GLORIETA GEOSCIENCE, INC.
P.O. Box 5727 Santa Fe, NM 87502
(505) 983-5446 Fax (505) 983-6482
E-mail: ggi@glorietageo.com
Web Address: www.glorietageo.com

Memorandum

TO: Levi Kryder, Darrell Lacy
FROM: Jay Lazarus, Pres./Sr. Geohydrologist, Elke Naumburg, PhD., Ecohydrologist
DATE: February 21, 2013
RE: Trigger Levels at Stump Springs associated with Ground Water Diversions at the Hidden Hills Solar Electric Generating Facility

---

INTRODUCTION

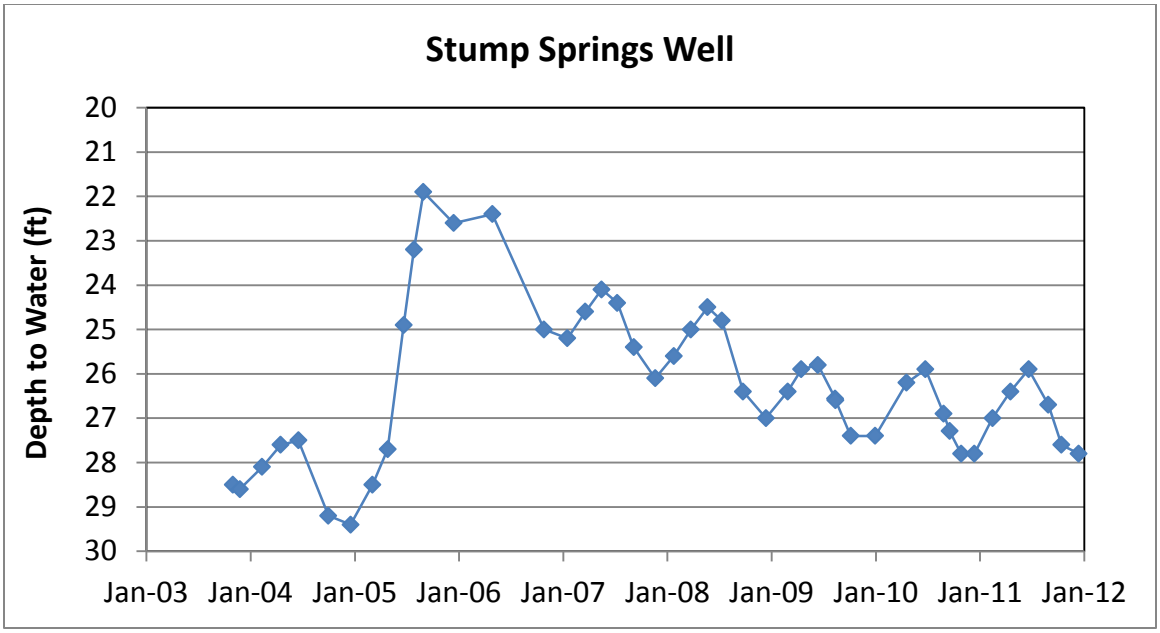
Nye County requested that Glorieta Geoscience, Inc. (GGI) assess the proposed trigger level of 6 inches at Stump Springs that would be implemented if future pumping from the BrightSource/Hidden Hills Solar Electric Generating Station (BrightSource; HH) caused water levels in Stump Springs to decline and potentially adversely affect mesquite and acacia habitat. No mesquite or acacia species in the vicinity of Stump Springs and HH are currently listed as threatened or endangered.

WATER FOR MESQUITE & ACACIA

Mesquite and acacia require more water to survive in the Mojave Desert than direct precipitation provides. Sources of water to support these species can come in the form of runoff enhancing soil moisture or the capillary zone above shallow groundwater. Based on data discussed below and analyses of aerial photography it is apparent that mesquites in the Stump Springs drainage receive water from shallow recharge associated with near-surface alluvial fan deposits and geologic structures.

The average depth to water in the Stump Springs well has been 26.25 ft (8 m) between October 2003 and December 2011 (USGS online NWIS database). Intra-annual variation in water levels in the well are at least 2 ft (see figure below). Assuming that the water table depth in the well is representative of the Stump Springs area, the mesquite is growing in an area that has a water table significantly above the maximum ground water elevation required for the species.

GLORIETA GEOSCIENCE, INC.
P.O. Box 5727 Santa Fe, NM 87502
(505) 983-5446 Fax (505) 983-6482
E-mail: ggi@glorietageo.com
Web Address: www.glorietageo.com



