(760) 878-0001

FAX: (760) 878-2552

EMAIL: mail@inyowater.org

WEB: http://www.inyowater.org

COUNTY OF INYO
WATER DEPARTMENT

Memorandum

Date: February 8, 2013

To: Dana Crom, Deputy County Counsel

From: Bob Harrington, Water Director

Subject: Hidden Hills Solar Electric Generating System – Rebuttal to Applicant's comments on Water Supply section of the California Energy Commission Final Staff Assessment.

Cc: Kevin Carunchio, CAO
Randy Keller, County Counsel
Greg James, Special Counsel
Josh Hart, Planning Director

The follow are comments on the Applicant's opening testimony concerning the California Energy Commission Final Staff Assessment (FSA) for the Hidden Hills Solar Electric Generating System (Project). These comments pertain to the section titled Water Supply of the Applicant's Exhibit 71, (Docket Log #69215).

Aquifer parameters and interpretation of aquifer tests. The Applicant's claim that the transmissivity values used in the FSA are unrepresentative is unfounded. While the aquifer tests provide useful estimates of aquifer parameters, they are not conclusive because of their short duration and the limited area affected by the tests. The aquifer tests conducted by the applicant were for short time periods relative to the life of the project – days versus decades – so the aquifer test affected a small volume of aquifer material relative to that which may be affected over the life of the project. Predictions based on extrapolating the results of these short duration tests over the life of the project contain large uncertainties. These uncertainties are unrecognized in the Applicant's testimony. The Applicant argues that the assumptions made in the FSA concerning aquifer properties are "unsupportable and extreme" resulting in a wide range in predicted drawdown in the FSA. The FSA properly recognizes the uncertainty

present in conducting such an analysis and properly uses a range of values and conditions to bracket the potential effects of the project.

The Applicant argues that the FSA errs in treating the aquifer as a confined aquifer. The Applicant's opening testimony (Water Supply Figure 2) provides a cross section of the aquifer at the Project site, showing the aquifer as bound above and below by fine-grained clayey material, which would be the typical stratigraphy of a confined aquifer. The Applicant is correct in asserting that the data from the aquifer tests are consistent with leaky aquifer models; however, the Applicant greatly overstates their case when characterizing the FSA's aquifer analysis as invalid.

The principal flaw in the Applicant's analysis of the aquifer test results is their reasoning that because the test stabilized over a period of days, it would remain stable over the life of the project. They interpret that leakage from adjacent confining units provided a source of water that stabilized water levels in the aquifer. This is a reasonable interpretation of the effects observed during the test, but when extrapolating these results to the life of the project, it must be determined whether the withdrawal of leakage from the confining units is sustainable for the life of the project. The Applicant criticizes the FSA's estimate of drawdown at the Stump Spring well of 0 to 19 feet as being "extremely large and results from the use of insupportable and extreme aquifer property assumptions" (Water Supply p. 18). The Applicant makes the unequivocal statement that "No drawdown will occur beyond the site boundaries" (Water Supply p. 18), i.e., there will be no drawdown at the Stump Spring well. The FSA's range of 0 to 19 feet includes the Applicant's claim of no drawdown, but also places an upper bound on drawdown that may occur.

<u>Effect of the State Line Fault on groundwater flow.</u> The applicant argues that the State Line Fault, northeast of the project site is "a barrier to groundwater flow and therefore disconnects variations in groundwater conditions on the southwest side (where HHSEGS site is located from the northeast side (where Stump Springs and other groundwater related resources exist)" (Water Supply p.5) and that it is "a flow barrier, separating the HHSEGS site from the water related resources on the Nevada side of the border" (Water Supply p. 6). The Applicant also testifies that "groundwater flows in a southwest direction in the southern part of the basin" (Water Supply p. 13) and "The valley-fill aquifer that would be used by the project is primarily recharged in the eastern portion of the basin from runoff in the Spring Mountains" (Water Supply p. 13). Elsewhere, in a presentation from the Applicant titled "Analysis of Groundwater Conditions" (Docket Log # 65767) the Applicant argued that the regional gradient results in groundwater flow from northeast to southwest, and that this regional flow needs to be considered when interpreting aquifer test data from the site. Figure 1 is from the applicant's presentation, showing contours of groundwater hydraulic head running from northwest to southeast. Groundwater flows in the direction perpendicular to these contours, from higher values to lower, that is, Figure 1 implies that groundwater flows from northeast to southwest, crossing the State Line Fault.

