

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

RECEIVED

SEP 14 2016

DEPARTMENT OF
WATER RESOURCES

A Beneficial Use Field Report is prepared by a water right examiner as the result of an examination to clearly confirm and establish the extent of the beneficial use of water established in connection with a permit during the development period authorized by the permit and any extensions of time previously approved.

A. GENERAL INFORMATIONPermit No. 63-332451. Owner Union Block Associates, LLCPhone No. 208-345-3221Current address 1020 W Main Street, Suite 270, Boise, ID 837022. Examiner's name Terry Scanlan, P.E. (Examiner No. 129)EXAM DATE 7/14/20163. Accompanied by Andy LudwigEmail Andy@parklaneco.comAddress sameRelationship to permit holder ManagerPhone No. 208-809-47034. Source Ground Water

tributary to _____

B. OVERLAP REVIEW1. Other water rights with the same place of use City of Boise municipal water, 63-123422. Other water rights with the same source and point of diversion 63-12342**C. DIVERSION AND DELIVERY SYSTEM**

1. Point(s) of Diversion:

Ident. No.	Gov't Lot	¼	¼	¼	Sec	Twp	Rge	County	Method of Determination/Remarks
			NW	NE	10	3N	2E	Ada	Exam, 2015 Photo
			NW	NE	10	3N	2E	Ada	Exam, 2015 Photo

2. Place(s) of Use: _____ Method of determination Exam, 2015 Photo

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
3N	2E	10		X															

3. **Delivery System Diagram:** Indicate all major components and distances between components. Indicate weir size/ditch size/pipe diameter (inside), as applicable. Use the space provided or ☒ see attached.

Scale: 1" = _____

- ☒ Copy of USGS Quadrangle attached showing location(s) of point(s) of diversion and place(s) of use (required)
☒ Aerial photo attached (required for irrigation of 10+ acres)
☒ Photo of diversion and system attached

4.

Well or Diversion Identification No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
Well 1	Submersible	7.5		Sta-Rite 70 Series	
Well 2	Submersible	15		Berkely6T15-225	

*Code to correspond with no. on map and aerial photo

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date
*Theoretical						

2. Measurements: _____

*See Scott Kings letter dated 9/9/2016 resulting in the use of a theoretical measurement

E. NARRATIVE/REMARKS/COMMENTS

Two 6-inch wells equipped with a submersible pumps provide ground water to a closed-loop heating and cooling system serving the Union Block Building in downtown Boise. Well 1 is equipped with a 7.5 hp submersible pump and operates as the primary well. Well 2 was originally drilled as an injection well, however has been converted for use as a back-up production well via installation of a 15 hp submersible pump. Now the spent heating and cooling water is discharged into the ACHD's storm water drain system located in the alley behind the Union Block Building. License 63-12342 allows diversion of 0.26 cfs for seasonal cooling from 3/15 to 11/15 from the same system. Pumping capacity for Well 1 alone was determined using theoretical calculations at 0.33 cfs as documented by the Department licensing review for right 63-12342. The 0.41 cfs recommended for licensing under permit 63-33345 represents the heating and cooling system's design peak flow rate. According to a letter dated January 8, 2008 from the system engineer also included in Attachment C, the plate heat exchanger is rated at 132.6 tons at 200 gpm and a maximum 16 degree F temperature increase (i.e., 64 degree inlet, 79.9 degree outlet). Proportioning this flow rate to the connected equipment load, results in a water requirement of 184 gpm when connected equipment is operating at capacity. Annual volume was estimated based on NOAA data and calculations the Department used in licensing overlapping right 63-12342, which is still current.

This right when combined with water right 63-12342 is limited to 0.41 cfs and 296.8 afa.

Attachment A: copy of permit and proof of beneficial use

Attachment B: copy of well drillers reports

Attachment C: Scott King letter dated 9/9/2016, annual volume and system capacity flow calculations

Attachment D: aerial photo and topo map

Attachment E: photos of place of use and wells

Has the permit holder met all conditions of permit approval, including any mitigation requirements and/or measuring device installation requirements? ☐ Yes ☒ No If no, what must be done to meet the permit requirements?

