

Feasibility of Constructing Water Supply Wells in the vicinity of the Craighead Ranch, Grand Teton National Park

This paper documents the findings of a brief investigation into the feasibility of constructing water supply wells as supplemental sources of irrigation water for the Craighead Ranch (Figure 1) on South Antelope Flats, Grand Teton National Park.

Hydrogeology

The geologic map of the park (Love et al., 1992) shows the area underlain by glacial outwash and alluvium. Glacial outwash is derived from glacial deposits that have been reworked by running water, i.e., eroded, transported, and redeposited. In the process, much of the fine-grained fraction is washed away, leaving very permeable sand and gravel.

Nolan and Miller (1995) conducted time-domain electromagnetic surveys (TDEM) to estimate the thickness of unconsolidated sand and gravel deposits in the Jackson Hole valley. TDEM is a magnetic induction method for determining subsurface electrical resistivity. In general, high resistivity corresponds to saturated, coarse-grained materials (sand and gravel) and low resistivity corresponds to less permeable, fine-grained materials such as clay, silt, shale, etc. One of their survey sites was on South Antelope Flats, about a mile northeast of the residential area on the Craighead ranch. The estimated thickness of the sand and gravel layer, the glacial outwash, at this site was 820 feet.

Anticipated hydrogeologic conditions in the area, large thickness of mostly sand and gravel sediments, are favorable for construction of large-volume wells.

Existing Wells in the Area

The Wyoming State Engineers database was searched to identify existing wells in the area and obtain construction and yield data for these wells. Records for wells are provided in Table 1.

There are three water-supply wells at Dornan's. They are 75, 85, and 90 feet deep and reportedly produce 500, 100, and 100 gpm. These wells are located near the Snake River and are likely completed in the alluvium associated with the river. They are likely more productive due to their proximity to the river.

The State Engineers database contains records for 11 wells on South Antelope Flats within about a mile of the Craighead Ranch. All of the wells are permitted for domestic use, which is limited to 25 gpm in Wyoming. Thus the maximum pumping rate shown for any of these wells is 25 gpm. The wells are mostly in the range of 80-120 feet deep. The reported yield for these wells probably more accurately reflects the size of pump that was installed in the well, rather than the maximum sustained yield for the well. Because these wells were constructed for domestic supplies, there was likely very little effort made to maximize the yield of the wells. Cost to the owner was probably a more important factor in determining how deep the well was drilled and how the well was constructed. The wells were likely drilled a few tens of feet deeper than the water table, a few perforations were made in the casing, and the job was done.

A well was constructed by Clark Moulton in 1963 near the center of Section 26, about 3 miles east of the Craighead Ranch. The well was drilled to a depth of 353 feet and reportedly was test pumped at 20 gpm for 4 hours resulting in no drawdown. If those data are accurate, it would indicate that the well was capable of producing much more than 20 gpm, as pumping at that rate caused no water level drawdown. There is no geologic log available for this well, so we are unable to determine whether it is completed in unconsolidated sediments (glacial outwash) or perhaps in an underlying bedrock formation.

Potential for Large-Volume Wells

The potential for constructing large-volume wells on South Antelope Flats appears favorable, but has not been proven. If the desired yield is for 100 gpm, the potential for success is good. If the need is 500 gpm, there is more risk. There is a large thickness of sand and gravel underlying the area, but no wells have been drilled more than a few tens of feet below the water table. There has been no exploration or testing of a significant thickness of saturated sediments. However, one would expect that a properly constructed well, penetrating several hundred feet of these sediments could yield several hundred gallons per minute. There is also a very real risk that there could be enough fine-grained sediments mixed in the aquifer to limit the production to a few tens gallons per minute. Data from the TDEM survey indicate a strong likelihood of a very permeable aquifer.

