

MEMORANDUM

TO: Water Right File 65-13513

FROM: Daniel Nelson – Analyst 3

DATE: September 26, 2018

SUBJECT: Licensing Review of Water Right 65-13513

A filed report was performed on this water right by Western Region staff in 1996. However, when reviewed for licensing, several of the elements in the field report didn't make sense. I visit the site on September 7, 2018, to work through the various permits that needed licensing for this property. The following are my findings.

Point of Diversion:

Point of diversion for this permit is from a well that is known as the 10 inch well. The permit and the field examiner correctly placed the well in the SESW of Section 7, Township 13 North, Range 4 East. I was able to GPS the site location and confirm that actual well location in the Lot 1 (NWNW) of Section 13, Township 13 North, Range 4 East.

Place of Use:

The field report provides for a large place of use of 110 acres. However, the system diagram in the field report describes water being delivered from several different water rights, water sources, and water rights. There isn't a common system for all of the acres described in the field report. The water from the 10 inch well can only irrigate approximately 71 acres. Please see the overlap analysis sheet to see the location of the acres irrigated and system diagram to see the delivery system for this well.

Diversion Rate:

The field examiner performed a theoretical calculation on this system to determine the flow rate. Unfortunately, he used the static water level instead of a reasonable pumping water level. The owner provided some good information in a telephone conversation memo dated September 19, 1996, that provided some very useful information. Using this information, I ran three scenarios in the attached theoretical calculation sheet, and I determined that pump probably operates close to 1.42 cfs. At 71 acres and 0.02 cfs per acre, the diversion rate is also 1.42 cfs. Therefore, I am recommending that this permit be limited to 1.42 cfs.

Diversion Volume:

The volume calculated in the field report was for 110 acres, and is no longer reasonable for the 71 acres actually irrigated. The volume would be limited by the headgate requirement of 3 af per acre for 71 acres (213 af) or the diversion rate for the irrigation season for a total of 563 af ($1.42 \text{ cfs} \times 1.9835 \times 200 \text{ days} = 563.3 \text{ af}$). The annual volume will be limited to the headgate requirement or 213 af.

Please Note: The irrigation season of use for the permit was 4/15 to 10/15, but that was the old standard. The current standard is 4/15 to 10/31 or 200 days.

Overlap:

Water rights 65-11250, 65-13459, and 65-13513 (this permit) all irrigate a portion of the same acres depending on the time of year. Water right 65-11250 is a gravity fed system from Moores Creek that only irrigated the lower pasture by flood irrigation. Right 65-13459 provides primary irrigation around the home and the pasture to the south, and supplements the ground irrigated by water right 65-11250. This permit 65-13513 is also ground water and is mainly used to irrigate the pasture north of the home and place of use, but the pivot does come down and irrigates a portion of the lower pasture later in the year when there is not enough Moores Creek water.

The well for the permit doesn't really supply adequate water for the entire lower pasture, so when there isn't any Moores Creek water, it is used to irrigate the western side of the lower pasture where the pivot can't reach.

Conditions:

This is an older permit, so all of the conditions on this permit should be removed and replaced by modern versions of the conditions that are necessary. Therefore the following conditions should be added: 943, WB7, and various X35 conditions as shown below:

Rights 65-11250, 65-13459, and 65-13513 when combined shall not exceed a total diversion rate of 5.88 cfs, a total annual maximum diversion volume of 882 af at the field headgate, and the irrigation of 294 acres.