Water bearing zone proposed and developed: 79 to 195 feet.

F. FLOW CALCULATIONS☒ Additional computation sheets attached

Measured Method:

See Attachment C. Theoretical system capacity approximately 0.56 cfs.

G. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

 $V_{I.R} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) =$ _____ $V_{D.R} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 =$ _____ $V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} =$ _____

2. Volume Calculations for Other Uses:

See Attachment C

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use		Rate of Diversion Q (cfs)	Annual Volume V (afa)
	From	To		
Heating & Cooling	1/1	12/31	0.41 cfs	171.8 afa
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Totals:			0.41 cfs	171.8 afa

2. Recommended Amendments

☐ Change P.D. as reflected on page 1☐ Add P.D. as reflected on page 1☒ None☐ Change P.U. as reflected on page 1☐ Add P.U. as reflected on page 1☐ Other**I. AUTHENTICATION**

Field Examiner's Signature



Date

9/12/12

Reviewer _____

Date _____



ATTACHMENT A

PERMIT RECORD AND PROOF OF BENEFICIAL USE

State of Idaho
Department of Water Resources
Permit to Appropriate Water

NO. 63-33245

Priority: March 23, 2009

Maximum Diversion Rate: 0.41 CFS

This is to certify, that PARKLANE CO INC
817 W FRANKLIN ST
BOISE ID 83702

has applied for a permit to appropriate water from:

Source: GROUND WATER

and a permit is APPROVED for development of water as follows:

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>RATE OF DIVERSION</u>
HEATING	01/01 to 12/31	0.41 CFS
COOLING	01/01 to 12/31	0.15 CFS

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER	NW1/4NE1/4	Sec. 10, Twp 03N, Rge 02E, B.M., ADA County
GROUND WATER	NW1/4NE1/4	Sec. 10, Twp 03N, Rge 02E, B.M., ADA County

PLACE OF USE: HEATING

Twp Rge Sec	NE				NW				SW				SE				
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
03N 02E 10		X															

PLACE OF USE: COOLING

Twp Rge Sec	NE				NW				SW				SE				
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
03N 02E 10		X															

CONDITIONS OF APPROVAL

1. Proof of application of water to beneficial use shall be submitted on or before **October 01, 2016**.
2. Subject to all prior water rights.
3. Project construction shall commence within one year from the date of permit issuance and shall proceed diligently to completion unless it can be shown to the satisfaction of the Director of the Department of Water Resources that delays were due to circumstances over which the permit holder had no control.
4. This right does not grant any right-of-way or easement across the land of another.
5. Use of water under this right shall be non-consumptive regarding the Boise River when evaluated with the shallow aquifer presumed to be tributary to the river.

State of Idaho
Department of Water Resources
Permit to Appropriate Water
NO. 63-33245

6. Water diverted and beneficially used under this right shall be discharged to the Boise River.
7. Prior to the diversion and use of water under this approval, the right holder shall comply with applicable water quality permitting requirements administered by the Department of Environmental Quality or the Department of Agriculture.
8. Rights 63-12342 and 63-33245 when combined shall not exceed a total diversion rate of 0.41 cfs.
9. Water bearing zone to be appropriated is from 79 to 195 feet.
10. After specific notification by the Department, the right holder shall install a suitable measuring device or shall enter into an agreement with the Department to use power records to determine the amount of water diverted and shall annually report the information to the Department.
11. Diversion and use of water with a temperature greater than 85 degrees Fahrenheit is not authorized under this right.
12. Cooling and heating use is for the Union Block Building.
13. The following rights are diverted through point(s) of diversion described above: 63-12342 and 63-33245.

This permit is issued pursuant to the provisions of Section 42-204, Idaho Code. Witness the signature of the Director, affixed at Boise, this 20th day of September, 20 41.



