

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 47-17649

Exam Date: 02/05/2019

1. Current Owner:

JAY BLACKHURST 4813 RIVER RD BUHL ID 83316 AND
AMY WESTOVER 4813 RIVER RD BUHL ID 83316

2. Accompanied by: Jay Blackhurst and Amy Westover

Phone No (208) 869-7927

3. SOURCE:

WASTE WATER

Method of Determination: Aerial Photography and on-site inspection.

B. OVERLAP REVIEW

1. Other water rights with the same place of use:

Comments: No other water rights use the same place of use

2. Other water rights with the same point-of-diversion:

Comments: Other water rights with the same point-of-diversion

C. DIVERSION AND DELIVERY SYSTEM

1. LOCATION OF POINT(S) OF DIVERSION:

WASTE WATER NW¼ NW¼ SW¼, Sec. 33, Twp 08S, Rge 14E, Govt. Lot 06, B.M. TWIN FALLS County

Method of Determination: On-site inspection

PLACE OF USE: HEATING

Twp	Rng	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
08S	14E	33										X L6							

PLACE OF USE: RECREATION

Twp	Rng	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
08S	14E	33									X L6								

PLACE OF USE: DOMESTIC

Twp	Rng	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	

08S	14E	33											X L6						
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Method of Determination:

3.

Delivery System Diagram Attached (required). Indicate all major components and distances between components.

X

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.

X

Aerial Photo Attached (required for irrigation of 10+ acres).

X

Photo of Diversion and System Attached

X

4.

Well or Diversion ID No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
N/A	N/A	N/A	N/A	N/A	N/A

D. VOLUME CALCULATIONS

1. Volume Calculations for irrigation: N/A (Lawn and Landscape are irrigated from a separate cold water source)

2. Volume Calculations for Other Uses:Heating Calculator Spreadsheet (see attachment) for the Heating Component: **4.8 AF**Domestic Component: Culinary use associated with the home: **0.6 AF**Recreation: A 300 gallon tub filled to 90% capacity twice a day: 270 gallons X 2 = 540 gpd X 365 days = 197,100/325850 = **0.6 AF**

E. NARRATIVE/REMARKS/COMMENTS

On February 05, 2019 Corey Skinner, Clinton Barnes, (IDWR employees) and I performed a field exam for Water Permit 47-17649 on property located at 4813 River Road approximately 6 miles northwest of Buhl. The application for permit to divert 0.02 cfs of low temperature geothermal (LTG) wastewater was filed on October 26, 2015. The Permit to Appropriate Water was issued on November 21, 2016. Proof of Beneficial Use was due on December 01, 2017 and Proof was submitted on October 06, 2017.

Jay Blackhurst and Amy Westover, the applicants, showed us the developed water use for the Recreation, Heating, and Domestic components of the permit. The source of the LTG wastewater is from water right 47-17629 located on a neighbor's property to the north. The wastewater is conveyed south through a second neighbor's property to the north boundary of the Blackhurst/Westover property using buried two inch High-Density Polyethylene Pipe (HDPE). The buried pipe runs through the entire Blackhurst/Westover parcel from north to south and there is a buried valve box at approximately the midpoint that diverts water for the three beneficial uses. Unused wastewater continues to the south parcel boundary and onto another neighbor's property.

The valve box contains a tee connection and two valves: one valve diverts water for the proposed beneficial uses and one valve controls the flow of unused waste water. The water diverted for beneficial uses goes to the house through a buried line. A tee connection on this line diverts water for the recreation use to a 300 gallon outdoor hot tub. The domestic use consists of culinary uses inside the home. The heating use consists of a flow-through system of tubing embedded in the home's concrete floor slab. From the floor slab the water exits the house through a buried line and returns to the HDPE pipe where it is conveyed off-property. None of the waste water is used for irrigation.

The Recreation use consists of diverting 270 gallons of water to an outdoor tub twice daily (197,100 gallons/year) for the equivalent of 0.60 Acre Feet. The Heating use consists of diverting water into the floor slab (1300 ft²) of the home for the equivalent of 4.8 Acre Feet (calculated using a geothermal heating spreadsheet). The domestic use consists of culinary in-home use only (no irrigation) for the equivalent of 0.6 Acre Feet). The flow rate for the Recreation, Heating, and Domestic uses will be limited to 0.02 cfs. Water Permit 47-17649 has condition X35 that allows a maximum diversion rate of 0.02 cfs and a maximum volume of 6.0 AF when combined with 47-17629.

