

MEMORANDUM

TO: Water Right File 65-13459

FROM: Daniel Nelson – Analyst 3

DATE: September 25, 2018

SUBJECT: Licensing Review of Water Right 65-13459

A partial filed report was performed on this water right by Western Region staff in 1995. However, several elements were not included in the report. 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 6 inch well. The permit and the field examiner placed the well in the NENE of Section 13, Township 13 North, Range 3 East. I was able to GPS the site location and confirm the well location.

Place of Use:

The field report didn't provide a number of acres. After review of the system, I was able to determine that the 6 inch well could irrigate 47 acres. Most of those acres are overlapped by other rights. Please see the overlap review below.

Diversion Rate:

A portion of the ground irrigated by this permit is irrigated using a sprinkler system and a portion is irrigated by wild flooding through a ditch system. The pump can divert into sprinkler system or be diverted to open discharge into a ditch that diverts Moores Creek water. The diversion rate was also not calculated in the field report. However, the field notes with the report give somewhat of an idea of the flow rate of the portion of the water use diverted to the sprinklers. I was able to match that diversion rate and use the data from that information to calculate a theoretical calculation for the diversion rate that open discharges into the ditch. Please see the sprinkler test and theoretical calculation sheets I have included with this memo to show the recommended rate of diversion of 0.53 cfs.

The 0.53 cfs is based on the open discharge portion of the system, which is higher than the amount diverted in the sprinkler system due to pressure difference in pressure.

Diversion Volume:

No volume was calculated for this permit either. However, the volume would be limited by the headgate requirement of 3 af per acre for 47 acres (141 af) or the diversion rate for the irrigation season for a total of 793.4 af ($0.53 \text{ cfs} \times 1.9835 \times 200 \text{ days} = 793.4 \text{ af}$). The annual volume will be limited to the headgate requirement or 141 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 (this permit) and 65-13513 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. This permit 65-13459 provides primary irrigation around the home and the pasture to the south, and supplements the ground irrigated by water right 65-11250. Water right 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:

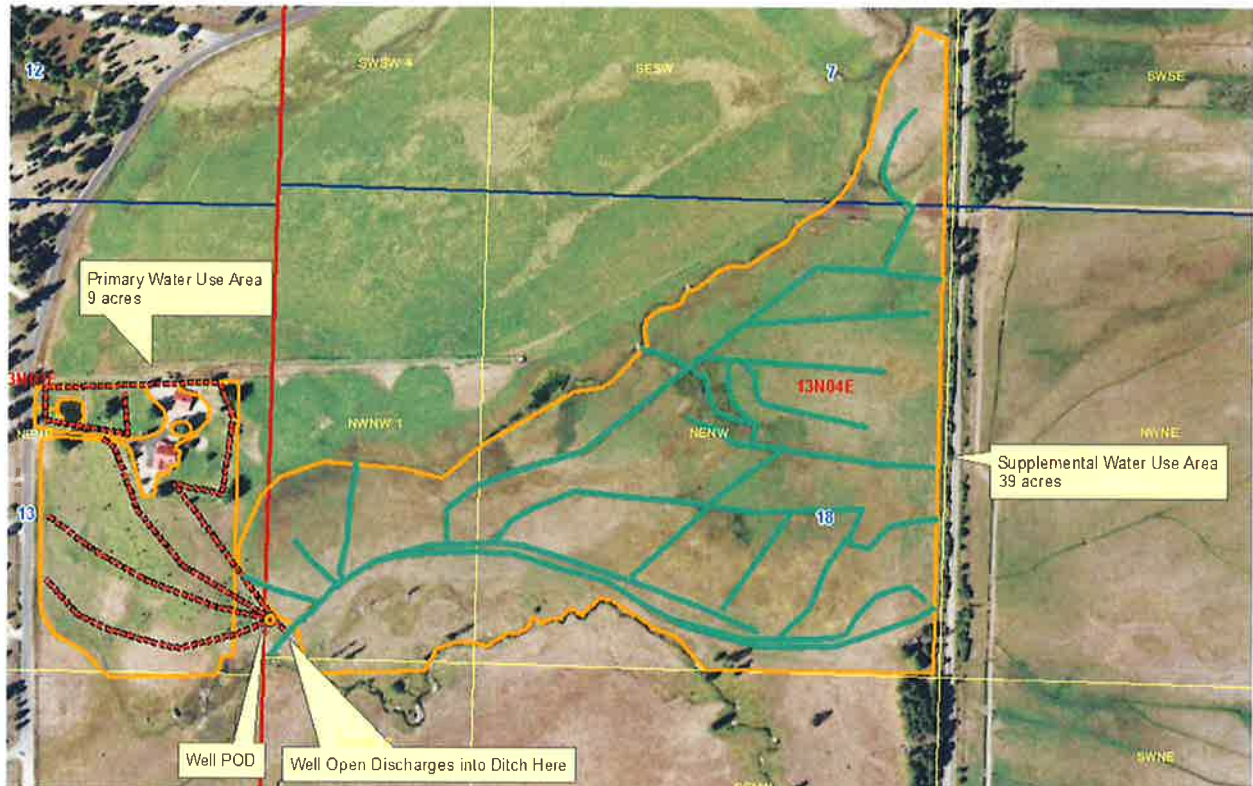
Rights 65-11250, 65-13459, and 65-13513 when combined shall not exceed a total diversion rate of 5.88 cfs, a total annual maximum diversion volume of 882 af at the field headgate, and the irrigation of 294 acres.