JOHN WESTRA, Western Regional Manager

RECEIVED

SEP 14 2016

DEPARTMENT OF
WATER RESOURCESSTATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
STATEMENT OF COMPLETION
FOR SUBMITTING PROOF OF BENEFICIAL USE

FOR OFFICE USE ONLY

Amt. of Fee \$: _____

Receipt No. _____

Receipt By: _____

Date Received: _____

The Idaho Department of Water Resources considers this form a statement by the permit holder(s) that development of a water right has been completed and that water has been applied to beneficial use to the extent described below. **This form must be accompanied by an examination fee, when necessary, or by a completed Beneficial Use Field Report prepared by a certified water right examiner.** Please refer to the instructions and fee schedule for this form. If ownership of the permit has changed, please contact any Department office or visit the Department's website at: www.idwr.idaho.gov for an Assignment of Permit form. If you wish to relinquish your permit because you have not established the authorized use of the water and are not applying for an extension, please notify the Department in writing.

1. Permit No.: 63-33245 Telephone No.: 208-345-32212. Name of Permit Holder(s): Union Block Associates, LLC3. Mailing Address: 1020 W Main Street City: BoiseState: ID Zip: 83702 Email: _____4. Source of Water: Ground Water If **GROUND WATER** (well), Date Drilled: mo. _____ / yr. _____Well Driller: See attached Drilling Permit Number: _____

5. Extent of use(s) completed (as authorized by the water right permit):

Domestic (No. of households): _____ Stockwater (No. and type of stock): _____

Irrigation (No. of acres): _____ Other: Heating & Cooling6. Total rate of diversion or storage volume for which proof is submitted: 0.41 cfs OR _____ acre-feet.7. Compliance with a measuring device requirement, lockable controlling device requirement, and/or other conditions of permit: **Refer to the approval conditions on your permit and respond accordingly. The Department will not issue a license if permit conditions are not met.****Measuring Device:** Is a measuring device required?Yes ☐ No ☒

If yes, has the measuring device been installed?

Yes ☐ No ☐**Lockable Controlling Device:** Is a lockable device required to control the diversion?Yes ☐ No ☒

If yes, has the lockable device been installed?

Yes ☐ No ☐**Other Conditions of Permit:** Do the approval conditions on your permit require you to submit additional information in connection with your proof of beneficial use? If yes, list the conditions below and attach documents with the required information._____ Completed? Yes ☐ No ☒8. Fee Enclosed: \$ n/a See fee schedule on back of the instructions for filing proof of beneficial use.

Proofs filed without an appropriate fee, will be considered incomplete.

9. Person to contact to accompany the Department representative during field examination of the water system.

Name: _____ Telephone Number: _____

Mailing Address: _____ City: _____

State: _____ Zip: _____ Email: _____

The information given on this form is my true statement of the extent to which the above numbered permit has been developed and water has been diverted and applied to a beneficial use. I understand that any undeveloped portion of the permit is relinquished to the State of Idaho.

Signature of permit holder: _____

[Signature]
(Include your title, if on behalf of company or organization)
Park Lane Company

Date: 8/8/2016

Mail to: Idaho Department of Water Resources, PO Box 83720, Boise, ID 83720-0098

ATTACHMENT B
WELL DRILLERS' REPORTS

4. Continued

Well 1

Date Drilled: 7/31/1996
Driller: Phipps Drilling
Drilling Permit No.: 63-96-C-0396-0000

Well 2

Date Drilled: 8/7/1996
Driller : Phipps Drilling
Drilling Permit No.: 63-96-C-0397-0000

Date Deepened: 9/6/1999
Driller: Stevens & Sons
Drilling Permit No.: 63-99-W-0720-100

Date Deepened: 6/27/2007
Driller: Dennis Phipps
Drilling Permit No.: 847303

FORWARD WHITE COPY TO WATER RESOURCES

ATTACHMENT C

FLOW AND ANNUAL VOLUME CALCULATIONS

Lori Graves

FYI
for theoretical

From: Terry Scanlan
Sent: Thursday, July 14, 2016 5:23 PM
To: Lori Graves
Subject: FW: Information requested for Union Block Building

From: caronpumpwater@aol.com [mailto:caronpumpwater@aol.com]
Sent: Thursday, July 14, 2016 12:40 PM
To: Terry Scanlan <TScanlan@spfwater.com>
Subject: Information requested for Union Block Building

Hi Terry,

Hope this is what you need.

