

MEMORANDUM

To: Water Right File No. 29-13672
From: Ashley Ritter
Date: December 04, 2020
Re: Licensing Amendment Recommendation

Review

Priority Date

The priority date for permit 29-13672 is listed as 01/30/2004. Permit approval was issued on 05/29/2008 with a proof due date of 06/01/2012. An initial Statement of Completion for submitting Proof of Beneficial Use ("proof") was submitted to Idaho Department of Water Resources ("the Department") on 05/14/2012. Upon review, the Department determined that the proof submitted was incomplete, and that reporting requirements, conditions eight (8) and nine (9) of permit 29-13672 had not been complied with. The permit holder's attorney at the time (Rob Woods) submitted the required data on 10/04/2012. A review of the water permit's backfile suggests that the additional information was submitted timely and that there is no indication that the priority date should be advanced.

Source

Evidence indicates that the source is ground water (same as permitted). This was verified with review of the available well log (well-constructed in 2001, to a depth of 700 feet) and during the November 9, 2012, field examination conducted by the Department.

Place of Use (POU)

Permitted POU: T09S, R38E, S21, SESE

Developed POU: T09S, R38E, S21, Lot 2 NWSESE SWSE
Determination-ArcGIS review

Point(s) of Diversion (POD)

Permitted for 1 POD:

T09S, R38E, S21, NWSESE

Developed 3 POD's:

- | | |
|--|--|
| 1. (Permitted) Well-constructed 05/31/2001 | T09S, R38E, S21, <u>Lot 2</u>
NWSESE SWSE |
| 2. Well-constructed 02/16/1995 | T09S, R38E, S21, <u>Lot 2</u> SWSE |
| 3. Well-constructed 03/22/1990 | T09S, R38E, S21, <u>Lot 2</u> SWSE |

Determination-ArcGIS review, permit application review, and review of well construction logs.

The permitted POD's location description is different than what was developed, and a permit amendment will be required before a license can be issued. There are also two

additional POD's (total of 3 POD's) that utilize ground water within the same (one) system. The two (2) additional POD's were constructed and in use prior to authorization permit 29-13672, used as POD's for water right 29-7869. It is recommended that the additional POD's (2 additional) be added to the permit to better reflect actual system use. The location description is the same for all three (3) POD's-- T09S, R38E, S21, Lot 2 SWSE.

Diversion Rate

A theoretical system calculation will be used for licensing recommendations since actual field measurements are not available (system calculations will include all three POD's). Water right 29-7869 is licensed for 0.5 cfs and utilize the same three (3) POD's as permit 29-13672. Information found within a field exam conducted in 1995 for water right 29-7869 is used in well capacity calculations for Well #1 and Well #2 (see 29-7869 water right backfile for field exam).

Well #1: The West Well (Well #1) constructed in 1990 was reported having a 3.5 hp pump by D. Dunn during the reported 1995 beneficial use field exam. According to the proof submitted for water right 29-7869 the pumping water level of Well #1 was 31 feet (this depth is assumed to be the pump setting depth). The pumping water level was calculated using the Theoretical Dynamic Pumping Level Diagram for Wells (8/95) rdh. The calculation sheet states that if pump setting depth is known (31 feet) a pumping water level of 10 feet above the setting depth may be used, thus 31 feet - 10 feet = 21 feet. D.Dunn computed a theoretical system capacity using zero (0 psi) pressure. Since system pressure was unknown and the well driller's report did not indicate that Well # 1 is an artesian well, a pressure value of 10 psi (to account for minor friction losses) is used. Based on these calculation parameters (Table 1) the capacity of Well #1 is 0.49 ~0.50 cfs or approximately 219 gpm.

THEORETICAL HORSEPOWER EQUATION WORKSHEET (cjh 1/92)

Water Right No.: 29-13672
 Reviewer: Ashley Ritter
 Date of Review: 11/23/2020
 29-13672

	Based on BU Statement	West Well / Based on DDunn Field Exam	Well #1 (1990) AR Theoretical	Well #1 (1990) AR Theoretical	Well #1 (1990) AR Theoretical
P/D No.:	Well #1 (1990)	Well #1 (1990)	Well #1 (1990)	Well #1 (1990)	Well #1 (1990)
PUMP HORSEPOWER	3	3.5	3.5	3.5	3.5
BOOSTER HORSEPOWER	0	0	0	0	0
PUMPING LEVEL	31	35	21	21	21
DISCHARGE PRESSURE	50	0	5	10	15
RATE OF FLOW (cfs)	0.13	0.62	0.66	0.49	0.39
RATE OF FLOW (gpm)	57	276	297	219	174

