



Practical Solutions
in Groundwater Science

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Mr. Robert Hardcastle
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P.O. Box 82218
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Peer Review of: K2 Well Site Evaluation – Groundwater Resources Potential

Dear Bob:

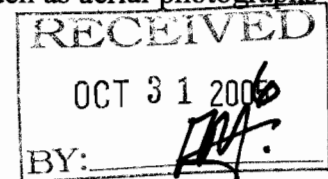
As you requested, Clear Creek Associates, PLC (“Clear Creek”) has performed a peer review of the report titled *K2 Well Site Evaluation – Groundwater Resources Potential* (“K2 Well Site Evaluation Report”), which is dated May 30, 2006, and was prepared by Highland Water Resources Consulting Inc. (“HWRC”) for the Pine-Strawberry Water Improvement District. The report prepared by HWRC focused on the groundwater resources potential of the “K2” well site, which is reportedly at an elevation of 5,868 feet above mean sea level, located at N34°, 24.388’ and W111°, 29.712’.

This peer review provides an evaluation of the following issues:

- A general review of the water availability conclusions of HWRC, based on our professional knowledge, familiarity, and experience with the groundwater conditions in the Pine/Strawberry area.
- Assessment of whether it is more likely than not, that a well developed at the “K2” site in accordance with the HWRC report will yield at least 150 gallons per minute (gpm) of sustainable water production.
- Evaluation of whether the conclusions presented in the HWRC Report are supported by their data and analyses.
- Professional opinion as to whether the deep aquifer water resources would be more favorable or not in the Strawberry area, versus the Pine area.

REVIEW COMMENTS

The *K2 Well Site Evaluation Report* that was prepared by HWRC included a fracture trace analysis of the K2 well site. The fracture trace lineaments presented in Figure 1 of that report are on a topographic base map, and it is not clear whether other imagery, such as aerial photographs



or digital elevation model (DEM) images would also support the topographic interpretation. The location and orientation of the mapped fracture traces appear reasonable, however.

The HWRC report included no reference to a field check of the candidate well sites (K1, K2, & K3) associated with the photo lineament (fracture trace) analysis. In this area, field confirmation is probably not necessary to differentiate true geologic features from man-caused features (such as fence lines or jeep trails). A field check of fracture trace sites is very useful to supplement the fracture trace analyses, since it enables the geologist to determine the orientation (strike) and inclination (dip) of the fracture plane. For example, if a fracture dips 10 degrees to the east versus 10 degrees to the west, it makes a significant difference at a depth of 1,000 feet or more.

The report made reference to a semi-confined aquifer in the Precambrian aquifer, and a lower perched aquifer near the base of the C-aquifer. It seems that the intent is to potentially exploit both these aquifers (in addition to the R-aquifer, which includes the Redwall Limestone, Martin Formation, and Tapeats Sandstone). However, the validity of the perched C-aquifer and the semi-confined Precambrian aquifer cannot be assessed from this report, since no backup data or references were provided.

The *K2 Well Site Evaluation Report* that was prepared by HWRC included a discussion of the relationship between the regional aquifer underlying the K2 area and Fossil Springs. This section of the report appears to be truncated at the bottom of page 3, where an incomplete sentence that does not continue on page 4. Nonetheless, this section provides caution that the impact to Fossil Springs from a well at the K2 location is not known with certainty, and that wells further to the west (from the K2 site) would be likely to withdraw groundwater from the "capture zone" of Fossil Springs. This section also indicates that wells further to the east near Pine, would be less likely of capturing water that would otherwise be contributed to Fossil Springs. This is noteworthy, because the Bloom Well to the northeast of Pine had the highest reported transmissivity value of all wells with available aquifer test data, at the time of Clear Creek's November 19, 2001 report for this area.

In the "Summary and Recommendations" section of the *K2 Well Site Evaluation Report*, HWRC provides caution about water rights and environmental issues. This is a valid concern, and consistent with the findings of Clear Creek's November 19, 2001 report of the area.

In accordance with the rules of the Arizona Board of Technical Registration, the *K2 Well Site Evaluation Report* should be either sealed and signed by a registered professional geologist, or stamped "Draft".

SUMMARY

General statements from Clear Creek Associates' peer review of the subject report are detailed in the paragraphs above. The proposed K2 Well Site appears to be in the proximity of a fracture trace, but field verification was not reported, and since specific data references were not presented in the *K2 Well Site Evaluation Report*, the likelihood of a well at the K2 site producing 150 gallons per minute (gpm) of sustainable groundwater is not well supported.

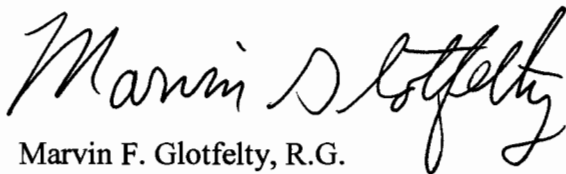
Due to the lack of data references and field support, some of the conclusions presented in the *K2 Well Site Evaluation Report* by HWRC are poorly supported. However, to their credit, HWRC do caution the reader as to the potential pitfalls and risks associated with the installation of a well at the K2 site.

Due to the potential for Strawberry-area wells to impact the flow of groundwater to Fossil Springs or other surface water seeps and springs, and also due to the more favorable reported aquifer characteristics in the Pine area (see Clear Creek Associates report, November 19, 2001, Table 2), it is our opinion that a deep aquifer water resource in the Pine area would be more favorable than a deep aquifer water resources located in the Strawberry area.

Clear Creek Associates appreciates the opportunity to provide hydrogeologic consulting services to Brooke Utilities. If you have any questions regarding the peer review presented herein, or require any additional information, please call.

Sincerely,

CLEAR CREEK ASSOCIATES, PLC.



Marvin F. Glotfelty, R.G.
Principal Hydrogeologist

