

August 19, 1999

L54(2380)
ROMO/General

Memorandum

To: Bill Thompson, Special Projects, Rocky Mountain National Park

Through: William L. Jackson, Chief, Water Operations Branch

From: Larry Martin, Hydrologist, Water Operations Branch

Subject: Well testing at McGraw Ranch

PURPOSE: Two existing wells at McGraw Ranch were tested to determine if they could provide an adequate water supply for domestic use at the ranch.

SUMMARY: The eastern well at McGraw Ranch was tested on August 17, 1999. The well was pumped continuously for 5 hours at a rate of 14 gallons per minute. During this time, the water level was drawn down from about 16 feet to 64 feet below the top of the casing. The total amount of water pumped during the test was 4200 gallons, about double the anticipated maximum daily demand at the Ranch. The eastern well is easily capable of supplying the water needs at the ranch. The planned 40,000 gallon storage tank should be filled in stages, over a period of 1-2 weeks to avoid over-stressing the well or aquifer.

DISCUSSION: McGraw Ranch is a former dude ranch that was purchased by the park service several years ago. The ranch is located about 3 miles north of Estes Park, near the eastern park boundary. Ranch buildings are being repaired to create a research center and housing for visiting researchers. As part of the repair project, a new water system will be installed. It is anticipated that demand at the ranch will be no more than 2000 gallons per day. A 40,000 gallon storage tank will be installed to provide water for fire protection.

There are two existing wells at the ranch. The West Well is 212 feet deep and the East Well is 165 feet deep, as measured from the top of the well casing. We are uncertain about any other aspects of construction for either of the wells as they were constructed prior to the park acquiring the property. Water rights records indicate that the wells were constructed in 1966. These records indicate that the West Well is 110 feet deep and the East Well is 235 feet deep. However, our measurements found that the wells are 212 and 165 feet deep respectively. These records also indicate that the West Well

produces 20 gpm and the East Well produces $\frac{1}{2}$ gpm, which is the opposite of our findings. So we are reluctant to place much faith in any information provided in the water rights records.

Park maintenance staff tested the West Well on 8/5/99 and pumped it dry in 27 minutes. Water pumped from the well was discolored and foul looking. It was obvious to maintenance staff that the West Well would not be useable as a water supply for the ranch.

Park maintenance staff moved the test pump to the East Well and tested it on 8/12/99. The well produced a steady stream of water that became clearer as the well was pumped. The water level was drawn down 20 feet, from 14 to 34 feet, after 40 minutes of pumping. It was decided to test the East Well more extensively.

On 8/17/99, Larry Martin, Brad Gillies, and Mark VanMouwerik, from the Water Resources Division conducted a drawdown and yield test on the East Well. The well was pumped continuously for 5 hours. The discharge rate remained constant at 14 gpm throughout the test. Drawdown and recovery were measured frequently throughout the test. These data are shown on the attached graph. After 5 hours of continuous pumping, the water level had been drawn down about 48 feet, from 16 to 64 feet, as measured from the top of the well casing. At this point there was still 100 feet of water in the well and the rate of drawdown seemed to have stabilized. We projected the rate of drawdown beyond the end of the test to show predicted drawdown in the well for various times up to 800 minutes of pumping, as shown on the second graph. After 12 hours of continuous pumping, we would expect that the water level would be drawn down to about 79 feet below the top of the casing. There would still be 85 feet of water in the well. Pumping the well at 14 gallons per minute for 12 hours would produce 10,000 gallons of water.

Recovery of water level in the well was slower than expected. We would expect recovery to be the mirror image of the drawdown curve, and should have seen about 26 feet of recovery in the 75 minutes that we monitored water levels following cessation of pumping. Instead we saw only 20 feet of recovery (as measured from extending the drawdown curve through the recovery period. We do not have an explanation for this slower than expected rate of recovery. But note it here for future reference and as a reason for caution when filling the large storage tank. It would be prudent to allow a longer than normal period for recovery of this well after long periods of pumping. Perhaps limiting the pumping to 10-12 hours followed by 36 hours of recovery during filling of the storage tank. Water levels should be monitored during high use periods, such as filling the storage tank, to determine when and how long to operate the pump.

Water quality was monitored throughout the test pumping of the East Well. Specific conductivity was about 520 umhos/cm at the start of the test and gradually decreased to about 430-450 umhos/cm during the last 3 hours of the test. Conductivity in the 430-450 range indicates that the total dissolved solids concentration would be expected to be about 250 mg/l, well within the drinking water standards. pH of the water was 7.0-7.1 throughout the pumping period. Taste and odor were good. The water was somewhat discolored at the start of the test, but cleared after an hour of pumping. The initial discoloration is probably related to the well not being used for about 20 years. Park maintenance staff will collect samples for complete chemical analysis of the water next week.