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

Table 1: Well # 1 (West Well) Well Capacity Calculation

Well #2: The East Well (Well # 2) constructed in 1995 was reported having a 5.0 hp pump with a dynamic pumping water level of 35 feet by D. Dunn during the reported 1995 beneficial use field exam associated with water right 29-7869. D. Dunn computed a theoretical system capacity using zero (0) pressure. Since system pressure was unknown and the well driller's report did not indicate that Well # 2 is an artesian well, a pressure value of 10 psi (to account for minor friction losses) is used. Based on these calculation parameters (Table 2) the capacity of Well #2 is 0.53 cfs or approximately 238 gpm.

THEORETICAL HORSEPOWER EQUATION WORKSHEET (cjh 1/92)

Water Right No.: 29-13672
 Reviewer: Ashley Ritter
 Date of Review: 11/23/2020
 29-7869

	Based on BU Statement	Well #2 / Based on DDunn Field Exam	Well #2 (1995) AR Theoretical	Well #2 (1995) AR Theoretical	Well #2 (1995) AR Theoretical
P/D No.:	Well #2 (1995)	Well #2 (1995)	Well #2 (1995)	Well #2 (1995)	Well #2 (1995)
PUMP HORSEPOWER	3	5	5	5	5
BOOSTER HORSEPOWER	0	0	0	0	0
PUMPING LEVEL	35	35	35	35	35
DISCHARGE PRESSURE	50	0	5	10	15
RATE OF FLOW (cfs)	0.12	0.88	0.66	0.53	0.44
RATE OF FLOW (gpm)	55	395	297	238	198

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

Table 2: Well # 2 (East Well) Well Capacity Calculation

Well #3: Well # 3 (the POD currently permitted under 29-13672) constructed in 2001 has a 7.5 hp pump installed at 220 feet below ground surface, based on a verbal statement provided by the permit holder. The pumping water level was calculated using the Theoretical Dynamic Pumping Level Diagram for Wells (8/95)rdh. The calculation sheet states that if pump setting depth is known (220 feet) a pumping water level of 10 feet above the setting depth may be used, thus 220 feet - 10 feet = 210 feet. A value of zero (0) pressure is used as the permit holder states this is an artesian well. Based on these calculation parameters (Table 3) the capacity of Well # 3 is 0.22 cfs or approximately 99 gpm.

THEORETICAL HORSEPOWER EQUATION WORKSHEET (cjh 1/92)

Water Right No.: 29-13672
 Reviewer: Ashley Ritter
 Date of Review: 11/23/2020
 29-7869

		C	B	D
P/D No.:	Based on Dr. Lachmar supervised pumping test (9/15/2005-9/16/2005)	Well #3 (2001) AR Theoretical	Well #3 (2001) AR Theoretical	Well #3 (2001) AR Theoretical
PUMP HORSEPOWER	Well #1 (1990)	Well #3 (2001)	Well #3 (2001)	Well #3 (2001)
BOOSTER HORSEPOWER	unknown	5	7.5	7.5
	0	0	0	0
PUMPING LEVEL	unknown	210	210	200
PUMP SETTING DEPTH	250	220	220	220
DISCHARGE PRESSURE	Based on artesian conditions per Mr. Katsilometes' statement	0	0	0
RATE OF FLOW (cfs)	0.20	0.15	0.22	0.23
RATE OF FLOW (gpm)	90 calculated with 5-gal bucket method	66	99	104

The above calculates the formula =

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

Assumptions: 70% efficiency,
 No Friction

Table 3: Well # 3, Well Capacity Calculation

Total System Capacity: 0.50 cfs + 0.53 cfs + 0.22 cfs = 1.25 cfs
 29-7869 licensed for 0.50 cfs
 29-13672 permitted for 0.50 cfs +
 1.0 cfs

The system is capable of producing 1.25 cfs. Water right 29-7869 is licensed for 0.50 cfs allowing 0.75 cfs remaining capacity. The remaining capacity is able to provide the 0.50 cfs permitted under 29-13672. Therefore, it is recommended that permit 29-13672 be licensed for 0.50 cfs.

Volume

The volume calculations are divided into two sections, the first focusing on volume of water needed to heat buildings, and the second focusing on volume of water needed for pool use.