Cost Estimate

The park engineer prepared a 2007 estimate for a 300-foot well at the Teton Science School a few miles east of the Craighead Ranch. That estimate is a little over \$50,000 for a 6-inch well drilled mostly through bedrock, which will be easier to construct than drilling through unconsolidated sediments. At the Craighead Ranch, we might want a larger diameter well, longer well screen, and more development time because of the type of material the well would be constructed in. A reasonable estimate for a high-capacity, 300-foot well in this area is around \$75,000

References

Love, J.D, John C. Reed, Jr., and Ann Coe Christiansen, 1992, *Geologic Map of Grand Teton National Park, Teton County, Wyoming*, U.S. Geological Survey Geologic Investigations Series Map I-2031

Nolan, Bernard T. and Kirk A. Miller, 1985, *Water Resources of Teton County, Wyoming, Exclusive of Yellowstone National Park*, U.S. Geological Survey Water-Resources Investigations Report 95-4204, 76 pp.

Wells at Doornan's. Probably constructed in alluvium of Snake River.

Permit #	Priority	Township	Range	Sect.	Qtrqtr	Applicant	Facility Name	Uses	Yld Act	Well Depth	Static Depth
P89284W	03/30/1992	43N	116W	25	SWSE	MOOSE ENTERPRISES DORNAN FAMILY, TRUST	ME-D-1	MIS	100	85	19.2
P89285W	03/30/1992	43N	116W	25	SWSE	MOOSE ENTERPRISES DORNAN FAMILY, TRUST	ME-F-1	MIS	500	75	31
P89286W	06/08/1992	43N	116W	25	SWSE	MOOSE ENTERPRISES DORNAN FAMILY, TRUST	DORNAN'S #1	MIS	100	90	38.5

Wells in the vicinity of Craighead Ranch, South Antelope Flats. Probably constructed in glacial outwash.

Permit #	Priority	Township	Range	Sect.	Qtrqtr	Applicant	Facility Name	Uses	Yld Act	Well Depth	Static Depth
P116324W	06/14/1999	43N	115W	20	SWSW	FRANK CREIGHEAD	CREIGHEAD #2	DOM	25	141	77
P23142P	01/15/1973	43N	115W	20	SESE	JOHN A. MULTON	JOHN MOULTON #2	DOM	25	100	40
P4320P	01/05/1964	43N	115W	26	NWSE	CLARK A. MOULTON VEDA L. MOULTON	MOULTON #1	DOM,STO	20	353	197
P4321P	08/23/1947	43N	115W	29	NESE	CLARK A. MOULTON VEDA L. MOULTON	MOULTON #2	DOM,STO	5	91	80
P23141P	01/15/1973	43N	115W	29	SENE	JOHN A. MULTON	JOHN MOULTON #1	DOM	25	103	40
P58117W	09/08/1981	43N	115W	29	NESE	CLARK A. MOULTON	MOULTON #3	DOM	15	118	30
P91948W	06/07/1993	43N	115W	30	SENE	LYLE MCREYNOLDS	MCREYNOLDS #1	DOM	12	99	49
P8429P	12/21/1951	43N	115W	30	SWNE	HARRISON R. CRANDALL	CRANDALL #1	DOM	12	47	30
P57376W	06/24/1981	43N	115W	30	NWNE	ROLAND T. & MARY E. MCREYNOLDS	MCREYNOLDS 1	DOM	15	108	33
P75590W	09/23/1987	43N	115W	30	SWNE	RICHARD C. BARKER	BARKER #1	DOM	25	60	36
P23508P	01/16/1973	43N	115W	30	SWNE	LOUISE MAPES BERTSCHY	MAPES #1	DOM	25	80	21
P25029W	11/06/1973	43N	115W	30	SWNE	LOUISE MAPES BERTSCHY	MAPES #2	DOM	3	89	40

Table 1. Records of wells on a part of South Antelope Flats, Grand Teton National Park.
Data are from the Wyoming State Engineers Office.