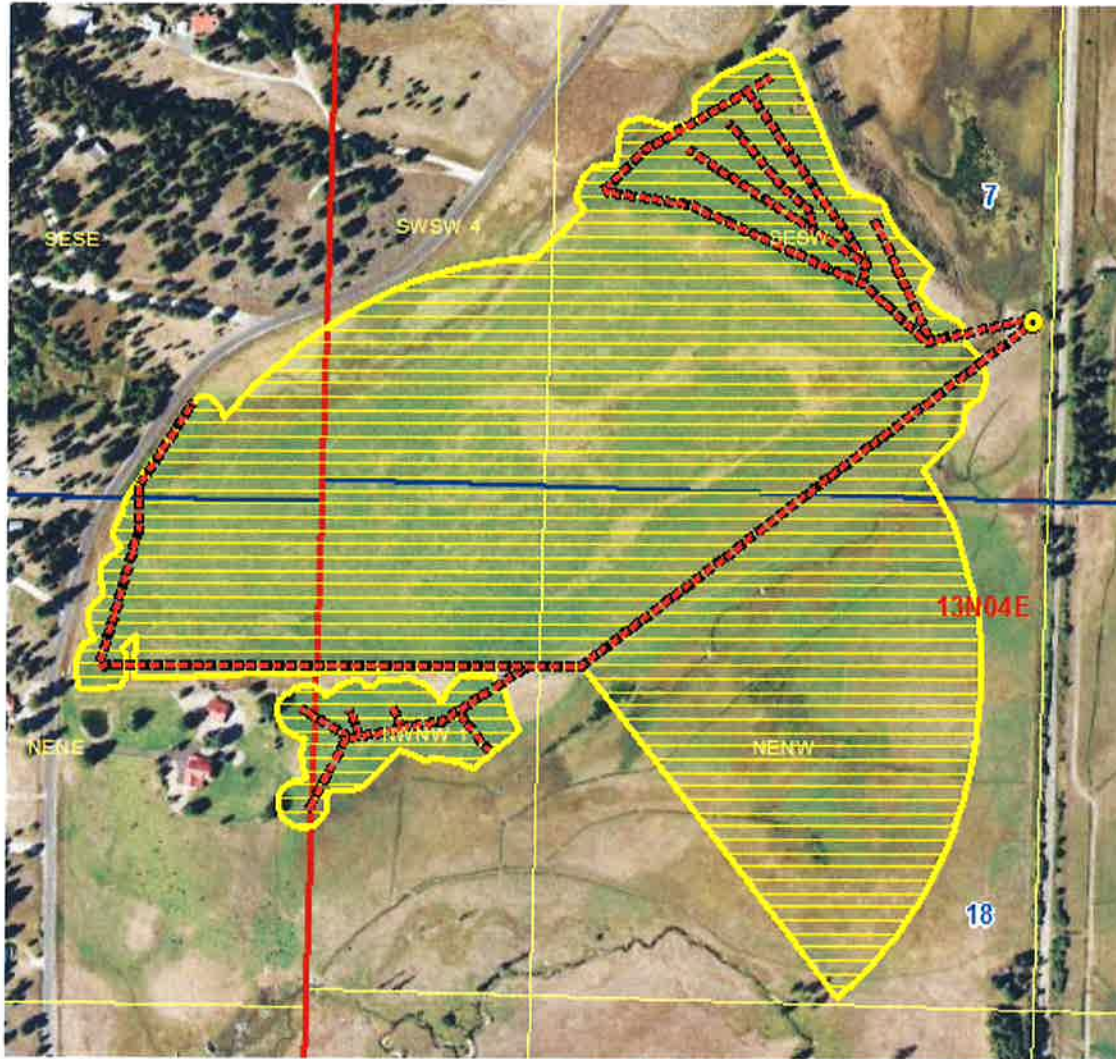
Rights 65-11250 and 65-13513 when combined shall not exceed a total diversion rate of 5.82 cfs, a total annual maximum diversion volume of 873 af at the field headgate, and the irrigation of 291 acres.

Rights 65-13459 and 65-13513 when combined shall not exceed a total diversion rate of 1.64 cfs, a total annual maximum diversion volume of 246 af at the field headgate, and the irrigation of 82 acres.

Please Note: Condition T17 was a measurement condition that was required to determine the flow rate. The flow rate has been determined, so there is no longer a need for a measurement device to be installed. No measurement device was installed on the system.

