 3.4 mi west of the Nevada-Utah state line. The basin-fill aquifer is of either Quaternary alluvium or Miocene deposits. The Quaternary alluvium contains poorly sorted, unconsolidated boulders, gravels, sands, silts, and clays derived from glacial outwash and sediments that were transported by modern drainage systems flanking the Snake Range (Miller et al., 1995). The Miocene deposits are composed of coarse-grained, moderately to well-cemented alluvial deposits that formed during middle Miocene uplifting of the Snake Range. This geologic unit is consolidated and typically conglomeratic. The Miocene deposits include brecciated megablocks and typically are overlain by coarser fluvial, glacio-fluvial, alluvial, and debris-flow deposits. The brecciated megablocks are composed of Paleozoic rocks originally present in the western Snake Range. Some megablocks are monolithologic, whereas other megablocks have varying lithologies (Asch and Sweetkind, 2010; Jackson, 2010).

The NDOW well was drilled to a depth of about 32 ft, and has perforated casing from 15 to 30 ft below the top of the casing. During a 5-hour aquifer test, the well was pumped at a constant rate of 17 gpm. The NDOW well penetrated either Quaternary alluvium or Miocene deposits. The USGS site identifier and local well name are 385503114062201 and 195 N12 E70 15BADB1 FISH STATION, respectively.

Table 1—Location and construction of NDOW well.

[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 1929 (NAVD 29)]

Well Name	Latitude	Longitude	Altitude, ft amsl	Screened interval, feet below ground surface		Inner Diameter, inches
				Top	Bottom	
NDOW Well	38°55'6.1"	114°06'22.2"	5,885	15	30	6

MEASUREMENTS

The single NDOW well was tested (Table 1). Water levels were measured at 3 minute intervals with a pressure transducer with an accuracy of ± 0.02 ft (Schlumberger, 2008). Water levels also were measured routinely in the well during and immediately after the test using an electric tape with a resolution of 0.01 ft.

The well was pumped at a constant 17 gpm for 5 hours as measured with a 5-gallon bucket. Discharge rates were limited by the top of the screened interval and pump intake. The drawdowns were estimated by subtracting the water level prior to pumping from the subsequent water levels (Figure 2). An offset in the transducer record was corrected by shifting water levels 0.70 ft after 1.6 hours of pumping.