Conditions of the permit have been met and I recommend licensing .02 cfs and 6.0 Acre Feet per year based on IDAPA rule 37.03.02 Beneficial Use Exam Rules (03/29/2012).

F. Have conditions of permit approval been met?☒ Yes ☐ No**RECOMMENDATIONS****1. Recommended Amounts**

<u>Beneficial Use</u>	<u>Period of Use</u>	<u>Rate of Diversion</u>	
HEATING	01/01 to 12/31	0.02 CFS	4.8 AFA
RECREATION	01/01 to 12/31	0.02 CFS	0.6 AFA
DOMESTIC	01/01 to 12/31	0.02 CFS	0.6 AFA

Totals: 0.02 CFS 6.0 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 ☒ None

I. AUTHENTICATION Kent Aasa - Water Resource Agent

Field Examiner's Name  Date 04/10/2019

Reviewer _____ Date _____

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Recreation Volume

1 acre ft = 325,850 gallons 0.02cfs = 9 gallons per minute

Hot tub: 300 gallon tub filled to 90% capacity twice a day for 365 days;

$(2) (270) (365) = 197,100 \text{ gallons} / 325,850 = 0.6 \text{ acre feet}$

Domestic Volume

Culinary use associated with the home: 0.6 acre feet

Heating Volume

Heated floor slab inside the home: 4.8 acre feet (see attached spreadsheet)

Total Volume

$0.6 + 0.6 + 4.8 = 6.0 \text{ acre feet}$

47-17649 System Diagram



Legend



Township/Range

Sections

QQ

Parcels



Field Exam
47-17649



Buried 2 inch pipe

POU_47-17649

Valve Box

Heating
Domestic

Hot Tub
Recreation

Field Exam
47-17649

Buried Pipe

Volume calculation WR 47-17649 House (1,300 ft²)

The annual volume requirement was calculated using a Memorandum from Rick Sterling to Terry Blau dated March 25, 1988 and Administrative Memorandum from Norm Young dated September 28, 1992 titled Rate of flow for heating use. The memorandums contain equations for calculating the annual water requirements for geothermal heating. The equations are listed below with an explanation of the variables; data was taken from the field exam and the National Oceanic and Atmospheric Administration (NOAA).

Explanation of values used in calculations:

The home has a total of 1,300 ft², the efficiency factor was assumed to have an *energy efficiency* or 1.11 BTU/hr ft² °F. The Design temperature difference for the area is 70 °F. The temperature of the geothermal source was reported to be 98 °F. The temperature in the home is expected to be 70 °F. The annual heating degree days were taken from the **Hagerman 2 SW** weather station because it is closest in elevation and proximity.

Design Heat Load Calculation: $E = [e \times \Delta t_1] 0.8 \times A$

Where:

E = BTU/hr required

e = House efficiency factor

Δt_1 = Design temperature difference

0.8 = Adjustment factor for two story homes

A = Area of heated space

Values used:

$$\begin{aligned} e &= 1.11 \text{ BTU/hr ft}^2 \text{ °F} \\ \Delta t_1 &= 70 \text{ °F} \\ A &= 1,300 \text{ ft}^2 \end{aligned}$$

$$E = [e \times \Delta t_1] 0.8 \times A = \boxed{80,808} \text{ BTU/hr}$$

*If calculation is not for a two story home the 0.8 factor in the equation is not used.

Temperature Drop Across System Calculation: $\Delta T_s = 0.3(S - T)$

Where:

ΔT_s = Temperature drop across system

S = Geothermal source temperature

T = Temperature required by system

Values used:

$$\begin{aligned} S &= 98 \text{ °F} \\ T &= 70 \text{ °F} \end{aligned}$$

$$\Delta T_s = 0.3(S - T) = \boxed{8.4} \text{ °F}$$

Volume Calculation:

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2}$$

Where:

V = Annual volume of geothermal water required

HL = Peak heating load in BTU/hr

DD = Annual heating degree-days

24 = 24 hrs/day

C_D = Empirical correction factor for heating effect vs. 65 °F degree-days

Δt_1 = Design temperature difference

k = Correction factor to account for losses, use 0.90

C = Constant to correct for desired units, 2.72×10^6 BTU/AF-°F

$\Delta t_2 = \Delta T_s$ = Temperature drop across system (calculated above)