Building Heat Use: The permit holder (George Katsilometes) stated that two buildings utilize hot water for heating purposes (main inn building and spa building). A modene hot coil fan (reverse radiator) is used in the main inn and a heat exchange unit with propylene glycol is used in the spa building. Mr. Katsilometes stated that 50 gpm (combined) is diverted for heating use and that a targeted indoor temperature of 72 degrees Fahrenheit ("F") is anticipated year-round.

Temperature data from the previous five (5) years (November 2015 through October 2020) collected at a weather station in Pocatello, Idaho

(<https://w2.weather.gov/climate/index.php?wfo=pih>) was used in determining a volume for building heating use. For each individual month (60 months total), the total number of days where the maximum temperature was above 72 F was determined. This value represents the days where it is assumed heating is not required ("non-heating days") within that month. Subtracting the total number of non-heating days from the total number of days in the month equates the number of days where the maximum temperature is at or below 72 F, or the days where it is assumed heating is required ("heating days").

Using the past five (5) years of temperature data (see example for the month of May, Table 4 below) the minimum number of days (evaluating the entire 5 years of data) that the maximum daily temperature was recorded as above 72 F was determined for each month. The minimum number of days (evaluating the entire 5 years of data, Table 5) that the maximum daily temperature was recorded as above 72 F was then subtracted from the total number of days in the month to determine the maximum number of days to be utilized for heating.

Year	Month	Average Monthly Temperature	Maximum Monthly Temperature	Minimum Monthly Temperature	# Days in month Maximum Daily Temperature was above 72**	Days in month	*Minimum # Days (evaluating entire data set) Maximum Daily Temperature was above 72**
2016	May	53.9	83	29	12	31	11
2017	May	53.7	89	22	13	31	
2018	May	57.9	87	28	22	31	
2019	May	52.3	82	20	11	31	
2020	May	55.3	93	28	11	31	

Table 4: Determination of Heating Days Used for Each Month Evaluating Entire Data Set

Month	Average Monthly Temperature (evaluating entire data set)	*Minimum # Days (evaluating entire data set) Maximum Daily Temperature was above 72**	Days in month	Maximum # Days Utilized for Heating (Days in month minus # Days in month Maximum Daily Temperature was above 72**)
Jan	26.3	0	31	31
Feb	30.16	0	28	28
Mar	39.92	0	31	31
April	47.1	0	30	30
May	54.62	11	31	20
June	63.2	20	30	10
July	71.58	29	31	2
Aug	69.44	29	31	2
Sept	59.54	16	30	14
Oct	45.24	1	31	30
Nov	36.2	0	30	30
Dec	24.32	0	31	31
		106		259
				Total

January through October includes data from 2016 through 2020
November and December includes data from 2015 through 2019

Table 5: Determination of Annual Days Recommended for Heating Use

From this evaluation of the temperature data set it was determined that 259 days annually will be allotted for heating use (Table 5). At 50 gpm for 259 days, 57.2 AF (acre-feet) is recommended for heating use for the two above mentioned buildings (Table 6).

Volume allotted for Heating Use					
GPM	GPH	Days	Hours	Gallons	AF
50 →	3000	259 →	6216 →	18,648,000	57.2

Table 6: Volume Recommended for Heating Use of Buildings

Pool Use: The permit holder advised that 385 gpm is needed for pool operations (17 total pools, heating sidewalks, etc.) and that this flow rate is pumped continuously during the colder months. The applicant advised that water flow is reduced by approximately 50 gpm during the warmer months to reduce temperature within the pools (higher temperature water not needed during warmer months) and the reduced 50 gpm flow is diverted to a pool that is not used, then discharged into the river.

As previously discussed it was determined that 259 days annually will be allotted for heating use (259 days where the entire 385 gpm flow rate is needed). This allows 106 days that heating is not required (Table 5).

Month	*Minimum # Days (evaluating entire data set) Maximum Daily Temperature was above 72**	Days in month
Jan	0	31
Feb	0	28
Mar	0	31
April	0	30
May	11	31
June	20	30
July	29	31
Aug	29	31
Sept	16	30
Oct	1	31
Nov	0	30
Dec	0	31

Volume utilized for pool use

GPM	Days	Gallons	AF
385	259	143,589,600	440.7
360	28	37,627,200	115.5
335	78	14,515,200	44.5

Table 7: Flow Rates Recommended for Pool Use

June, July and August, the hottest months, where temperature in the pools are assumed to be reduced, based on the permit holder's statement, is recommended utilizing a flow rate of 335 gpm (385 gpm-50 gpm). The minimum number of days (evaluating the entire five years of data) that the maximum daily temperature was recorded as above 72 F were added together for June, July, and August, equating to 78 days (Table 7). May, September, and October, for this evaluations purpose will be considered milder months, where 360 gpm will be recommended as a flow rate for the remaining 28 days (365-259-78=28) This is a reduction of half (25 gpm) of the 50 gpm to account for milder temperatures (not considered heating or non-heating days).