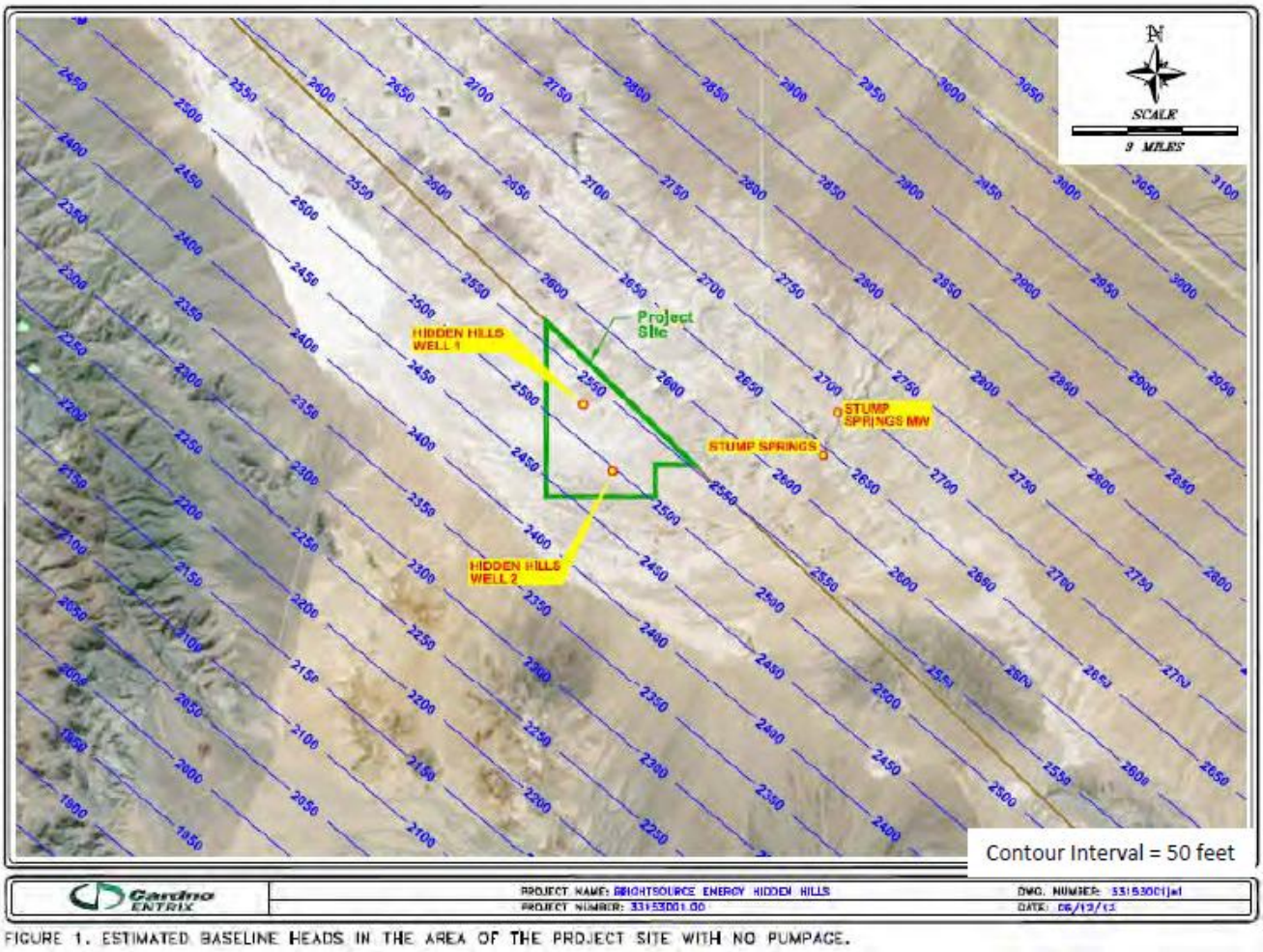


Figure 1. Pre-project groundwater contours from the Applicant's June 14, 2012 presentation (Docket Log #65767).

A hydraulic head map similar to Figure 1 was produced by a US Geological Survey study (Harrill, 1986, Figure 7) and is shown here as Figure 2.