Rights 65-11250 and 65-13459 when combined shall not exceed a total diversion rate of 5.68 cfs, a total annual maximum diversion volume of 852 af at the field headgate, and the irrigation of 284 acres.

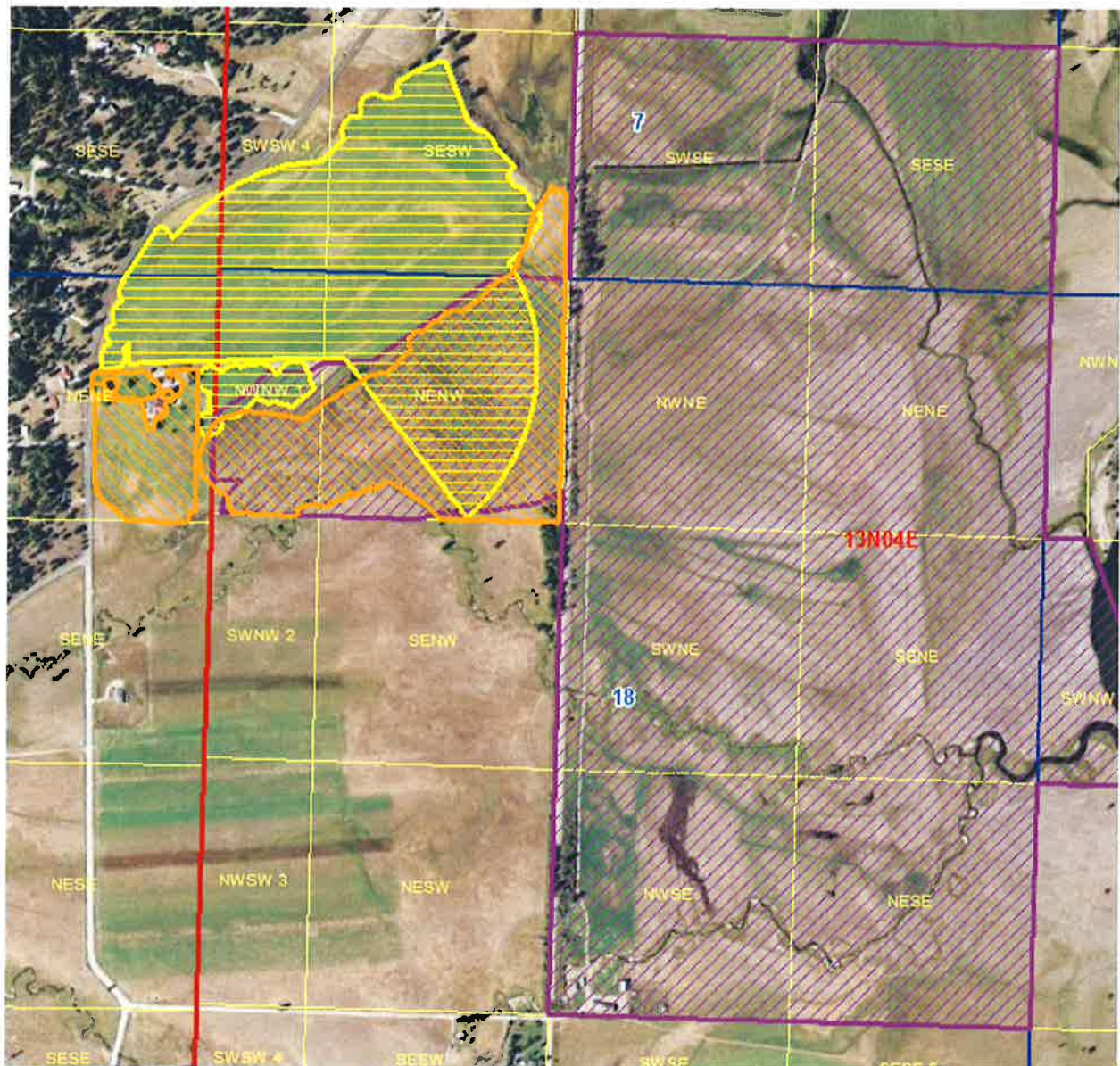
Rights 65-13459 and 65-13513 when combined shall not exceed a total diversion rate of 1.64 cfs, a total annual maximum diversion volume of 246 af at the field headgate, and the irrigation of 82 acres.

