

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 36-16441

Exam Date: 7/9/2013

1. Current Owner: JEROME JOINT SCHOOL DISTRICT NO 261
125 4TH AVE W
JEROME ID 83338
(208)324-2392
2. Accompanied by: Troy Fletcher
Phone No: (208) 308-3152
Address: 125 4TH AVE W, JEROME ID 83338
Relationship to Permit Holder: heating & cooling maintenance technician for Jerome School District

3. SOURCE

GROUND WATER

B. OVERLAP REVIEW

1. Other water rights with the same place of use: The school is located within the Jerome municipal and the North Side Canal Co. service areas but there are no other cooling or heating rights at the place of use.
2. Other water rights with the same point of diversion: None

C. DIVERSION AND DELIVERY SYSTEM**1. LOCATION OF POINT(S) OF DIVERSION:**

GROUND WATER	NE1/4SE1/4NE1/4	Sec. 13, Twp 08S, Rge 16E, B.M.
JEROME County		
GROUND WATER	NE1/4SE1/4NE1/4	Sec. 13, Twp 08S, Rge 16E, B.M.
JEROME County		

Method of Determination: Utilized WMIS points (1000449 and 1000450) for these diversions and verified locations visually during field exam.

2.

PLACE OF USE: HEATING

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
08S 16E 13				X													

PLACE OF USE: COOLING

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
08S 16E 13				X													

Method of Determination: Place of use determined using 2011 aerial photography and verified the place of use is located as recorded. See attached map.

3. ☐ Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.
- ☐ Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be 1:24,000 or greater.
- ☐ Aerial Photo Attached (required for irrigation of 10+ acres).
- ☐ Photo of Diversion and System Attached

4.

<u>Well or Diversion ID No.*</u>	<u>Motor Make</u>	<u>Hp</u>	<u>Motor Serial No.</u>	<u>Pump Make</u>	<u>Pump Serial No. or Discharge Size</u>
D0043325		25			
D0043326		25			

D. FLOW MEASUREMENTS

1.

<u>Measurement Equipment</u>	<u>Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calib. Date</u>
Flow Meter	Sonic	Fuji	Portaflow	7K0085TB		March 2013

2. Measurements: Flow meter measured a rate 233.6 gpm or 0.52 cfs from the wells.

E. FLOW CALCULATIONS

Measured Method:

Theoretical Yield:

$$Q = \frac{8.8 \times (Hp) \times (Eff)}{H}$$

Where: Hp = 2(25) Hp (Per Troy Fletcher)

Eff = efficiency = 70% assumed

H = total head = pumping level = (2.31 x system pressure)

assume pumping level of 276 feet (based on Well Drillers Report)

assume system pressure = 40 psi

$$H = 276 + (40 \times 2.31) = 368.4$$

$$Q = \frac{8.8 \times 50 \times .70}{368.4} = 0.84 \text{ cfs}$$

F. VOLUME CALCULATIONS**1. Volume Calculations for Other Uses:**

Heating/Cooling: The system is utilized for the most during regular fall & spring school sessions, but is also used in the summer as needed for staff.

According to totalizer data collected from the flow meter, 41.24 AF of water was pumped through the system and reinjected into the aquifer in 2013. Climate data provided by Weather Underground reports Heating Degree Days (HDD) at 6758 and Cooling Degree Days (CDD) at 904 in Jerome for 2013 (<http://www.wunderground.com/history>). According to the Western Regional Climate Center, the maximum HDD and CDD reported for Jerome are 7990 HDD and 1025.69 CDD (<http://www.wrcc.dri.edu/summary/Climsmsid.html>).

