OVERVIEW

A nine-day, 917 gallons per minute (gpm) constant-rate aquifer test was conducted by Hydro Logic, Inc. for M3 Eagle, LLC in the Big Gulch vicinity of North Ada County during the Spring of 2008. Water levels were measured in 22 on-site and 2 off-site wells for two-to-five days before and two weeks after the nine-day, pumping portion of the test. The site in this instance is the approximately 6,000-acre M3 Eagle property shown on Figure 1.

HLI designed and provided full-time supervision of the nine-day discharge test, and also supervised pre- and post-test measurements. In all the effort covered the period March 1-31, 2008. Before beginning this work, HLI directed a comprehensive well development program of high-pressure water jetting, surge block swabbing, and isolation packer-pumping of the screened interval of the SVR #7 well (the pumping well for the aquifer test). Each of the 23 observation wells for the test was inspected with a down-hole video camera, swabbed, bailed, and/or tested to ensure its viability as a monitoring well. Those wells equipped with pumping plants had the equipment removed prior to development and designated monitoring tubes installed when the pumps were replaced in the wells.

The SVR#7 well was pumped at a constant and continuous pumping rate of 917 gpm (± 0.5 percent) for 12,970 minutes (9 days). Discharge from the pumping well was piped to a stock pond approximately 900 feet from the pumping well; this ultimately spilled over into the dry Big Gulch Creek. Discharge was measured at the well with a propeller-type, totalizing in-line flow-meter. Discharge was measured again at the end of the discharge pipe at the stock pond by means of a transducer-equipped, circular orifice weir. Approximately 12 million gallons of water were pumped during the drawdown portion of the test.

The water level in the pumped well (SVR #7) at the end of the test was measured at 193.78 ft bgl (feet below ground level), as compared to the pre-test, non-pumping level of 165.21 ft bgl; thus, the test produced a drawdown of 28.57 feet. The calculated nine-day specific-capacity was 32.1 gpm/ft. Most of the drawdown observed in the pumping well was the result of low well efficiency (calculated at 15 percent) caused by frictional flow through a louvered well screen, torch-cut perforated pipe, and a crushed-gravel "hole-filler" used to envelop the completion interval of the well during its original construction. Water level measurements in the pumping well, as with all of the observation wells for this test, were obtained with steel-tape-calibrated electric sounders and programmed pressure-transducer/data-loggers over the entire month-long test (pre-test, draw down, recovery).

Water level responses in observation wells during the test were measurable but small, ranging from 1.71 to 0.09 feet in observation wells located 845 feet to more than two miles from the pumping well, respectively The relatively small drawdown observed in

the pumping well, and the shallow regional drawdown "cone of depression" generated in the Pierce Gulch Sand Aquifer during the test, indicate that sustainable pumping yields in excess of 2,000 gpm are possible from properly designed and constructed water supply wells beneath the western and central portions of the M3 property.

The maximum drawdown in the nearest observation well ("Big Gulch stock well") located 845 ft from SVR #7, was1.71 ft. The furthest responding observation well (SVR #9, at 11,660 ft from SVR #7, indicated a drawdown of 0.09 ft. Several of the observation wells located from 8,173 to 22,302 feet from SVR #7 indicated no measurable drawdown response during the test.

Analysis of the test data by HLI demonstrates that the Pierce Gulch Sand Aquifer beneath the foothills areas north of the City of Eagle is more transmissive than previously believed with a mean aquifer transmissivity of 420,000 gallons per day per foot (gpd/ft). The data were analyzed using Aqtesolv® after preprocessing with Excel spreadsheet software to quantify and remove barometric effects and regional aquifer water level trends. The results of the Aqtesolv® analyses indicate that the Pierce Gulch Sand Aquifer (pumped by SVR #7 and monitored by most of the 22 observation wells) has a transmissivity ranging from 450,000 to 580,000 gpd/ft and a storativity averaging $3x10^{-3}$ (unitless) beneath the western and central portions of the M3 property.

The calculated transmissivity values are lower, and the storativity values higher, beneath the eastern and central portions of the property where the Pierce Gulch Sand Aquifer rises to the surface, has a smaller saturated thickness, and is mostly unconfined. In these areas the transmissivity ranges from 180,000 to 300,000 gpd/ft with storativities (specific yields) on the order of 0.1 to 0.2; large values for both coefficients. Theis (1935) analyses of drawdown data proved most effective because most observation wells were too far from the pumping well to use the Cooper-Jacob (1946) method. Barometric Efficiency is quite high, ranging from 33% to 99% in wells on the M3 property, supporting HLI's conclusion (HLI, 2007) that the Pierce Gulch Sand Aquifer is somewhat cemented.

The results of our analyses indicate that the Pierce Gulch Sand Aquifer beneath the M3 site has characteristics similar to those in the Pierce Gulch Sand Aquifer beneath the greater Eagle-Star vicinity. The Pierce Gulch Sand Aquifer is highly transmissive beneath both upland and valley regions. The analyses reported from this test are comparable to the high-transmissivity results reported in the reanalyses of Valley aquifer tests reported in HLI (2008b).

Our interpretation of borehole geophysical logs, high-quality lithologic logs (from both on-site and from several wells to the south in the greater Eagle and Star vicinity), and previously conducted aquifer tests, has resulted in an improved understanding of the hydrogeologic framework of the Pierce Gulch Sand Aquifer and the overlying shallow alluvial sub-aquifers present beneath parts of he M3 site and beneath areas to the south. This refined understanding helped to guide the design and was essential to our analysis of the data from the SVR #7 aquifer test.

