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MEMORANDUM
June 29, 2006

To: Andrew Burns, Senior Hydrologist
Southern Nevada Water Authority
From: Peter D. Rowley, Consulting Geologist, Geologic Mapping, Inc.
Gary L. Dixon, Consulting Geologist, Southwest Geology, Inc.
Subject: Elliott and others (2006), USGS Scientific Investigations Report 2006-5099

This is to give our analysis of the report by Peggy Elliott, David Beck, and David Prudic on "Characterization of surface-water resources in the Great Basin National Park area and their susceptibility to ground-water withdrawals in adjacent valleys, White Pine County, Nevada." It was released by the Nevada District of the Water Resources Division apparently only a week or two ago. We find that the report deficient in many categories, especially in its conclusions regarding a possible decrease in Park water resources should pumping be undertaken in Spring or Snake Valleys by SNWA. We also find that their conclusions regarding the effects of possible future pumping are political statements consisting of speculations that are unsubstantiated by any data contained in the study.

The report is poor in the following categories: (1) its fundamental premise that data from seepage tests or stream gages can be used to pinpoint streams that might dry up from well pumping of groundwater miles away and hundreds of feet lower; (2) methodology problems that make some conclusions doubtful; (3) inaccurate application of geology; and (4) poor writing that hinders understanding of the report.

Although it is certainly a worthwhile exercise to itemize and monitor surface-water resources in a National Park, to use those data to address a political issue for which they have no bearing is an inappropriate application of scientific information. Seepage tests are valuable in water-rights adjudication, to define streamflow availability, and to assess and manage water resources. Such tests determine whether certain stream reaches gain or lose water, and tying these gains and losses to the geology in the streambed will allow an understanding of groundwater recharge processes. Although it might be theoretically possible that gross amounts of groundwater withdrawal by pumping could lower the water table and turn one reach of a nearby gaining stream to a losing stream, it is a real stretch of the imagination to conceive of a cone of depression reaching miles and hundreds of feet up the flank of the Snake Range to where any stream within Great Basin Park exists. This report misapplies stream gage and seepage data toward this kind of speculation. There are no data in the report that support in any way such conclusions. The large extent of the speculations are made clear by the many usages of "might extend," "potentially could," "likely are," "depending on the quantity of water withdrawn," or the like in the sentences containing the speculations.

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Seepage tests require error analysis so that the reader can be convinced that an apparent gain or loss in a reach exceeds the error associated with the measurement of that value. There is no error analysis in this report other than the admission that "accuracy . . . varied from good to poor" (p. 18). Nonetheless, the authors present many conclusions about losing or gaining reaches even though (a) the numbers from the lower measurement site are only slightly different from the upper site, (b) gains or losses made during a second seepage test contradict the first test, or (c) the so-called gains or losses do not make common sense based on the geology. The study itself is flawed, and thus some conclusions are suspect.

The application of geology to the study was incomplete, and geologic conclusions were for the most part invalid and not technically defensible. The geologic map was compiled from a 30-year-old reconnaissance map, only part of which area underwent modern remapping, and only part of this published remapping was used in this study. The Tertiary rocks (Tr) unit consists of Tertiary basin-fill units that should be lumped with the QTs unit, and a Tertiary volcanic unit should have been mapped, even though it should appear only in the cross sections. High-angle faults, which bear on groundwater flow much more than those detachment faults that are mapped here, are not shown on the maps used in this study, although in places the authors note high-angle faults mapped in the modern studies. Generally, therefore, high-angle faults are ignored. The cross sections that show the geology are not the work of a professional geologist: in most places they are simplistic, with contacts and faults being inaccurately portrayed, and in other places the sections are absurd. No range-front faults that are the cause for the uplift of the Snake Range are shown in the cross sections. In fact, the authors in places (p. 30, 32, 35, 36) make conclusions that these faults could not be crossed by the streams because they recognize no abrupt changes to a losing stream in the basin-fill deposits. Based on our geologic mapping and on geophysical profiles, we and some of the modern mappers showed faults that cross all profiles. The streams probably do not become losing where they cross the faults because the water table is at or close to the level of the stream, or the readings are in error. Seepage tests do not tell where faults are.

The writing suffers from mistakes that include excessive wordiness, concluding the obvious, repetition, poor organization, devoting too much text to explaining minor issues (e.g., specific conductance, water temperatures) when referring to the figures would have been fine, and getting sidetracked in explaining poor data or qualifying questionable conclusions.

The USGS needs to take more responsibility for its products.

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