Values used:

HL = 80,808 BTU/hr

DD = 5,832 °F

24 = 24 hrs/day

C_D = 0.61

Δt_1 = 70 °F

k = 0.9

C = 2,720,000 BTU/AF-°F

Δt_2 = 8.4 °F

$$V = \frac{HL \times DD \times 24 \times C_D}{\Delta t_1 \times k \times C \times \Delta t_2} = \boxed{4.8} \text{ afa}$$

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Method	#1	Chose a house efficiency factor (.28 - Best, .44 Better, .67 Average, 1.11 Poor)	1.11	BTU/hr ft ² - °F
	#1	Design temperature (Twin Falls = 73)	70	°F
	1&2	Area of heated space	1300	ft ²
	#1	Single story = 1 Two story = 0.80	0.8	
	1&2	Geothermal source temperature	98	°F
	1&2	System Temperature, Home = 70 Greenhouse = 60	70	°F
	1&2	Degree Days (see degree days tab)	5832	°F
	1&2	Greenhouse empirical correction factor, greenhouse = 0.85, other = 0	0	
		Heat load (pick value from table below)	80,808	BTU/hr

Heat load in BTU/hr				
Method	#1	Mathematically calculated	80,808	BTU/hr
	#2	Well Insulated	25,594	BTU/hr
		Normally Insulated	39,629	BTU/hr
		Older Homes	58,052	BTU/hr
		Double Poly	86,597	BTU/hr
		Single Poly	147,255	BTU/hr
		Fiberglass	162,750	BTU/hr
		Glass	199,333	BTU/hr

Volume of water required for heating	4.8	afa
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Calculated value	Answer	Input value	Constant
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Heat Load

BTU/hr required House efficiency factor Design temperature Area of live Two story house

.28 - Best, .44 Better, Twin falls in between If not a two story house

BTU/hr	BTU/hr ft ² - °F	°F	ft ²	
E	e	ΔT	A	0.8
80808.0	1.11	70	1300	0.8
E = e×ΔT×A×0.8 = 80808.0 BTU/hr				

62.2 BTU/ft² hr

Temperature Drop Across System

Temperature drop across Geothermal source temperature

Temperature of water Commonly used

°F	°F	°F
ΔT _s	S	t
8.4	98	70
ΔT _s = 0.3×(S-t) = 8.4 °F		

Estimating a Flow Rate for Geothermal Heating

Flow Rate System heat load Temperature Caution: This calculation should not be used to design a geothermal heating system, but will give an indication of the approximate flow needed for a geothermal resource when applying for a water right. Value should not be used for licensing. An actual measurement from the system should be taken.

gpm	BTU/hr	°F
W	Q	ΔT _s
19.2	80808.0	8.4

$$W = Q / (500 \times \Delta T_s) = 19.2 \text{ gpm}$$

Peak heat required per square foot of floor area

Design temperature difference (inside design temperature - outside design temperature) 70

x	y	
84	184	153 BTU/hr
104	186	125 BTU/hr
110	178	113 BTU/hr
124	118	67 BTU/hr
116	74	45 BTU/hr
124	54	30 BTU/hr
128	36	20 BTU/hr

Emperical correction factor

Degree Days 5832

Degree days (x)	Factor C _d + σ
0	1.2
5000	0.83
9000	0.92
y intercept for value	0.71
If 0-5000 then	0.55
If 5000-9000 then	0.61
	0.61
If greenhouse 0.85	0

Annual water requirement for geothermal heating

Volume of Geothermal Peak heating load Annual heat Conversion Emperical Design temperature Correction factor

afa	BTU/day	°F	hr/day	°F
V	HL	DD	24 C _D	ΔT ₁ k
4.8	80808.0	5832	24	0.61 70 0.9
V = (HL×DD×24×C _D) / (ΔT ₁ ×k×C×ΔT ₂) = 4.8				

or for heating effect vs. 65°F degree days

Factor C_d	Factor $C_d - \sigma$
0.86	0.51
0.59	0.36
0.66	0.4
0.51	0.31

0.61

Constant	Temperature loss across system
Units conversion factor	
BTU/af - °F	°F
C	ΔT_2
2720000	8.4