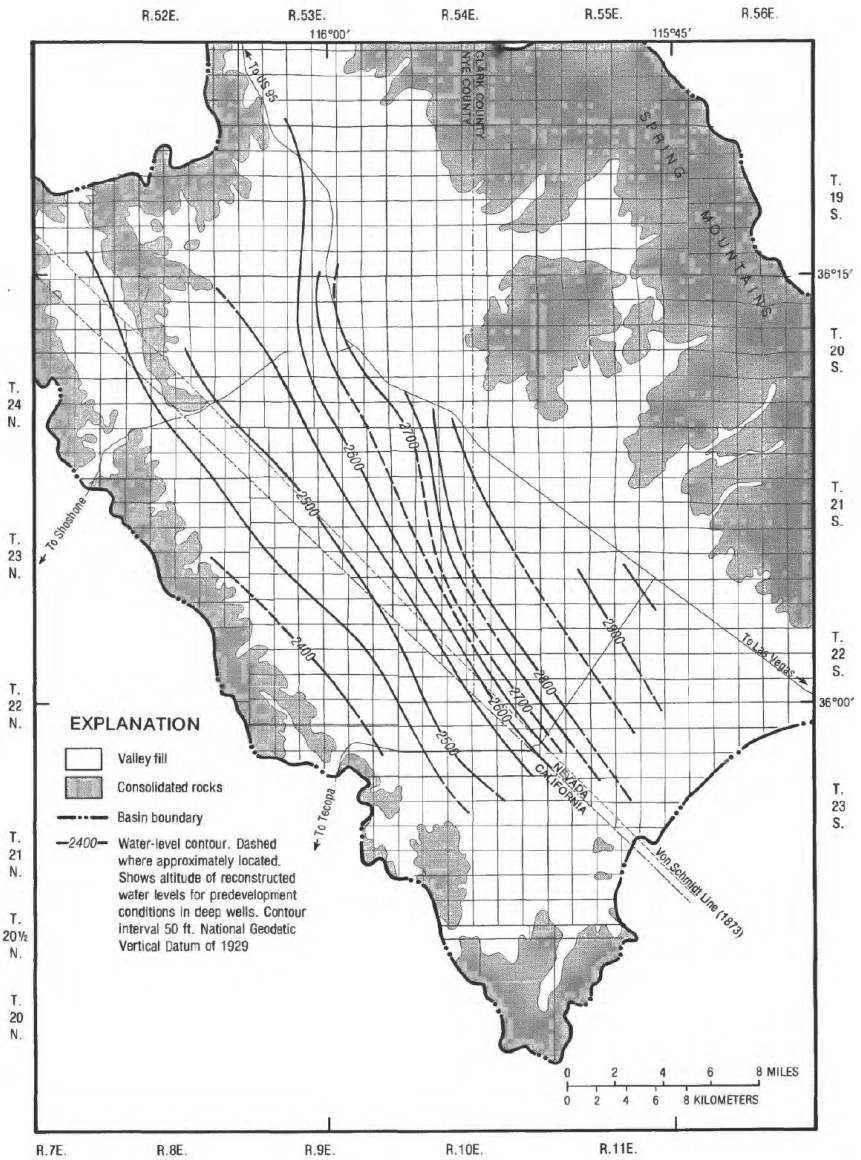


Figure 7. Water-level contours for deep wells under predevelopment conditions.

Figure 2. Pre-development groundwater hydraulic head contours from Harrill (1986).

Harrill concluded that groundwater "left the valley by evapotranspiration from areas of shallow groundwater and <u>by subsurface outflow beneath the Nopah Range</u>" (emphasis added). This is contrary to the Applicant's testimony that the State Line Fault disconnects the Project site (and, consequently, the Nopah Range, at the southwestern margin of the basin) from the northeastern part of the basin. The steepening of the gradient in the vicinity of the fault indicates that the fault is a low permeability zone; however, the continuity of the gradient across the fault indicates that the fault does not wholly disconnect the basin. Moreover, the Applicant makes contradictory claims that, on one hand, the State Line Fault disconnects the

southwest and northeast sides of the basin, and on the other hand, that the project site is recharged from the Spring Mountains and regional flow across the fault is important to consider. In the event that the Applicant is correct that the Project site is disconnected from sources of recharge in the Spring Mountains, the aquifer system at the site is isolated from the Spring Mountains, which is the most significant recharge zone in the basin, further justifying the cautionary approach used in the FSA.