7.5 HP 70 series sta-rite pump end
7.5 HP 200V 30 motor Model # 2343088602

15 HP Berkeley 6T 15-225 pump end
180 GPM @ 270 TDH
15 HP 200V 3PH motor

Thanks,

Doug

Flow Calculations, Permit 63-33245

Flow from each well is combined at heat exchanger, then combined flow is discharged from heat exchanger to storm drain manhole.

Well No. 1

- 7.5 hp submersible pump (Sta-Rite 70 series, 50 gpm at 305' TDH (from pump curve)
- Static Water Level = 30' (from driller's report)
- Specific Capacity = 100 gpm/40' drawdown = 2.5 gpm/ft (from driller's report)
- Drawdown @ 75 gpm = 20'
- Interference drawdown from Well 2, assume 6 gpm/ft = 23 feet
- Pumping water level @ 60 gpm = 20' + 26' + 23' = 69'
- Pipe friction loss to heat exchanger, assume 200 feet (70' setting, 50' distance, plus bends) of 2" steel and PVC at 60 gpm with avg C of 100 = 20'
- Discharge pressure to heat exchanger = 305- 69'-20' = 216' = 93 psi

Well No. 2:

- 15 hp submersible pump, 140 gpm at 300' (from pump curve)
- Static Water Level = 30' (from driller's report)
- Specific Capacity = 180 gpm/100' drawdown = 1.8 gpm/ft (from driller's report)
- Drawdown @ 140 gpm = 78'
- Interference drawdown from Well 1, assume 6 gpm/ft = 8 feet
- Pumping water level @ 150 gpm = 30' + 78' + 8' = 115'
- Pipe friction loss to heat exchanger, assume 200 feet (149' setting, 20' distance, plus bends) of 4" steel and PVC at 150 gpm with avg C of 100 = 5'
- Discharge pressure to heat exchanger = 300'-115'-5' = 180' = 78 psi

Combined Flow

- Assume friction loss through heat exchanger of 20 psi.
- Discharge pipe friction. Assume equivalent length of 50 feet of 2" pvc with C of 140 = 32'. Assume equivalent length of 50 feet of 4" pvc with C of 140 = 1'. Total discharge friction loss is 33' = 14 psi.

Therefore, heat exchanger entrance pressure is 80 psi +/-, minus 20 psi head loss through exchanger, minus 14 psi loss to discharge manhole = 46 psi excess pressure available. System capacity is greater than 190 gpm (i.e., >0.42 cfs). Actual system capacity is estimated to be approximately 250 gpm (0.67 cfs) at 0 psi discharge pressure to manhole.



September 12, 2016

Dan Nelson
IDWR State Office
PO Box 83720
Boise, ID 83720-0098

Subject: *Flow Measurement; Permit 63-33245*

Dear Dan,

On August 18, 2016, I attempted a flow measurement on the ground water system developed under permit 63-33245 to support the beneficial use field exam conducted by Terry Scanlan on July 14, 2016.

The system consists of two wells that provide ground water to the heating and cooling system serving the Union Block building in downtown Boise. Using SPF's Panametrics PT878 portable ultrasonic liquid flow meter, I attempted a measurement on several pipes that discharge the combined heating and cooling water into the ACHD storm water drain system. The first was on the 2-inch PVC main on a vertical section with flow directed up from the building's basement so the pipe was full. I used both the "V" and "W" transducer setups, both sets of transducers, and both sets of cables. The transducers were then moved to a downstream 4-inch pipe that had flow comingled with the adjacent building, which could be shut off to isolate the Union Block building's flow. Again using both sets of transducers and cables with a "V" configuration, results were the same. The meter obtained zero signal. I expect this unsuccessful measurement is the result of high iron deposits coating the inside of the pipes. Andy Lugwig, the system operator, showed me these deposits on heat exchanger plates that were out for cleaning. He explained the heat exchangers must be cleaned frequently due to the iron deposits, and the iron tends to coat everything. The flowmeter was used successfully the day prior to this effort and has been used since.

As I was unable to obtain a discharge measurement, the flow rate recommended for licensing permit 63-33245 is supported with a theoretical flow rate based on details and supporting information following this letter (exam Attachment C). Please let me know if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Scott King". The signature is fluid and cursive, with the first name "Scott" and last name "King" clearly distinguishable.