Explanation

Additional info
units

symbol
Value

Explanation
Additional info
units
symbol
Value

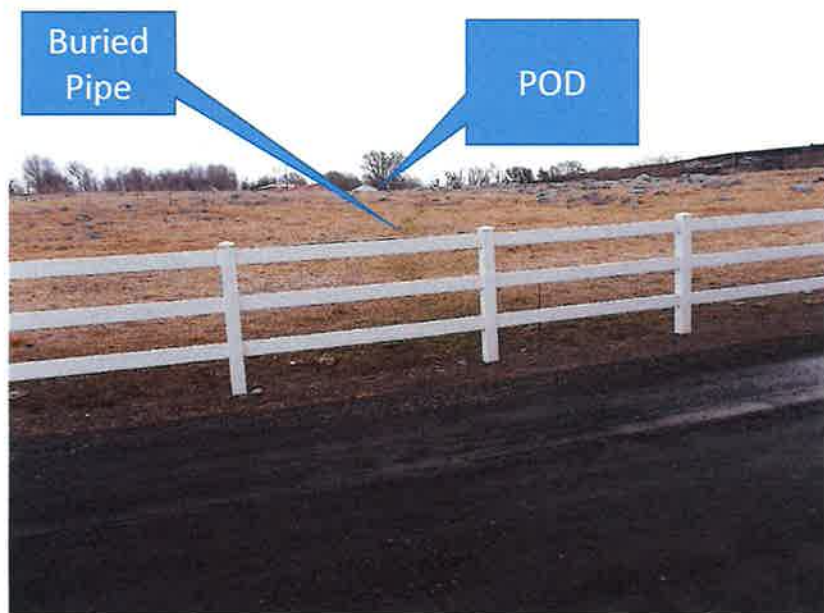
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Glass
Fiberglass
Single Poly
Double Poly
Older Homes
Normally Insulated
Well Insulated

Explanation
Additional info
units
symbol
Value

Field Exam 47-17649

Looking North to POD



Buried Pipe running south along fence to valve box



Field Exam

47-17649

Valve Box that controls water to house

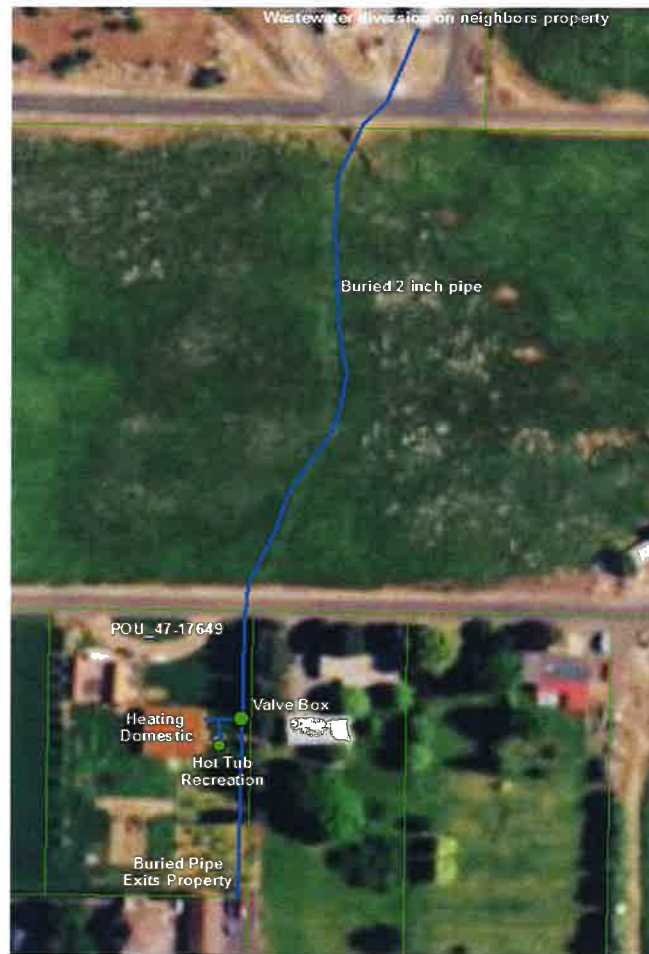


Recreation POU

300 gallon tub several yards east of home



47-17649 System Diagram



47-17649 Domestic/Heating POU



47-17649 Domestic/Heating POU