If I divide the total acre feet reported by HDD and CDD for the same period, this theoretically represents the amount of water used per Degree Day. Then if I multiply the result by the maximum Degree Days reported for that area, I should be able to calculate a reasonable volume for licensing that accounts for heating and cooling requirements in extremely cold or hot years:

$$(41.24 \text{ AF}/6758 \text{ HDD}) \times 7990 \text{ HDD} = 48.76 \text{ AF}$$

$$(41.24 \text{ AF}/904 \text{ CDD}) \times 1025.69 \text{ CDD} = 46.79 \text{ AF}$$

$$\text{Cooling season: } 5/1 - 9/30 = 42\% \text{ of year; } 0.42 \times 46.79 \text{ AF} = \mathbf{19.7 \text{ AF Cooling}}$$

$$\text{Heating Season } 10/1 - 4/30 = 58\% \text{ of year; } 0.58 \times 48.76 \text{ AF} = \mathbf{28.3 \text{ AF Heating}}$$

$$\mathbf{48.0 \text{ AF Combined Volume}}$$

G. NARRATIVE/REMARKS/COMMENTS

Application for permit 36-16441 was submitted by the Jerome Joint School District on 7/10/2006, with a corrected application submitted on 8/16/2006. Permit lapsed, proof of beneficial use was submitted 7/22/2009, and an order of reinstatement was issued advancing the priority date to 8/31/2006.

The developed system is a closed loop heat exchange system used to heat and cool the approximately 67,165 ft² elementary school. The system utilizes two wells equipped with 25 Hp pumps that supply water into the building through two separate lines that are merged into a single 4" water line equipped with a Seametrics flow meter. The water is then passed through a heat exchanger then back out to an injection well where it is returned to the aquifer.

On 7/9/2013, I visited the school to obtain a flow measurement for this field exam. The majority of information needed to complete the field exam had already been collected by the Watermaster for WD 130. Using a Fuji Portaflow ultrasonic meter, I was able to obtain a flow measurement of 233.6 gpm which is equivalent to 0.52 cfs with the system running at full capacity. The permit had been permitted with a requested flow rate of 0.45 cfs. This non-consumptive system is completely on-demand and each classroom can call for heating/cooling independent of other classrooms on the system, which would make estimating an accurate volume difficult. Therefore, volumes were collected from Water District 130 flow meter readings in order to obtain a full year of actual volume data for licensing purposes.

The actual volume recommended is slightly higher, as the measured volume was adjusted to compensate for extremely cold and/or hot years. The method used to adjust the volume was derived from a method suggested to me by Michele Edl, Staff Engineer at the State Office, in a memo that is attached to this field exam.

The original application for permit requested heating from 01/01 to 12/31 with no cooling use listed on the permit. The only difference between heating and cooling with the heat exchanger on this system is whether the exchanger is extracting heat from the water or adding heat to the water. Since this system is used for cooling and heating and each classroom can call for cooling or heating independent of other classrooms, I am recommending this be licensed as heating from 01/1 – 12/31 and cooling from 1/01 – 12/31. This ensures the water use is licensed in a manner that accounts for the potential to either cool or heat a classroom any time of year.

Recommend licensing 0.45 cfs flow rate; a cooling volume of 19.7 AF; a heating volume of 28.3 AF, with a combined volume of 48.0 AF.

Have conditions of permit approval been met? ☒ Yes ☐ No

H. RECOMMENDATIONS**1. Recommended Amounts**

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
HEATING	01/01 to 12/31	0.450 CFS	28.3 AF
COOLING	01/01 to 12/31	0.450 CFS	19.7 AF
<u>Totals:</u>		0.450 CFS	48.0 AF