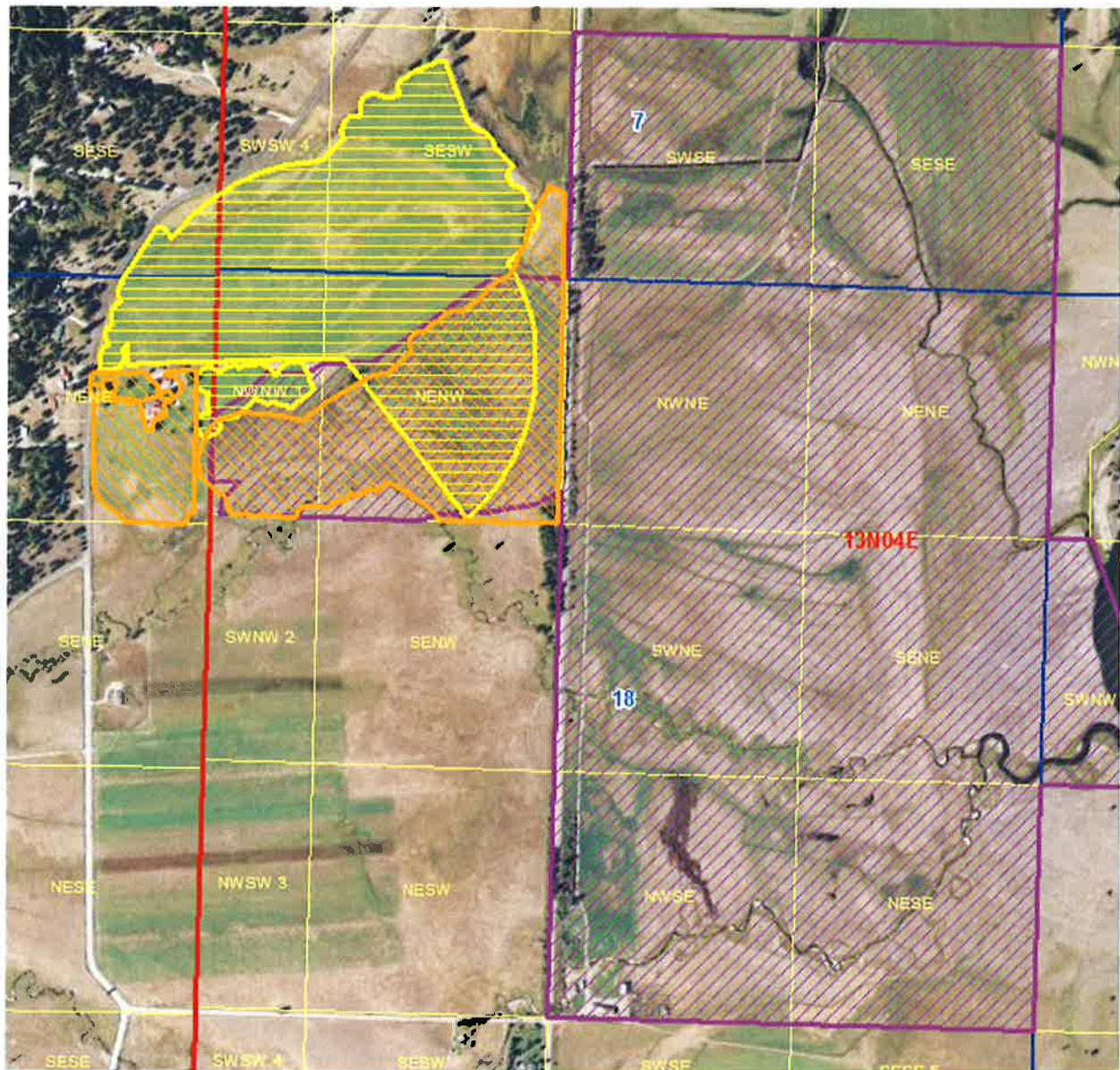
Permit 65-13513 – System Diagram

The yellow outline is the border of the place of use. The red dotted lines show the mainlines for this permit. No water is open discharged into any ditch or other conveyance system other than what is shown below.



Permit 65-13513 – Map of overlapping water rights

The aerial photo below shows the overlapping water rights for this permit. The land west of the railroad tracks that runs through the middle of sections 7 and 18 is the property line. The permit holder owns the land to the west (left) of the railroad tracks and east (right) of the road that goes around the pivot. The purple border is the place of use for water right 65-11250. The brown border is the place of use for 65-13459. The yellow border is the place of use for 65-13513. The majority of the overlapping acres is found in the north $\frac{1}{2}$ of the NW $\frac{1}{4}$ of Section 18.