The SVR #7 nine-day aquifer test satisfies our previous recommendation (HLI, 2008b) to conduct a major aquifer test in the North Ada County foothills. This prolonged hydraulic testing at 917 gpm, a rate comparable to a many other municipal water supply wells in the area, allowed the pumping well cone of depression to be monitored at distances of over 2 miles. The results of this test help to further refine and support the previous analyses of the Pierce Gulch Sand Aquifer as *the* major regional water supply aquifer in the greater M3-Eagle-Star vicinity. The aquifer test is meaningful and useful because: **a**) the testing period was sufficiently long and the pumping rate sufficiently high to adequately characterize true aquifer response, **b)** the three-dimensional hydrogeologic framework of the aquifer system is now better understood because of careful analysis of borehole geophysical logs and careful lithologic analysis, **c)** the effects of atmospheric pressure changes and pre-test water level trends were removed as part of the data analysis, **d)** only one well (SVR #7) was pumping during the test, **e)** water level measurements were made at one-minute intervals using electronic data loggers carefully calibrated to hand-measured levels, and **f)** rigorous state-of-the-art, computer-based analytical techniques were used to ascertain whether the chosen methods were applicable over the time-period of analysis. None of the previous tests conducted within the greater Eagle-Star-M3 vicinity have met all six of these criteria.

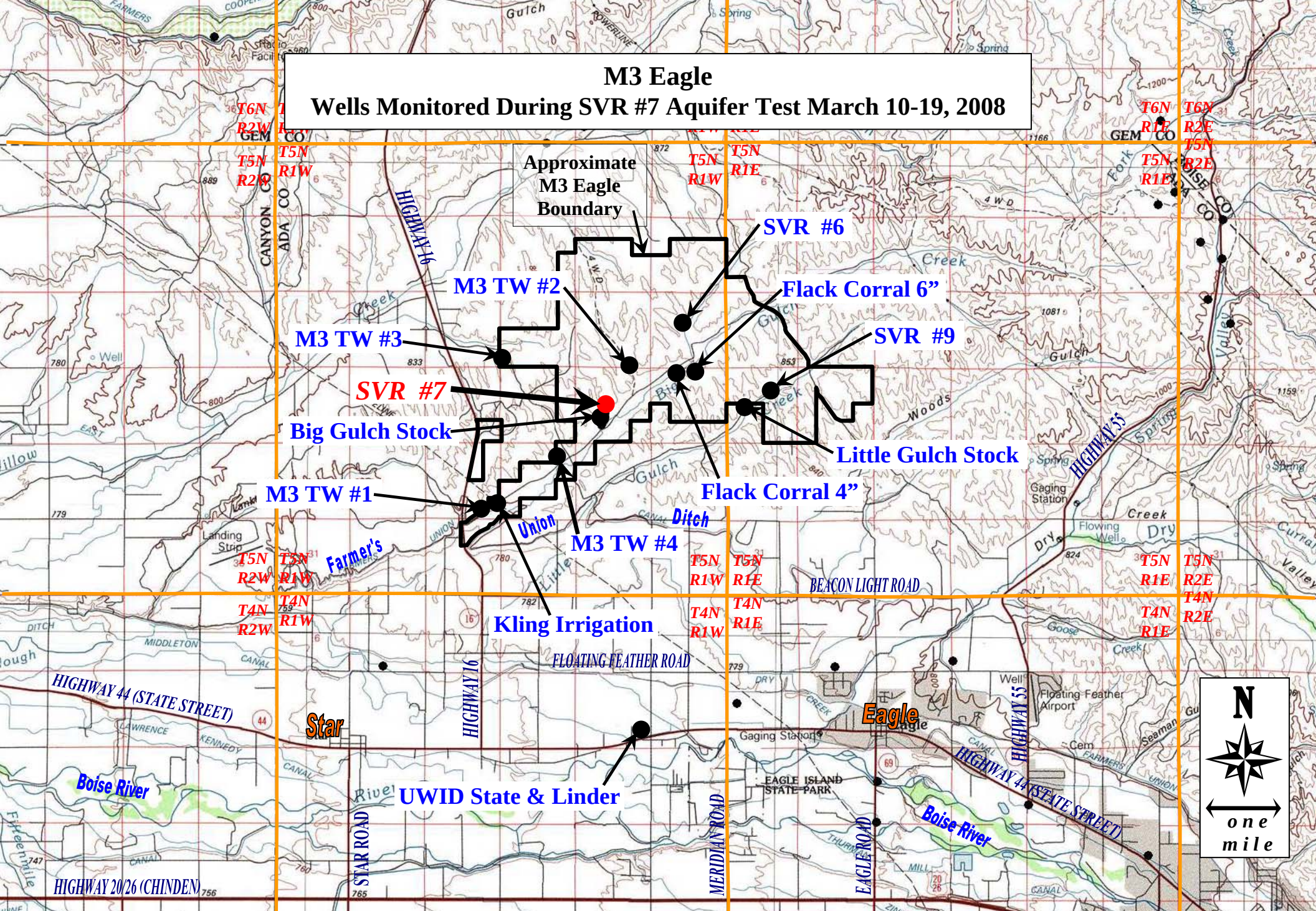

Figure 1. Base map is a (1:100,000 scale) USGS map.