2. Recommended Amendments

☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☒ None

☐ Change P.U. as reflected above ☐ Add P.U. as reflected above ☐ Other

I. AUTHENTICATION

Field Examiner's Name

Date

3-25-2014

Reviewer

Date

6/9/14



Figure 1: Production Wells

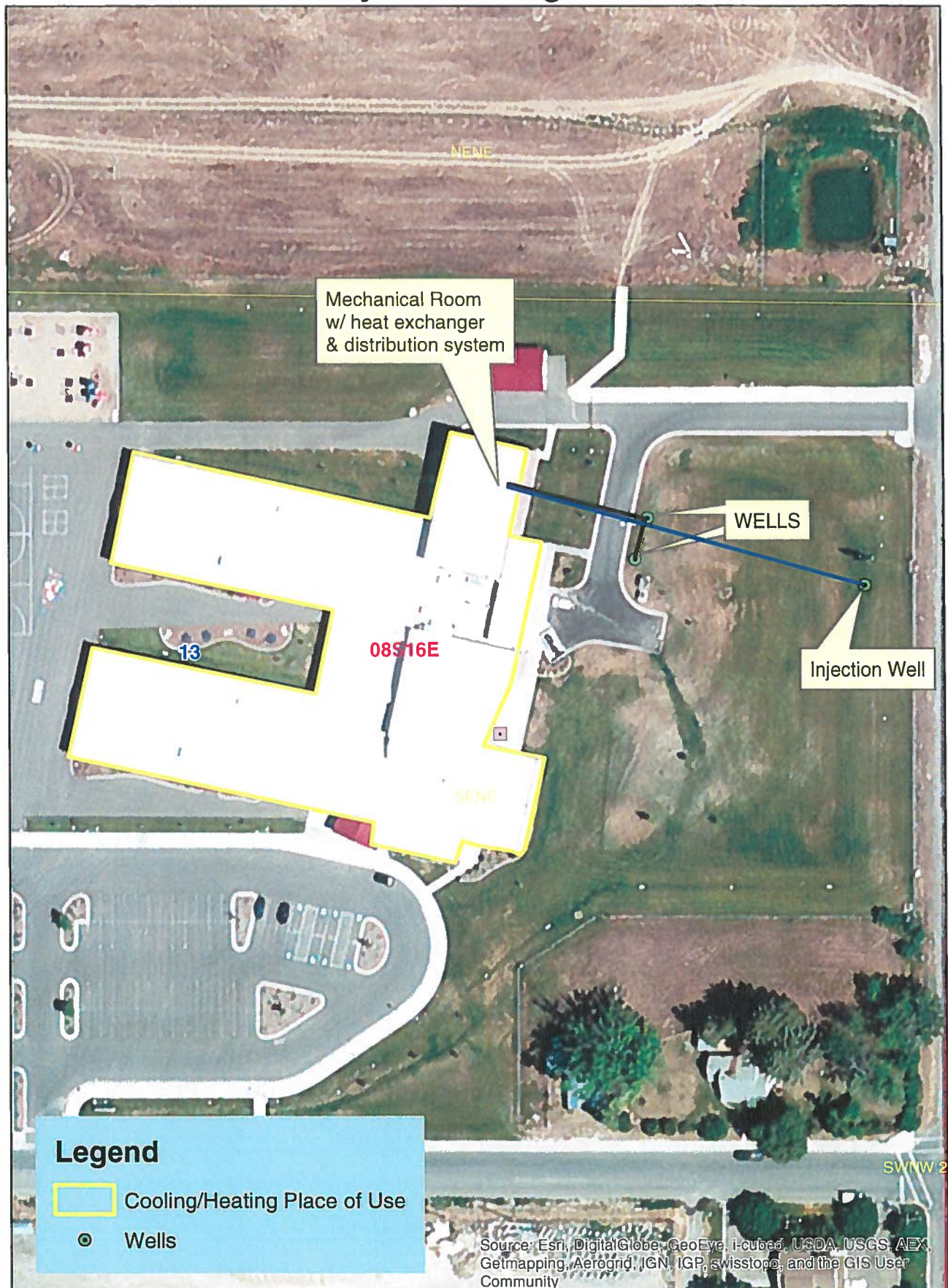


Figure 2: Heat exchanger and meter (covered with plastic bag)