Permits 65-13459 and 65-13513 Overlap Review

Section 7 Township 13N Range 4E

Water Right Number	NE				NW				SW				SE				TOTAL	Cumulative total per right
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-11250															16	9	25	25
65-13459																	2	2
65-13513											7	22					29	29
All Rights Combined											7	22			16	9	54	54
65-11250 and 65-13459															16	9	47	47
65-11250 and 65-13513											7	22			16	9	54	54
65-13459 and 65-13513											7	22					29	29

Section 17 Township 13N Range 4E

Water Right Number	NE				NW				SW				SE				TOTAL	Cumulative total per right
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-11250																	8	33
All Rights Combined																	8	62
65-11250 and 65-13459																	8	55
65-11250 and 65-13513																	8	62
65-13459 and 65-13513																	0	29

Section 18 Township 13N Range 4E

Water Right Number	NE				NW				SW				SE				TOTAL	Cumulative total per right
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-11250	27	38	38	39	22	9							13	24			210	243
65-13459					29	7											36	38
65-13513					23	9											32	61
All Rights Combined	27	38	38	39	30	10							13	24			219	281
65-11250 and 65-13459	27	38	38	39	30	10							13	24			219	274
65-11250 and 65-13513	27	38	38	39	30	10							13	24			219	281
65-13459 and 65-13513					30	10											40	69

Section 13 Township 13N Range 3E

Water Right Number	NE				NW				SW				SE				TOTAL	Cumulative total per right
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-13459	9																9	47
65-13513	7																7	68
All Rights Combined	10																10	291
65-11250 and 65-13459	10																10	284
65-11250 and 65-13513	7																7	288
65-13459 and 65-13513	10																10	79

Section 12 Township 13N Range 3E

Water Right Number	NE				NW				SW				SE				TOTAL	Cumulative total per right
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-13513																	3	71
All Rights Combined																	3	294
65-11250 and 65-13459																	0	284
65-11250 and 65-13513																	3	291
65-13459 and 65-13513																	3	82

Total Acres 65-11250 =	243
Total Acres 65-13459 =	47
Total Acres 65-13513 =	71
Combined Acres All Rights =	294
Combined Acres 65-11250 and 65-13459 =	284
Combined Acres 65-11250 and 65-13513 =	291
Combined Acres 65-13459 and 65-13513 =	82

Water Right	Diversion Rate	Acres	Rate/Acre
Right 65-11250	4.85	243	0.02
65-13459	0.53	47	0.01
65-13513	1.42	71	0.02

THEORETICAL HORSEPOWER EQUATION WORKSHEET (cjh 1/92)

Water Right No.: 65-13513
 Reviewer: Dan Nelson
 Date of Review: 9/26/2018

P/D No.:

PUMP HORSEPOWER
 BOOSTER HORSEPOWER

PUMPING LEVEL

DISCHARGE PRESSURE

RATE OF FLOW (cfs)

Scenario 1
50
0
80
45
1.67
751

Scenario 2
50
0
80
60
1.41
632

Scenario 3
50
0
80
80
1.16
522

1.42
 635.27

The above calculates the formula =

$$Q = \frac{8.8 * (\text{Efficiency}) * \text{hp}}{\text{depth to water} + 2.31 * (\text{psi}) + \text{friction}}$$

Assumptions: %70 efficiency.
 No Friction

Examiners Notes:

In a telephone conversation with the permit holder on September 19, 1996, the field examiner was told the pump was set at 90 feet, and that the pump test showed a pumping water level of 72 feet. I used the standard of 10 feet above the pump of 80 feet, since only 150 gpm was diverted during the pump test. The pressures on the system was taken at the pivot on the owner's meter and at the sprinkler heads. The field examiner states that the pressure at the pivot was 80 psi, which is a great deal more than the standard pivot set up of 40 psi at the top of the pivot. The pivot does go up hill, so there may have been a need to have a higher pressure for the pivot. The telephone memo states that the sprinklers on the pivot are designed at 25 psi. The pivot goes uphill approximately 40 feet in elevation, so I estimated that the actual pressure at the pivot would be approximately 45 psi $([40 \text{ ft} / 2.31] + 25 = 42.3 \text{ psi at the bottom of the pivot})$. I added a little extra pressure for friction loss. I tried a couple of different scenarios gradually increasing the pressure on the pump. The field examiner calculated 4.40 cfs and 1.60 cfs, but he used static water level instead of pumping water level. I think the system runs at different pressures depending on the number of sprinklers used. There are 71 acres being irrigated, and at 0.02 cfs per acre, that would allow a diversion rate of 1.42 cfs or 635 gpm. This is less than the field examiner calculated, but I feel it is a more reasonable representation of the pump capacity of this system. I think Scenario 2 above represents the maximum flow rate this system can operate at with the elevation changes in the field.