The total volume utilizing pool use is 600.7 AF. Subtracting the licensed volume for 29-7869 of 362.0 AF leaves 238.7 AF recommended for pool use for permit 29-13672.

The recommended total annual volume is calculated by adding the determined volume for pool use and heating use of the two above mentioned buildings as follows:

$$\begin{array}{r} 238.7 \text{ AF} \\ \underline{57.2 \text{ AF} +} \\ 295.9 \sim \mathbf{296 \text{ AF}} \end{array}$$

Year	Month	Average Monthly Temperature	Maximum Monthly Temperature	Minimum Monthly Temperature	# Days in month Maximum Daily Temperature was above 72**	Days in month	*Minimum # Days (evaluating entire data set) Maximum Daily Temperature was above 72**
2016	Jan	25.7	43	-14	0	31	0
2017	Jan	16.4	42	-22	0	31	
2018	Jan	34.4	61	8	0	31	
2019	Jan	25.1	49	-11	0	31	
2020	Jan	29.9	51	5	0	31	
2016	Feb	31.9	59	4	0	28	0
2017	Feb	32	56	2	0	28	
2018	Feb	32	57	5	0	28	
2019	Feb	26.7	49	-6	0	28	
2020	Feb	28.2	55	-7	0	28	
2016	Mar	41.7	67	19	0	31	0
2017	Mar	43.3	72	12	0	31	
2018	Mar	38.6	64	13	0	31	
2019	Mar	36.1	63	14	0	31	
2020	Mar	39.9	65	11	0	31	
2016	Apr	49.3	79	27	4	30	0
2017	Apr	44.8	69	23	0	30	
2018	Apr	47.9	82	18	5	30	
2019	Apr	47.8	74	26	1	30	
2020	Apr	45.7	82	19	2	30	
2016	May	53.9	83	29	12	31	11
2017	May	53.7	89	22	13	31	
2018	May	57.9	87	28	22	31	
2019	May	52.3	82	20	11	31	
2020	May	55.3	93	28	11	31	
2016	Jun	66.3	96	37	30	30	20
2017	Jun	63.9	96	40	27	30	
2018	Jun	62.8	92	34	26	30	
2019	Jun	61.2	87	29	24	30	
2020	Jun	61.8	95	33	20	30	
2016	Jul	70.6	98	39	29	31	29
2017	Jul	73.8	100	44	31	31	
2018	Jul	73.5	99	34	31	31	
2019	Jul	70.7	99	42	31	31	
2020	Jul	69.3	104	42	31	31	
2016	Aug	67.7	97	40	31	31	29
2017	Aug	70.1	97	42	31	31	
2018	Aug	68	102	34	29	31	

Year	Month	Average Monthly Temperature	Maximum Monthly Temperature	Minimum Monthly Temperature	# Days in month Maximum Daily Temperature was above 72**	Days in month	*Minimum # Days (evaluating entire data set) Maximum Daily Temperature was above 72**
2019	Aug	69.3	98	39	31	31	
2020	Aug	72.1	101	41	30	31	
2016	Sep	58.4	90	30	19	30	16
2017	Sep	58.9	98	32	18	30	
2018	Sep	60.2	92	28	24	30	
2019	Sep	59.6	96	30	16	30	
2020	Sep	60.6	100	27	24	30	
2016	Oct	49.8	77	25	4	31	1
2017	Oct	43.9	75	21	1	31	
2018	Oct	46.4	77	21	3	31	
2019	Oct	38.4	76	-6	1	31	
2020	Oct	47.7	81	3	10	31	
2015	Nov	32.1	61	-6	0	30	0
2016	Nov	40.5	68	15	0	30	
2017	Nov	40	67	18	0	30	
2018	Nov	33.3	61	8	0	30	
2019	Nov	35.1	62	5	0	30	
2015	Dec	24.9	60	-14	0	31	0
2016	Dec	19.7	45	-11	0	31	
2017	Dec	25.5	51	-1	0	31	
2018	Dec	24.1	45	-4	0	31	
2019	Dec	27.4	50	0	0	31	

* For the five years of data the minimum # of days with temperatures above 72 degrees was calculated

** Degrees Fahrenheit