Figure 3: Pumps for distribution system

System Diagram



JSD Elementary
LOG NAME:J
START :07-09 09:40
END :07-09 09:50
INTERVAL:00:01:00

7/9/2013 9:45
+6.170E+0 ft/s
+2.351E+2 gal/m
+TOTAL 0001166 gal
NORMAL

7/9/2013 9:40
+6.146E+0 ft/s
+2.342E+2 gal/m
+TOTAL 0000000 gal
NORMAL

7/9/2013 9:46
+6.185E+0 ft/s
+2.357E+2 gal/m
+TOTAL 0001400 gal
NORMAL

7/9/2013 9:41
+6.122E+0 ft/s
+2.333E+2 gal/m
+TOTAL 0000229 gal
NORMAL

7/9/2013 9:47
+6.138E+0 ft/s
+2.339E+2 gal/m
+TOTAL 0001634 gal
NORMAL

7/9/2013 9:42
+6.119E+0 ft/s
+2.332E+2 gal/m
+TOTAL 0000464 gal
NORMAL

7/9/2013 9:48
+6.165E+0 ft/s
+2.350E+2 gal/m
+TOTAL 0001868 gal
NORMAL

7/9/2013 9:43
+6.165E+0 ft/s
+2.349E+2 gal/m
+TOTAL 0000697 gal
NORMAL

7/9/2013 9:49
+6.121E+0 ft/s
+2.333E+2 gal/m
+TOTAL 0002102 gal
NORMAL

7/9/2013 9:44
+6.117E+0 ft/s
+2.331E+2 gal/m
+TOTAL 0000931 gal
NORMAL

7/9/2013 9:50
+6.169E+0 ft/s
+2.351E+2 gal/m
+TOTAL 0002336 gal
NORMAL

233.6 gpm
0.52 cfs

Idaho Department of Water Resources

WMIS

Water Management Information System



Quick Search:

Search Method:

WMIS Number

WMIS Number

1000449

Search

You are logged in as w

[Point Of Diversion](#)
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Flow Meter Water Usage

You are viewing 1000449; D01

[Click here to insert a new record.](#)

Edit	Delete	Report Year	Totalizer Start	Acre Feet Volume	Max Flow Rate (CFS)	Comments
		2013	9794200.00	41.24		end of year reading collected by staff. jjr
		Validated	Totalizer End	Adjusted Acre Feet	Adjusted Max Flow Rate	
		Validated by IDWR	23232011.00	41.24		
		Calibration Data		Acre Feet Qualifier	Preferred Method	
		Date:	1/1/2011 12:00:00 AM	No Monthly Recordings FM		
		Factor	1.00			
		Vol. Multiplier:	1.0000			
		Vol. Unit	GAL			
Edit	Delete	Report Year	Totalizer Start	Acre Feet Volume	Max Flow Rate (CFS)	Comments
		2012	0.00	30.06		totalizer repaired and reset -year. cy
		Validated	Totalizer End	Adjusted Acre Feet	Adjusted Max Flow Rate	
		Validated by Water Master	9794200.00	30.06		
		Calibration Data		Acre Feet Qualifier	Preferred Method	
		Date:	1/1/2011 12:00:00 AM	Partial Year Measurement	FM	
		Factor	1.00			
		Vol. Multiplier:	1.0000			
		Vol. Unit	GAL			
		Report Year	Totalizer Start	Acre Feet Volume	Max Flow Rate (CFS)	Comments
		2011				no data collected, meter may not be operating. cy
		Validated	Totalizer End	Adjusted Acre Feet	Adjusted Max Flow Rate	
		Not Validated				

Weather History for Jerome, ID

January 1, 2013 through December 31, 2013

January 1, 2013 through December 31, 2013

January 1 2013 - TO - December 31 2013

Daily

Weekly

Monthly

Custom

	Max	Avg	Min	Sum
Temperature				
Max Temperature	103 °F	61 °F	7 °F	
Mean Temperature	85 °F	49 °F	2 °F	
Min Temperature	69 °F	37 °F	-8 °F	
Degree Days				
Heating Degree Days (base 65)	63	19	0	6758
Cooling Degree Days (base 65)	20	2	0	904
Growing Degree Days (base 50)	36	8	0	2803
Dew Point				
Dew Point	65 °F	31 °F	-10 °F	
Precipitation				
Precipitation	0.38 in	0.01 in	0.00 in	3.62 in
Snowdepth	-	-	-	-
Wind				
Wind	46 mph	10 mph	0 mph	
Gust Wind	60 mph	25 mph	16 mph	
Sea Level Pressure				
Sea Level Pressure	30.86 in	30.06 in	29.40 in	