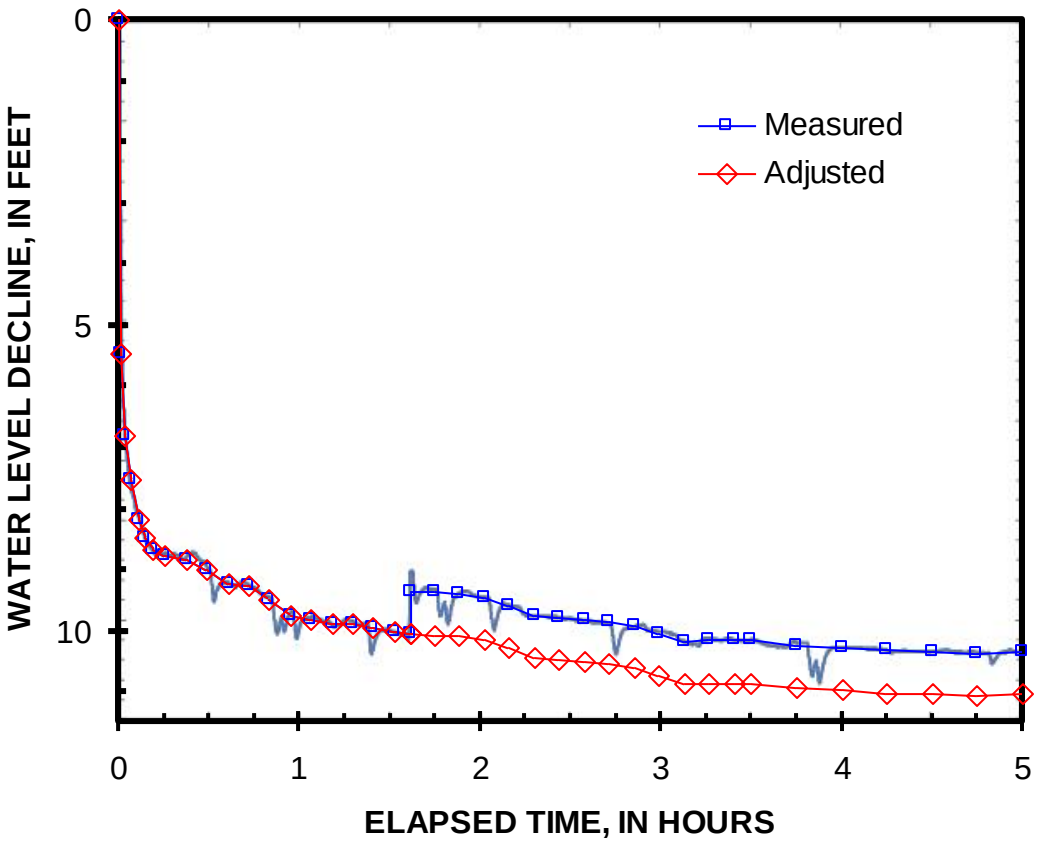

Figure 2.—Water level changes in NDOW well during 5-hr test, June 23, 2009.

ANALYSIS

Transmissivity of the carbonate-rock aquifer was 300 ft²/d (Figure 3). Drawdowns in NDOW well 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.

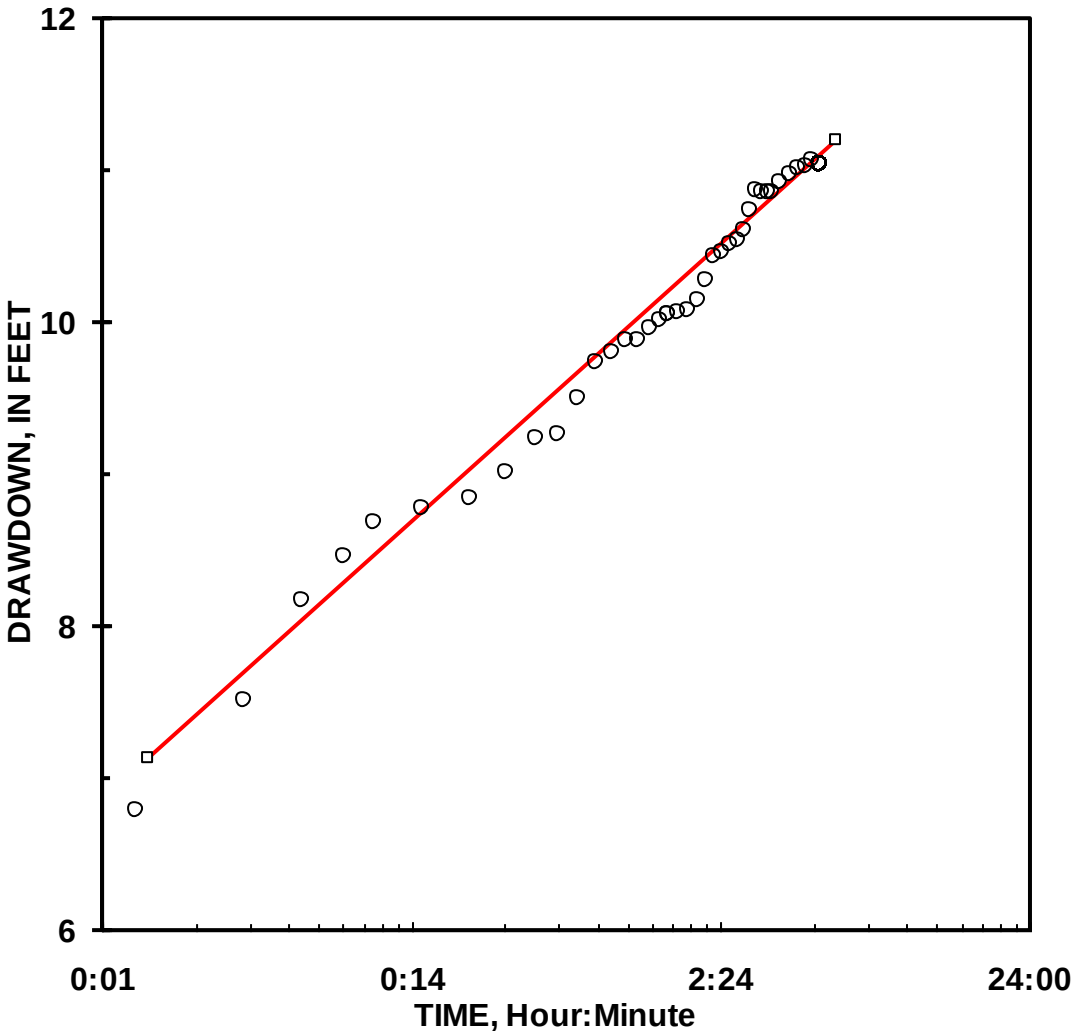

Figure 1.—Drawdowns and straight-line approximation in NDOW well during 5-hour aquifer test.

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