



TRANSMITTAL

DATE: June 4, 2009
TO: Scott Campbell
FROM: Scott King
CC:
RE: Mountain Springs
JOB NO.: 272.0120

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MOFFATT, THOMAS, BARRETT,
ROCK & FIELDS, CHTD.

The following items are:

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| ☐ Requested | ☒ Enclosed | ☐ Shipped Via _____ | |
| ☐ Report | ☐ Specification | ☐ Cost Estimate | ☐ Shop Drawings |
| ☐ Test Result | ☐ Prints | ☐ Test Sample | ☐ Other |

No.	Description
1	Final memo report for Mountain Springs Beneficial Use Field Exam Review

This data is submitted:

- | | |
|--|--|
| ☐ At your request | ☐ For your action |
| ☐ For your approval | ☒ For your files |
| ☐ For your review | ☐ For your information |

General Remarks: No change from the prior version – just stamped and final.

MEMORANDUM

DATE: June 4, 2009
TO: Scott Campbell
FROM: Scott King, P.E.
RE: Mountain Springs Beneficial Use Field Exam Review



Per your request, I have reviewed IDWR's Beneficial Use Field Reports for permit nos. 96-8667 and 96-8777. These reports were prepared by Eric Davis and are dated on exams conducted on September 25, 2008.

The beneficial use field reports identify three wells with pumps that are used to serve both permits. The three wells are reportedly equipped 5-hp, 7.5-hp, and 40-hp pumps. The following two tables present the permitted and recommended quantities for both water rights:

Permitted	Recommended
Total of 0.67 cfs for following uses: • <u>Irrigation</u> of 0.67 cfs for 35 acres • <u>Domestic</u> of 0.67 cfs for 70 homes	<u>Municipal</u> use of 0.67 cfs and 252 afy based on: • Irrigation of 70 acres at 0.67 cfs, 210 afy • Domestic (in-house) for 70 homes at 0.67 cfs and 0.6 afy/home for 42 afy

Table 1: Permitted and recommended flow rate and annual volume for 96-8667.

Permitted	Recommended
Total of 1.58 cfs for following uses: • <u>Irrigation</u> of 515 acres at 1.0 cfs • <u>Domestic</u> for 135 homes at 0.58 cfs • <u>Stockwater</u> for 6 horses and 12 range cattle at 0.02 cfs	<u>TOTAL</u> use of 1.58 cfs and 817.6 afy for the following: • <u>Irrigation</u> use of 1.0 cfs and 331.2 afy for 110.4 acres • <u>Municipal</u> use of 1.58 cfs and 486.4 afy based on: ○ Irrigation of 135 acres at 405 afy ○ Domestic (in-house) for 135 homes at 0.6 afy/home for 81 afy ○ Stockwater at 0.4 afy

Table 2: Permitted and recommended flow rate and annual volume for 96-8777.

Together, 96-8667 and 96-8777 were permitted for a total of 2.25 cfs. IDWR estimated pumping capacity for each pump, with a total combined capacity from all three of 1.78 cfs. I expect that combined use limits will be placed on the rights, limiting the total combined diversion rate to this 1.78 cfs capacity value.

IDWR's values for pumping capacity are based on a theoretical calculation commonly used by for estimating maximum pumping rates. The equation is based on pump horsepower, system pressure, pumping lift, and pumping efficiency.

$$Flow(cfs) = \frac{8.8 \times Horsepower \times Efficiency}{PumpingLift(ft) + (2.31 \times System\ pressure(psi))}$$

Observations regarding the primary elements follow:

- **Pump motor horsepower.** I assume that the horsepower numbers provided by IDWR are accurate. In the theoretical equation, horsepower and flow are proportional; higher horsepower results in greater flow.
- **Pump discharge pressure near the well-head.** The system pressure is listed at 50 psi for each well pump. This value may be a reasonable pressure for a municipal supply system, but the exam reports do not provide any supporting information (e.g. where the pressure was measured, how it was measured, and if this pressure is truly representative of actual high-flow conditions). In the theoretical equation, pressure and flow are inversely proportional; lower pressure

results in greater flow. We typically see municipal well-head discharge pressures exceeding 50 psi in order to provide for minimum system pressure standards set by DEQ.

- **Pumping lift.** The lift ranges from 62 to 81 feet between the three well pumps. However, the exam provides little data supporting the values and I cannot tell if these are actual measured values, or estimates based on well logs or other data. In the theoretical equation, pumping lift and flow are inversely proportional; lower pumping lift results in greater flow. Based on the water levels reported on the two available Driller's Reports, I would not expect to see significantly lower pumping lifts.
- **Pumping efficiency.** IDWR applied an assumed pumping efficiency of 70 percent. This is common practice at IDWR. Actual pumping efficiency can be higher or lower than 70 percent, and is dependent on many factors which can include: pump size (horsepower), type, adjustments, wear, and operating conditions. In my experience, many pumps are commonly designed to operate at efficiencies exceeding 70 percent. For typical standard vertical turbine submersible pumps of 5, 7.5, and 40-hp sizes, I would expect near optimum efficiency values ranging from 73 to 79 percent. In the theoretical equation, efficiency and flow are proportional; higher efficiency results in greater flow.

Conclusions

IDWR estimated a total pumping capacity of 1.78 cfs from the three wells supplying the two permits, which is 0.47 cfs less than the total combined rate authorized by the permits. This capacity is based on theoretical estimates of pumping capacity. IDWR is expected to impose combined use limits on the licenses issued for these permits, limiting the total combined diversion rate to the system capacity of 1.78 cfs. Some assumptions were made in estimating pumping capacity. It may be possible to gather additional information to support a higher, or lower, theoretical pumping capacity. Items that come to mind include:

- Actual measurements of pumping lift and pump discharge pressure during high-flow conditions. If pumping lift and/or discharge pressure is lower than the values used by IDWR, a higher pumping capacity may be demonstrated.
- Pump curves for the installed pumps may show a higher or lower pumping capacity. I recommend obtaining pump curves for the installed pumps.

Other observations include the following items:

- The beneficial use field report for 96-8777, on page 4, under item F.1. lists 101.4 acres for a volume calculation. The calculated volume of 331.2 af is consistent with 110.4 acres of irrigation; I believe the 101.4 number is in error and should instead be 110.4. The resulting volume of 331.2 should not change.

- The "Municipal" boundary extends west of Sagie Slough, particularly Section 11 NENW. Does the water system actually serve ground west of the slough and/or does Mountain Springs own ground in this area? If so, the boundary is likely okay. If not, this boundary could cause future confusion and clarifying the boundary may be recommended. See the attached Figure.
- The Irrigation place of use for 96-8777 extends outside of the municipal boundary at Section 1 NWNW. See the attached Figure. Is this correct?
- IDWR's flow calculations for both permits list three pumps. The 40-hp pump lists a water right no of **94-7367**. I assume this is a typographical error as I don't believe 94-7367 is related to these basin 96 permits.

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