Scott King, P.E.
Supervising Engineer

Annual Volume Calculations, Permit 63-33245

$$V_{I.R.}: 0.41 \text{ cfs} \times 1.9835 \times 365 \text{ days} = 296.8 \text{ afa}$$

$V_{D.R.}$: IDWR Administrator's Memo, Application Processing No. 23, describes a method for estimating the rate of flow necessary for heating purposes. The Department modified this method and used it for licensing the annual of volume beneficially used for cooling purposes under permit 63-12342. The same approach has been used for estimating annual volume beneficially used for heating and cooling purposes under permit 63-33245.

COOLING

1) Change in temperature across heat exchange system, ΔT_s :

$$\Delta T_s = 0.3 (t - s) = 0.3 (72 - 67) = 1.5^\circ\text{F} \text{ (used for 63-12342)}$$

Where, S = source water temperature in $^\circ\text{F}$

t = temperature required by system in $^\circ\text{F}$

2) Annual volume of water needed for cooling (V_A):

$$V_A = \frac{e \times \text{CDD} \times A \times 2.88}{\Delta T_s} = \frac{0.67 \times 942 \times 39,189 \times 2.88}{1.5} = 47,488,791.3 \text{ gal} = 145.7 \text{ ac-ft}$$

Where, e = insulation efficiency of building, dimensionless coefficient

CDD = cooling degree days during season of use (see attached NOAA data sheets for CDD and HDD)

A = area of building being cooled in ft^2

ΔT_s = change in water temperature across cooling system

HEATING

$$\Delta T_s = 0.3 (t - s) = 0.3 (72 - 67) = 1.5^\circ\text{F}$$

$$V_A = \frac{e \times \text{HDD} \times A \times 2.88}{\Delta T_s} = \frac{0.67 \times 5514 \times 39,189 \times 2.88}{1.5} = 277,975,791 \text{ gal} = 853.1 \text{ ac-ft}$$

Recommended Annual Volume, V (afa):

Cooling 145.7 ac-ft + heating 853.1 ac-ft = 873.8 total ac-ft

V = Smaller of $V_{I.R.}$ and $V_{D.R.}$ = 296.8 afa – 125 ac-ft (Lic. 63-12342) = **171.8 ac-ft**

NOWData - NOAA Online Weather DataBoise Area ([ThreadEx Station](#))

Daily Climate Normals

HDD (base 65)

1981-2010

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	35	32	24	17	11	4	1	0	1	7	19	31
2	35	31	24	17	11	4	1	0	1	7	19	32
3	35	31	24	17	10	4	1	0	1	8	20	32
4	35	31	24	17	10	4	1	0	1	8	20	32
5	35	31	23	16	10	3	0	0	1	8	20	32
6	35	31	23	16	10	3	0	0	2	9	21	33
7	35	30	23	16	9	3	0	0	2	9	21	33
8	35	30	22	16	9	3	0	0	2	9	22	33
9	35	30	22	16	9	3	0	0	2	10	22	34
10	35	30	22	16	9	3	0	0	2	10	23	34
11	34	30	22	15	8	2	0	0	2	10	23	34
12	34	29	21	15	8	2	0	0	3	11	23	34
13	34	29	21	15	8	2	0	0	3	11	24	34
14	34	29	21	15	8	2	0	0	3	12	24	35
15	34	29	21	15	7	2	0	0	3	12	25	35
16	34	28	20	14	7	2	0	0	3	12	25	35
17	34	28	20	14	7	2	0	0	4	13	26	35
18	34	28	20	14	7	2	0	0	4	13	26	35
19	33	27	20	14	6	2	0	0	4	13	27	35
20	33	27	19	13	6	2	0	0	4	14	27	35
21	33	27	19	13	6	1	0	0	4	14	27	35
22	33	27	19	13	6	1	0	0	5	15	28	35
23	33	26	19	13	6	1	0	0	5	15	28	35
24	33	26	19	13	5	1	0	0	5	15	29	35
25	33	26	18	12	5	1	0	0	5	16	29	35
26	33	25	18	12	5	1	0	1	6	16	29	35
27	32	25	18	12	5	1	0	1	6	17	30	35
28	32	25	18	12	5	1	0	1	6	17	30	35
29	32	25	18	11	4	1	0	1	7	17	31	35
30	32	-	17	11	4	1	0	1	7	18	31	35
31	32	-	17	-	4	-	0	1	-	18	-	35
Month	1046	798	636	429	226	64	8	10	103	385	748	1061

Sum/average of daily normals might not match monthly normal due to rounding.