HH EFFECTS ON STUMP SPRINGS AREA WATER LEVELS

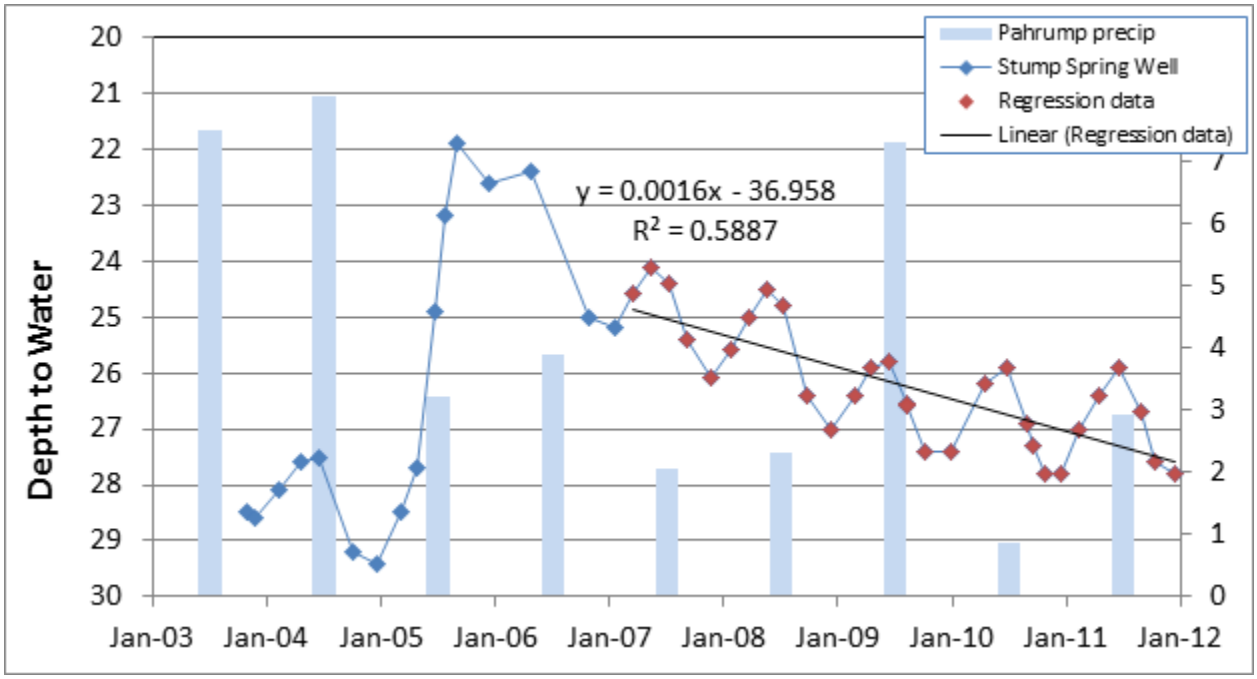
Based on the data provided by HH (Cardo Entrix, 2012) depth to water at Hidden Hills is 135 ft. Well logs from the HH pumping test report do not describe the presence of water above 135 ft. This suggests that mesquite in the HH area is likely dependent on surface runoff recharging shallower zones rather than deeper groundwater. Riesterer (2012) predicted a water level decline of 0.17 ft at Stump Springs after pumping the HH well field at 280 afa for 3 years and 140 afa for the next 27 years. Based on the model output, water levels in Stump Springs will not be affected by proposed HH diversions.

STATISTICAL TREND ANALYSIS OF WATER LEVEL DATA

In principle, fluctuating data can be detrended ***IF*** data exists that we know has a direct and immediate effect on water levels. The USGS report (USGS Scientific Investigations Report 2006-5024) cited in the California Energy Commission (CEC) staff report is an example. However, the USGS report analyzed short-term (~2 weeks) data impacted by easily measurable variables such as barometric pressure. In the case of inter- and intra-annual variation in water levels, detrending data is much more difficult. For example, precipitation recharge does not directly and immediately affect water levels. To find a statistical relationship for detrending requires a large data set, but even then it will be a relatively poor correlation that will yield limited usefulness for detrending. Also, if monitoring wells are to be drilled for the project, then obviously no long-term data will be available.

GLORIETA GEOSCIENCE, INC.
P.O. Box 5727 Santa Fe, NM 87502
(505) 983-5446 Fax (505) 983-6482
E-mail: ggi@glorietageo.com
Web Address: www.glorietageo.com

Analysis of Stump Springs data available from USGS indicates an overall downward trend after the 2003/2004 recharge event that can be reasonably described by a linear regression, but each year's cycle differs from the previous years. Precipitation cannot explain the annual minima (Dec) differences between years range between 0 and 0.9 ft.



Therefore, if pumping at the BrightSource has an effect on water table elevations, would be equivalent to conducting a pumping test, methods described in the USGS report can be utilized. If we are looking at long-term effects the lack of easily measurable and highly predictive variables seriously calls into question the ability to detrend the water level data sufficiently to detect a 6-inch BrightSource effect. This is especially true for wells that do not have at least a 10-yr monthly-resolution history of water level data prior to the project.

CONCLUSIONS

Given the natural fluctuations in the Stump Springs area, a 6-in decline trigger cannot be technically supported because inter-annual variations in water levels cannot be detrended to detect a BrightSource effect.

REFERENCES

California Energy Commission, 2013, Staff Rebuttal Testimony, Docket 11-AFC-2

CardoEntrix, 2012, Long-Term Aquifer Performance Test Report 2, Hidden Hills Solar Electric Generating Site, unpublished consulting report to BrightSource Energy, 599 pp.

Riesterer, J. 2012 Evaluation of pumping from proposed BrightSource project site, unpublished Glorieta Geoscience, Inc. consulting report to Nye County, 6 pp.

Halford, K. 2006, Documentation of a Spreadsheet for Time-Series Analysis and Drawdown Estimation, U.S. Geological Survey Scientific Investigations Report 2006-5024, 38 pp.