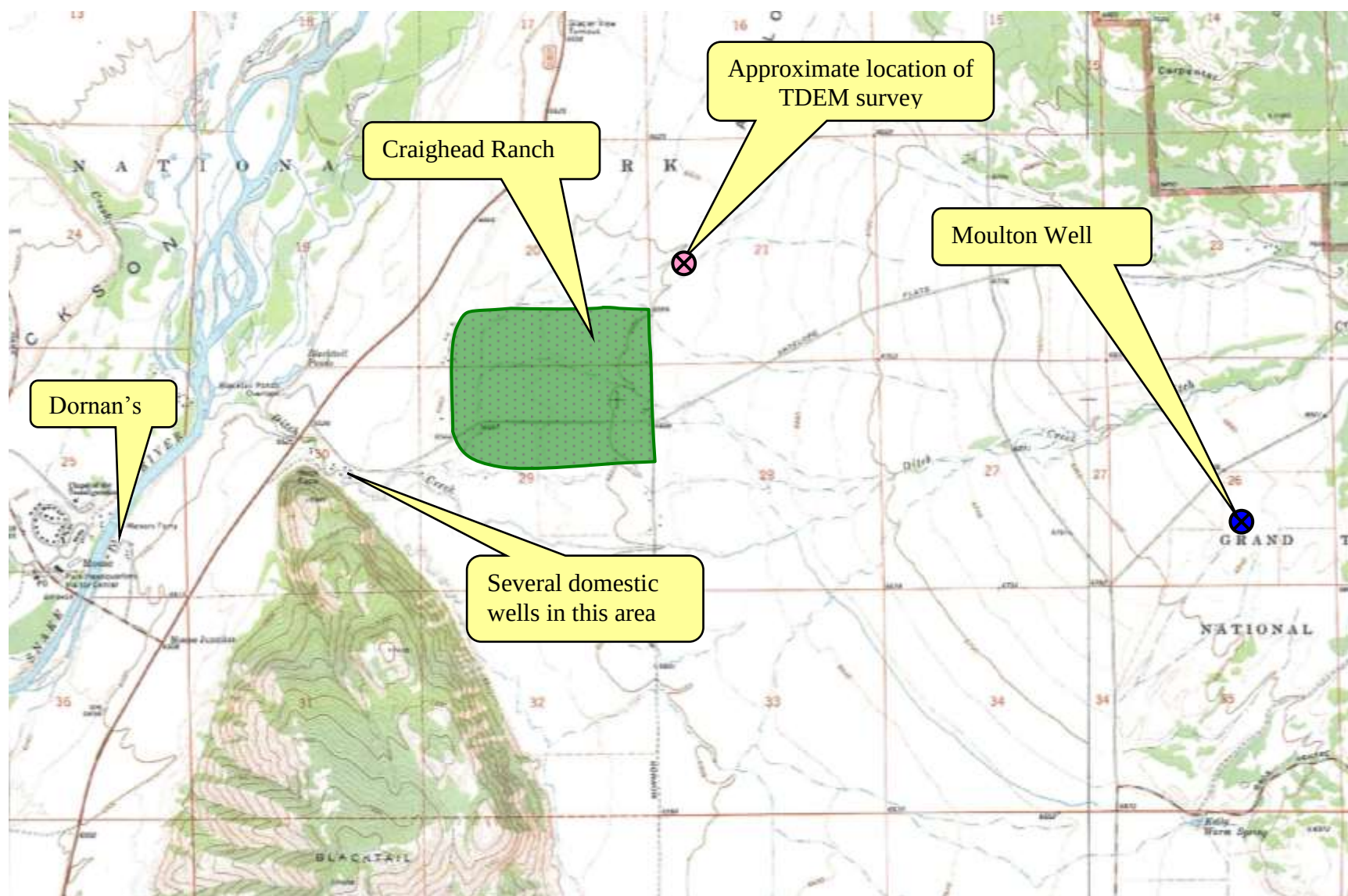


Figure 1. General vicinity of Craighead Ranch on South Antelope Flats, Grand Teton National Park.