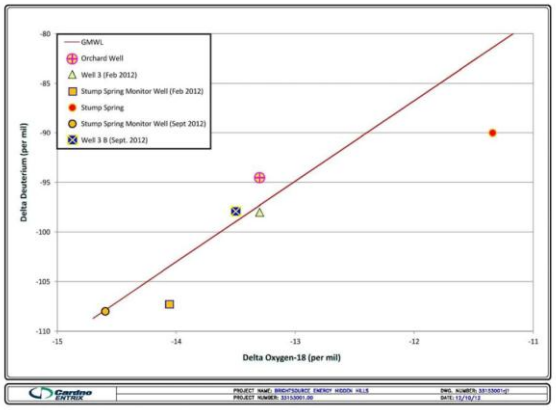
The Applicant asserts that groundwater mounding is present along the State Line Fault due to upward flow of groundwater along the fault. They cite their Figure 2 (Harrill's Figure 6) as evidence for this claim. It is clear from the locations of monitoring wells in the Applicant's Figure 1 that the existing monitoring network is insufficient to actually observe the purported groundwater mounding. Further, the Applicant's reliance on their Figure 2 as evidence for mounding is misplaced. The Applicant's Figure 2 shows contours of depth to water, not water table elevation, and the contour pattern that the Applicant claims as evidence for mounding could also be produced simply by the interaction between sloping topography, a sloping water table, and the fault acting as a partial barrier to groundwater flow. This memo's Figure 2 (Harrill's Figure 7), a map of water table elevation, does not show any evidence of mounding at the fault. Upward flow along the fault plane from a deep source is a possibility that at present is unsubstantiated.

Concerning the State Line Fault, Harrill (1986) concluded that "Springs and stands of mesquite along the northeast side of this feature suggest that if forms a partial barrier to ground-water flow." The State Line Fault impedes flow across the fault, but does not completely disconnect the portions of the basin on either side of the fault; therefore, it is necessary for the Project conditions of certification to address the possibility of effects to groundwater dependent habitat east of the fault.

<u>Geochemistry.</u> The Applicant argues that geochemical results indicate that Stump Springs water is from a different source than the basin fill aquifer. They argue that the higher concentration of major ions in Stump Springs water and the deviation of Stump Springs water from the isotope meteoric water line indicate a different source of water for Stump Springs than the valley fill aquifer. The most obvious, simple, and likely explanation for the higher concentration of major ions in Stump Springs is that that the spring water is affected by evaportranspiration in the vicinity of the spring. When the water table is shallow enough that water is taken up by plant roots or by evaporation from the soil surface, salts (ions) are left behind resulting in a higher concentration of salts in the groundwater.

The Applicant argues that their stable isotope data (their Figure 5) indicate that groundwater at the Project site and water supplying groundwater-dependent resources are from different sources. Figure 3 is a plot showing how hydrologic processes affect stable isotopes: precipitation plots along the meteoric water line with the position of a sample depending on the temperature of air mass from which the precipitation fell, and samples affected by evaporation plot along lines of lesser slope to the right of the meteoric water line. Applicant's

Figure 5 plots stable isotopes from wells near the Project and Stump Springs. A straightforward interpretation of the data presented by the Applicant is that the water from Stump Springs is derived from a similar source as the samples from monitoring wells, but has been affected by evapotranspiration.



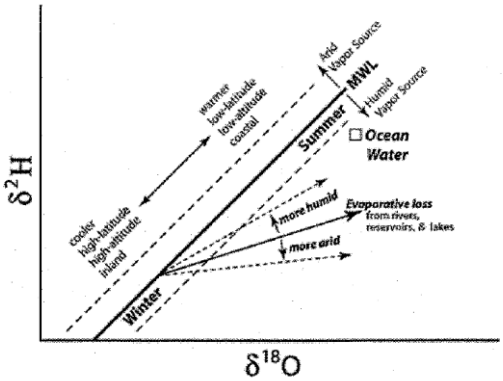


Figure 6. Summary diagram of how hydrologic processes affect oxygen and hydrogen isotopic composition of water.

Figure 3. At left, the Applicant's stable isotope data (their Water Supply Figure 5); at right, a summary of how hydrologic processes affect stable isotopes, (from the isotope hydrology web page of SAHRA (Sustainability of Semi-Arid Hydrology and Riparian Areas).
(http://web.sahra.arizona.edu/programs/isotopes/oxygen.html)

Water level triggers to protect off-site groundwater dependent resources. The Applicant raises a number of issues concerning the assessment of background water level trends and the detectability of pumping-induced changes in groundwater elevations. As an alternative to the FSA's use of the Mann-Kendall test, the Applicant proposes that the methods described in USGS SIR 2006-5024 be used to filter out background effects from hydrographs to more reliability detect effects from Project pumping. This method may be applicable here, but since it is relatively new and not widely applied, the Compliance Project Manager (CPM) should have some discretion and flexibility as to what method is used to determine background trends and baseline water levels. The Mann-Kendall test is much more widely known and applied than the method proposed by the Applicant; nevertheless, the CPM should be afforded access to multiple analytical tools.

