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MEMORANDUM

November 19, 2018

To: Mr. Jim Kunisch

From: Chuck Dickens
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Re: Deep Well - As-Built Details, Production Capacity & Hydrogeologic Conditions

This memorandum has been prepared to provide an overview summary of your subject deep water well located in the northeast quarter of section 29 of Township 3 north and range 19 west and south of the town of Quartzsite, Arizona. The ADWR registration number for the well is 55-213980. The well is permitted as an *exempt* well and was drilled and constructed in 2006. The original owners of the well were Frank and Barbara Mills. The well was originally drilled for a local - proposed residential project entitled Coyote Creek which was never built-out.

The deep well was drilled and completed to a depth of 855 feet with six (6) inch steel casing. The well was drilled and constructed by the Far-West Drilling & Pump Company. The well was completed with blank steel casing from land surface to a depth of 755 feet and perforated casing from 755 to 855 feet. The static depth to water was measured at 509 feet in March 2007. The well was test pumped in March 2007 at a rate of 27 gallons per minute (gpm) for a continuous period of 21.5 hours (nearly 35,000 gallons). The pumping water level depth at the end of the pumping test was 535 feet indicating a total drawdown (water level decline) of only 26 feet (see attached Pumping Test Graph).

Your deep well derives groundwater from the deep regional aquifer system which occurs (top of aquifer) at a depth of about 775 feet. Groundwater occurs within the deep regional aquifer under pressure which is why the water level in your well was measured at 509 feet, more than 250 feet above the top of the aquifer.

Nearly all other private wells in the vicinity of your deep well are shallow wells, most of which are only 300 feet in depth or less and produce groundwater from a shallow (local) perched groundwater zone and not the deeper regional aquifer penetrated by your deep well. Groundwater level depths in most of the local shallow wells range from only about 100 to 200 feet.

The attached Figure 1 presents an as-built schematic for your deep well, the typical construction depth of most of the local private shallow wells and an overview of local hydrogeologic conditions. As shown on Figure 1, the shallow perched groundwater zone that yields groundwater to shallow low – flow private wells is separated from the deeper regional aquifer by several hundred feet of very low permeable clay. Given the thick clay sequence separating the shallow perched groundwater zone from the deeper regional aquifer there is no potential for your deep well to effect groundwater levels reflective of the shallow perched zone which provides groundwater to local shallow wells. Furthermore, the groundwater level reflective of the deeper regional aquifer is several hundred feet below the bottom of the local shallow private wells. In summary, operation of your deep well will have no impact on the numerous nearby shallow private wells.

It is my understanding that your project build-out plan could include upwards of 18 residential units to be provided water from your deep well. The water demand of 18 residential units in the Quartzsite area of western Arizona would be quite low. Overall (conservatively high) average demand of 18 residential units would probably approach – certainly no more than 5,000 to 7,500 gallons per day (gpd), with an extreme peak day demand approaching 15,000 to 20,000 gpd. An average daily demand of 7,500 gpd computes to a low well production rate of only about five (5) gallons per minute (gpm). An extreme peak day demand of 15,000 to 20,000 gallons computes to well production rates of 10.5 to 14 gpm, respectively. Previous test pumping confirmed that your deep well will readily produce the required limited water supply for 18 residential units. Previous test pumping of the well at 27 gpm resulted in only 26 feet of drawdown (water level decline).

At any rate, if you have any questions or wish further discussion of local hydrogeologic conditions, groundwater level depths, well as-built details or production capacity of your deep well please contact me.

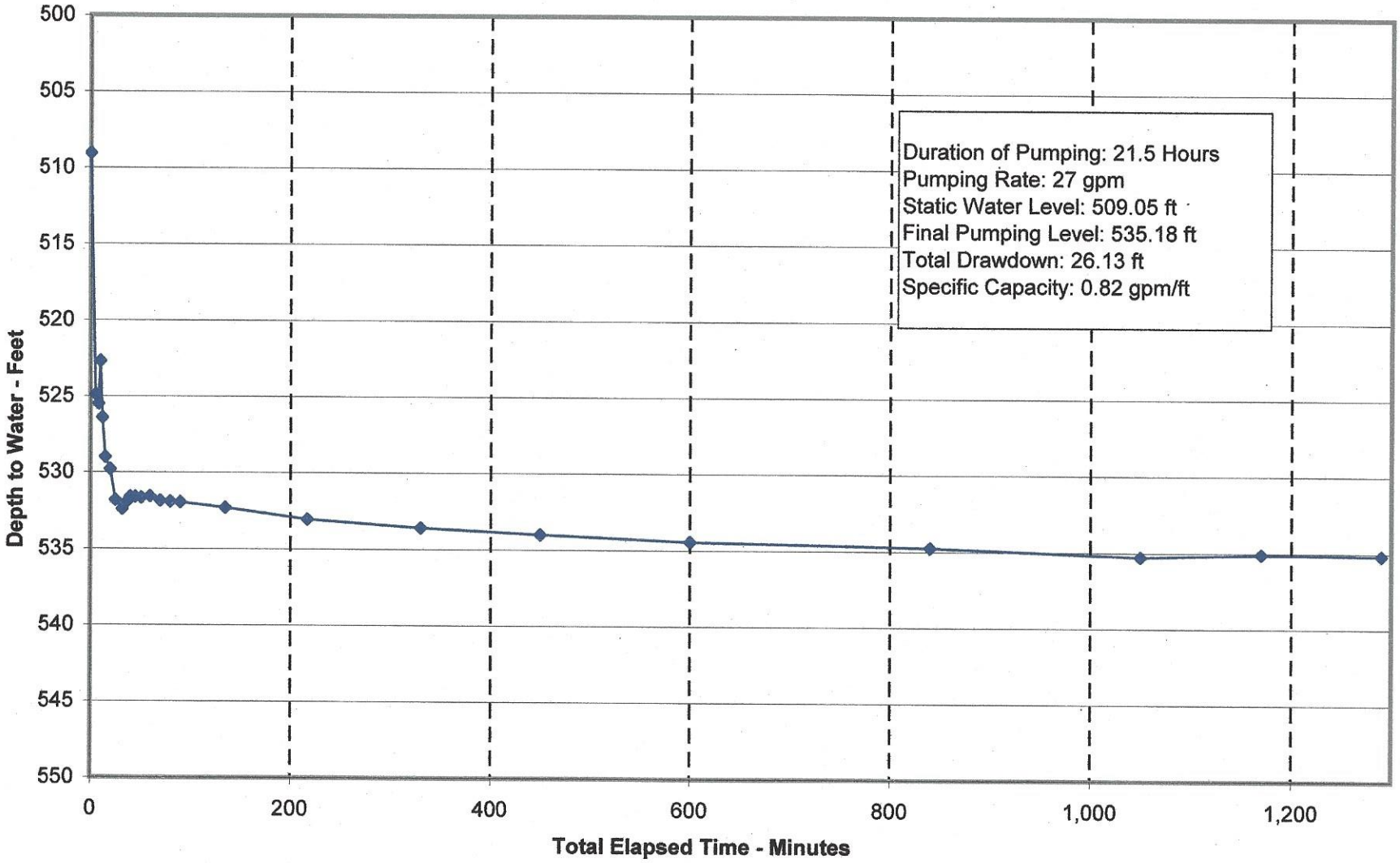

Figure B-1: Pumping Test Graph (Linear Scale)
Coyote Creek Supply Well

FIGURE 1 **KUNISCH DEEP WELL**