Official data and data for additional locations and years are available from the [Regional Climate Centers](#) and the [National Climatic Data Center](#).

NOWData - NOAA Online Weather Data

Boise Area ([ThreadEx Station](#))

Daily Climate Normals

CDD (base 65)

1981-2010

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	2	8	12	6	1	0	0
2	0	0	0	0	1	3	8	12	6	1	0	0
3	0	0	0	0	1	3	8	12	6	1	0	0
4	0	0	0	0	1	3	9	12	5	1	0	0
5	0	0	0	0	1	3	9	12	5	1	0	0
6	0	0	0	0	1	3	9	12	5	1	0	0
7	0	0	0	0	1	3	9	12	5	1	0	0
8	0	0	0	0	1	3	10	12	5	0	0	0
9	0	0	0	0	1	3	10	12	4	0	0	0
10	0	0	0	0	1	3	10	11	4	0	0	0
11	0	0	0	0	1	4	10	11	4	0	0	0
12	0	0	0	0	1	4	11	11	4	0	0	0
13	0	0	0	0	1	4	11	11	4	0	0	0
14	0	0	0	0	1	4	11	11	3	0	0	0
15	0	0	0	0	1	4	11	10	3	0	0	0
16	0	0	0	0	1	4	12	10	3	0	0	0
17	0	0	0	0	1	5	12	10	3	0	0	0
18	0	0	0	0	1	5	12	10	3	0	0	0
19	0	0	0	0	1	5	12	10	3	0	0	0
20	0	0	0	0	1	5	12	9	2	0	0	0
21	0	0	0	0	2	5	12	9	2	0	0	0
22	0	0	0	0	2	6	12	9	2	0	0	0
23	0	0	0	0	2	6	12	8	2	0	0	0
24	0	0	0	0	2	6	12	8	2	0	0	0
25	0	0	0	0	2	6	13	8	2	0	0	0
26	0	0	0	0	2	7	13	8	2	0	0	0
27	0	0	0	0	2	7	13	7	1	0	0	0
28	0	0	0	0	2	7	13	7	1	0	0	0
29	0	0	0	0	2	7	13	7	1	0	0	0
30	0	-	0	0	2	8	13	7	1	0	0	0
31	0	-	0	-	2	-	13	6	-	0	-	0
Month	0	0	0	3	41	139	342	309	100	8	0	0

Sum/average of daily normals might not match monthly normal due to rounding.

Official data and data for additional locations and years are available from the [Regional Climate Centers](#) and the [National Climatic Data Center](#).



January 8, 2008

Lori Graves
SPF Water Engineering
300 East Mallard Drive, Suite 350
Boise, ID 83706

Subject: Cooling Water Requirement for the Union Block Building

Dear Lori:

You have asked for information that documents the required flow rate and annual volume of groundwater needed for cooling of the Union Block Building.

- Peak flow rate required for cooling is 184 gpm. This peak flow, unchecked by building demand controls, produces an estimated annual volume required for cooling at 186 acre feet (AF).
- **A realistic (affordable controls) match of building load requirements to water flow is 50% of the above "wild" flow condition, i.e. $0.5 \times 186 = 93$ AF.**
- Precisely controlled and modulated flow rates tied to estimated building cooling demands theoretically could reduce annual water requirements to 11.5 AF.

A summary of the data I used to generate these figures is provided below.

Floor Area - 28,835 square feet. This is the total cooled area of the building on all three floors.

Total Load – 77.5 tons (930,000 BTU/hr). This is the amount of cooling required for the building. For the Union Block Building, it equals 32.25 btu/hr-sq ft. This load is low for an office building with average construction.