TO: Bill Mills

FROM: Michele Edl

REVISED: August 13, 2013

RE: Heating and Cooling Volume

Questions have arisen as to how to calculate a volume for a heating or cooling use. IDWR staff and consultants have attempted to estimate those volumes based on a long-standing method outlined in Admin Memo 23. That method should only be used as a last resort when nothing is known about the equipment or system. It is appropriate when the equipment/system no longer exist and a license volume is necessary. But it is a misapplication of the procedure to use it for existing equipment and systems. There is often a simpler way to calculate the volume from the actual system usage.

In many instances (e.g. in districts requiring totalizers or for large-scale systems, where a well or well pump is dedicated to the heating and cooling system) the estimation exercise should be unnecessary and certainly no better representation than the method I propose.

I am recommending that you use a method which relates the system readings to the HDD and CDD. You need to collect

1. information from the operator's handwritten log books, or the computer controller's system archive, or from the in-line totalizer and
2. the heating and cooling degree days from a weather station nearest to your POU.

System data

I understand that your field exams are for the Jerome School District. I also understand that there are totalizers on the systems but they have been adjusted by the operator. Although a year's worth of data is nice to have, it's not absolutely necessary. 24 hours worth of data may not be enough and data from the heating season can't really be used to represent the cooling season. So, you do need to collect enough data to characterize both heating and cooling use if that is what the permit authorizes. I like to see several days in a row, in the respective season, totalized so that we know that we are seeing a representative response of the building and the occupants to the weather.

DD data

The nearest weather station to your system may be the Jerome airport. I like the information provided by this website <http://www.wrcc.dri.edu/summary/Climsmsid.html> because they do the HDD and CDD calculations for us and they calculate the maximum HDD and CDD. You will find Jerome listed in the left panel.

To compare with this source, you will need a year's worth of system data.

I use a different website to collect HDD and CDD for shorter time periods. It is less official but again, they do the calculations for us. For Jerome I would use

<http://www.wunderground.com/history/airport/KJER/2013/8/13/CustomHistory.html>

The season or part season that we are measuring may not be the worst weather season that the heating or cooling system will see in its lifetime. IDWR has found that it is reasonable to issue a license in excess of the measured amount for these non-consumptive uses, if we can understand what an extreme weather year looks like. For heating and cooling use, the extreme years can be summarized as the maximum HDD and CDD respectively.

The method

Once I have system water use data; the totalizer readings, and the HDD and or CDD data for the **same time period** I make a comparison which calculates a volume.

I compare the system water use data with the DD data and reduce the ratio to cfs-d, gpm or AF per DD. This tells me how much water was used by the system for each DD.

To calculate the heating or cooling volume for licensing, I multiply the AF per DD found above by the maximum HDD or CDD given on WRCC's website.

Worked example

Suppose the heating system for the elementary school in the Jerome School District has a totalizer and from Jan 1 to Feb 1, 2012, the readings show that 200,880 gallons have passed through. In that same 31 days, there were 1066 HDDs. That reduces to 1884 gallons per HDD. For Jerome, the most extreme HDD is 7990 HDD. This system would require 15,053,160 gallons or 46.2 AF for an extreme winter. And this is what I would recommend for the license volume.

A similar calculation could be worked with pump motor hours. The additional assumption is that the pump runs constantly at the rate recommended for license.

Conclusions/recommendations

The system use data tells us all that we need to know. It's not necessary to ask for insulation or square footage. We assume that a building was built to code, but if it hasn't been IDWR cannot correct that. And we can't mandate efficiency. We only recognize beneficial use.

Unfortunately, IDWR doesn't ask that system records be provided with the Proof statement. It's up to the examiner to ask for it. And if the permit holder hasn't kept past system records then you will need to collect them going forward.

Energy efficiencies applied after the Proof will impact how the system responds and may reduce the licensed volume. So if possible, collect and compare data from the development period of the permit rather than from an operation period afterward.