The Applicant proposes that if water level triggers are exceeded, mitigation measures would be implemented; however, these mitigation measures do not include reductions in pumping. The Applicant makes the unequivocal claim that "No drawdown will occur beyond the site boundaries" (Water Supply p. 18). Given this certitude and the FSA's allowance for the Applicant to show that water level declines are due to other factors than their pumping, the FSA's condition of certification that pumping be reduced under certain circumstances is reasonable and necessary to protect groundwater-dependent habitat.

Protection of neighboring wells. The mitigation measures proposed by the Applicant for neighboring wells are inadequate. The Applicant proposes that neighboring pumps will be lowered or wells will be deepened if "groundwater is lowered enough as a result of Project pumping that well screens and/or pump intakes are exposed under static-non-pumping conditions…" These protections should be for while the neighboring well is pumping, not under static-non-pumping conditions. Figure 4 shows how the static water level differs from the pumping water level. Mitigation is necessary when the neighboring well's pump intake or screen is exposed while it is pumping. The mitigation proposed by the Applicant is grossly unfair to neighboring well owners. It is of little use to well owners to know that water levels are above their well screens and pump intake as long as they do not attempt to operate their well.

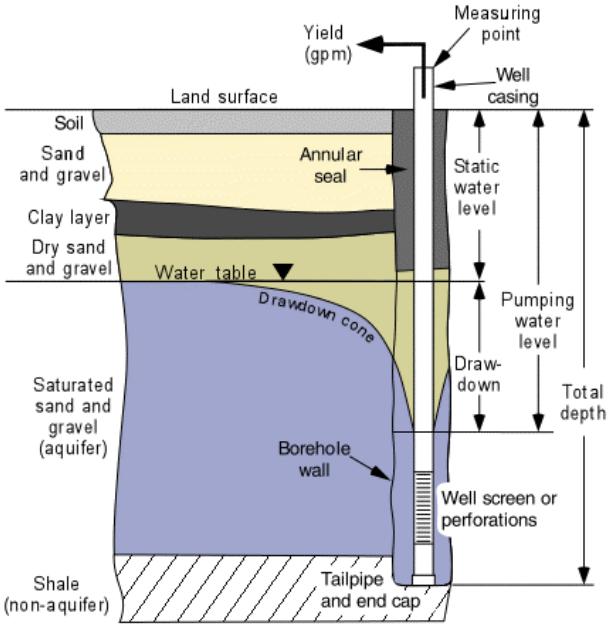


Figure 4. Water levels in a pumping well (Montana Groundwater Information Center, http://mbmggwic.mtech.edu/sqlserver/v11/help/welldesign.asp).

The Applicant suggests that the water level monitoring program may be revised or eliminated based on "the consistency of data collected" (Water Supply p. 34). It is unclear what this means – consistency with what? What inconsistencies would motivate continuation of the monitoring program? Any modifications to the monitoring programs should be based on what the monitoring program is revealing about the likelihood of negative impacts.

References

Harrill, J.R., Ground-Water Storage Depletion in Pahrump Valley, California-Nevada, USGS Water Supply Paper 2279, 1986.

APPENDIX A

GENERAL STATEMENT OF QUALIFICATIONS, RESUMES AND DECLARATIONS

1. Department Heads and Employees:

a. Doug Wilson, P.E., Interim Director, Inyo County Public Works: Mr. Wilson has served as Interim Public Works Director for the County on two occasions. The first from 2008 to 2009 and again, commencing 2010 to the present.

b. Bob Brown, Road Superintendent, Inyo County Road Department: Mr. Brown has served as Road Superintendent for Inyo County since 2008.

c. Paul Hancock, Engineering Assistant II, Inyo County Public Works Department: Mr. Hancock has worked as an Engineering Assistant II since August of 2000.

d. George Milovich, Inyo/Mono Agriculture Commissioner: Mr. Milovich has served as the Inyo/Mono Agriculture Commissioner since 1997.

e. Nathan Reade, Deputy Inyo/Mono Agriculture Commissioner: Mr. Reade has served as the Deputy Inyo/Mono Agriculture Commissioner since 2012.