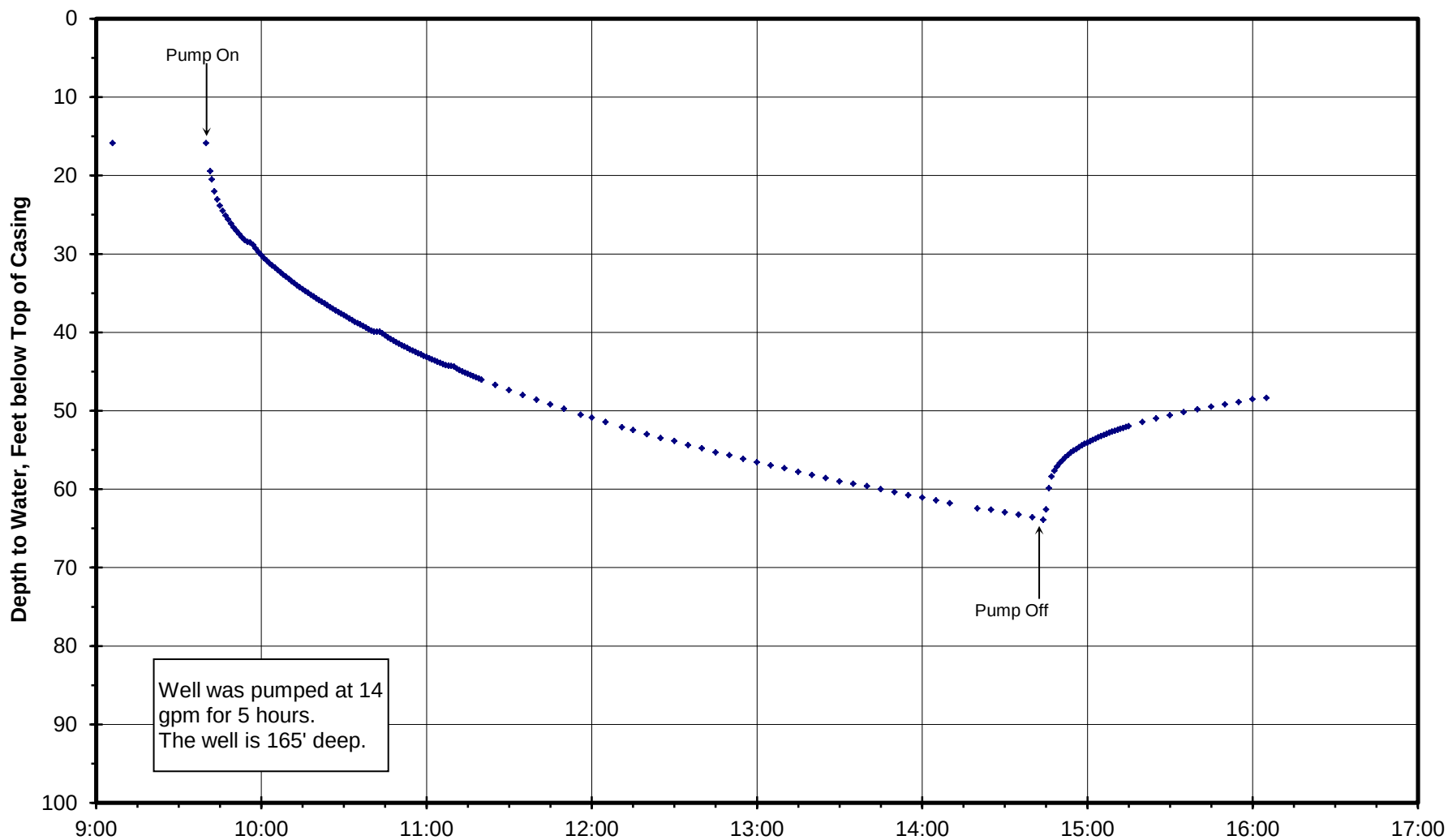
Use of groundwater from this well is probably covered by the original water right at the ranch. Park hydrologist, Ken Czarnowski, should be consulted on this matter to determine if any paperwork should be submitted for this project. The well permits for the two wells are P-27530 #1 and P-27530 #2. The Water Right Case No. is 2881.

The West Well should probably be sealed and abandoned. It does not provide a useable source of water and could be a pathway for contaminants to enter the aquifer. The well can be sealed and abandoned by filling with clean sand or gravel to 15 feet below ground surface and then filled with cement. The well casing can be cut off below ground surface or left as is, protruding about a foot above ground surface. Sealing and abandonment of the well should be reported to the State Engineer's Office.

CONCLUSION: The East Well can easily meet the water use demands of the research center and living quarters at the ranch. Normal usage at the ranch is expected to be less than 2000 gallons per day, which can be provided with about 2 hours pumping per day.

cc: IMR - Ayers
479 - Kimball, Pettee, Gillies, Van Mouwerik
ROMO – Czarnowski, O'Neil

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