Permit 65-13459- System Diagram

The well for this permit can go into a pressurized system that supplies water to the yards around the home and a small pasture south of the home, or it can open discharge into a ditch system that irrigates a large area east of the well. The red spotted lines are mainlines and the blue lines are ditches. The orange border is the place of use, and the orange dot is the well location. The area being irrigated around the home (9 acres) uses the well as a primary water source, and the area east of the house (39 acres) uses the well to supplement the water being used from Moores Creek under water right 65-11250.



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 ½ of the NW ¼ of Section 18.



Permits 65-13459 and 65-13513 Overlap Review

Section 7 Township 13N Range 4E

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

	NE				NW				SW				SE				TOTAL	
Water Right Number	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-11250							8										8	33
All Rights Combined							8										8	62
65-11250 and 65-13459							1										1	55
65-11250 and 65-13513							8										8	62
65-13459 and 65-13513																	0	39

Section 18 Township 13N Range 4E

	NE				NW				SW				SE				TOTAL	
Water Right Number	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

	NE				NW				SW				SE				TOTAL	
Water Right Number	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

	NE				NW				SW				SE				TOTAL	
Water Right Number	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
65-13513																3	3	71
All Rights Combined																3	3	294
65-11250 and 65-13459																	0	284
65-11250 and 65-13513																3	3	291
65-13459 and 65-13513																3	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	4.86	243	0.02
65-13459	0.53	47	0.01
65-13513	1.42	71	0.02

Permit 65-13459 – Sprinkler vs Theoretical Analysis

At the time I visited the property, the pump for this system has been winterized. Therefore, it did not seem reasonable to require a measurement be taken when I was there. However, the first examiner did provide some reasonably decent information to determine the flow rate through sprinkler tests. The theoretical calculation for the size pump used on this system is approximately 106 gpm under pressure and 239 gpm for open discharge. The field examiner stated that there were only two sets, but he only provided pressure readings on the set around the home. Using the information provided by the field examiner and my theoretical calculations, I believe we have a reasonable flow rate for this system. Please review the following information.

Set A:

6 sprinklers 7/32 nozzle @ 30 psi= 7.86 gpm/nozzle per sprinkler = 47.16 gpm

2 sprinklers 7/32 nozzle @ 40 psi= 9.02 gpm/nozzle per sprinkler = 18.04 gpm

9 sprinklers 9/64 nozzle @ 43 psi= 3.89 gpm/nozzle per sprinkler = 35.01 gpm

Total = 100.21 gpm

Please Note: The field examiner's notes say that there were also some popup sprinklers. However, he didn't get the size. Popup type sprinklers can run between 0.21 gpm to 1.58 gpm depending on the size and arc of the nozzle.

With a calculated theoretical flow rate of 106 gpm, this would leave approximately 6 gpm for the pop up sprinklers, or enough to allow approximately 6 or more sprinklers depending on the arc of the pop up sprinklers. Therefore, the theoretical calculation for the pressurized systems seems to reasonably accurate.

THEORETICAL HORSEPOWER EQUATION WORKSHEET (cjh 1/92)

Water Right No.: 65-22349
 Reviewer: Rachael Smith and Dan Nelson
 Date of Review: 5/22/2018

P/D No.:

PUMP HORSEPOWER
 BOOSTER HORSEPOWER

PUMPING LEVEL

DISCHARGE PRESSURE

RATE OF FLOW (cfs)

Well Under pressure	Well Open Discharge
7.5	7.5
0	0
64	64
57	10
0.24	0.53
106	239

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:

There was no way to measure this system. The pump had been winterized for the season, so I am performing this theoretical calculation to ensure the measurements made by the previous field examiner were reasonable.

The well depth was 99 feet and the static water level was 29 feet. Using the Department standard for estimating the pumping water level by using the following equation:

$$[(99 \text{ ft well depth} - 28 \text{ ft static}) / 2] + 28 \text{ ft static} = 63.5 \text{ feet.}$$

The estimated pumping water level used for the Well of 64.5 feet will be used as the lift.

The previous field examiner measured the pressure on the pressurized system at the sprinklers of approximately 30 to 40 psi. The yard sprinklers that were measured are approximately 40 feet in elevation above the well. Therefore, I used the following equation to determine the pressure at the well head:

$$(40 \text{ ft} / 2.31) + 40 \text{ psi sprinkler pressure} = 57.316 \text{ psi for the pressurized system.}$$

I used the standard open discharge pressure of 10 psi for the open discharge calculation.

Please see the comparison of the pressurized system to confirm that the pumping level is reasonably accurate. Therefore, I am recommending that this permit be limited to a diversion rate of 0.53 cfs, since that is the diversion available for the open discharge system.