Design Load – 113.5 tons (1,362,000 BTU/hr). This was determined by dividing the total load by the design load efficiency. For a cooling system to function properly, the equipment must be sized to provide more cooling than the building cooling requirement because the cooling is not 100% efficient. For purposes of determining the design load, an efficiency of 68 percent is assumed.

Connected Equipment Load – 122 tons (1,464,000 BTU/hr). This is the cooling requirement of the equipment that receives cooling from the plate heat exchanger. The connected equipment load must have a capacity equal to or greater than the design load.

Plate Heat Exchanger Rated Capacity – 132.6 tons (1,591,200). This is the maximum rated amount of cooling for the heat exchanger. The rated capacity needs to be equal to or greater than the connected equipment.

Water Flow Rate Requirement – 184 gpm. The plate heat exchanger is rated at 132.6 tons at 200 gpm and a maximum 16 degree F temperature increase (i.e., 64 degree inlet, 79.9 degree outlet).



Proportioning this flow rate to the connected equipment load, results in a water requirement of 184 gpm when the connected equipment is operating at capacity.

Annual Water Volume Requirement – 186, 93 or 11.5 acre feet. This diverse annual water volume requirement is determined by flow control methods, i.e. unchecked with partial manual shut-off, standard controls and theoretical controls matching demand respectively. The theoretical number can be determined by estimating the number of operating hours per year for the system using a "Trane Trace" modeling program based on the average degree-days per month for cooling in conjunction with equipment type used to accomplish the cooling. This building has a very efficient closed-loop heat-pump system. The attached data estimates annual energy consumption of both this heat-pump system (alternate 1) and a standard 4-pipe system (alternate 2) to demonstrate the energy conservation of the installed equipment.

Added Heating Water Requirements - The installed system is capable of utilizing well water for heating as well as cooling. The attached data identifies theoretical flow requirements for both cooling and heating based on monthly estimated heating/cooling energy requirements. Added heating water flow requirements is an additional 9.6 AF.

Please contact me with any questions regarding these calculated water requirements.

Sincerely,

Richard T. Kartchner, P.E.
Principal Mechanical Engineer

MEMORANDUM

TO: Water Right File 63-12342
FROM: Aaron Marshall *AM*
DATE: March 15, 2010
SUBJECT: Licensing Review

On August 16, 1996, IDWR issued permit no. 63-12342 which authorized the development of a water right for cooling purposes from March 15 to November 15 at a maximum diversion rate of 0.26 cfs. The permit was issued for non-consumptive use since the Boise River and all tributary ground water upstream from Star Bridge is fully appropriated. Condition no. 5 on the permit states:

"Proposed water bearing zone to be appropriated is from 0 to 65 feet. All flows to be reinjected to same zone."

On August 29, 1997, IDWR received a proof of beneficial use statement for this right and on November 19, 1997, an IDWR examiner conducted the beneficial use field examination. The examiner confirmed that the point of diversion and place of use for this right are located in the Union Block Building in downtown Boise. The examiner described the closed-loop heat exchange system used for cooling and heating purposes and completed inspections of the production well and injection well. The examiner measured the water temperature in the production well at 67 °F and indicated the operating pressure of the heat exchange system ranges from 50 to 70 psi. The examiner estimated the maximum diversion rate at 0.47 cfs based on an operating pressure of 50 psi, a 10 hp motor, 70% well efficiency, and a dynamic depth to water of 15 feet. The examiner did not complete a direct flow measurement.

According to the well driller's report for the production well, the borehole is cased down to 79 feet, screened from 79 to 89 feet, and the static water level was 30 feet below ground surface at the time of completion. The driller tested the well by pumping 100 gallons per minute for 1 hour from a depth of 70 feet resulting in a drawdown of 40 feet inside the well.

According to the well driller's report for the injection well, the borehole was cased down to 63 feet, slotted from 21 to 63 feet, and the static water level was 30 feet below ground surface at the time of completion. In 1999 and 2007, the injection well was deepened to 115 feet and 195 feet respectively.

On March 23, 2009, IDWR received a request from SPF Water Engineering, on behalf of the permit holder, to change permit condition no. 5 to describe the water bearing zone from 79 to 195 feet and remove the water injection requirement. SPF explained that the injection well could no longer accommodate the flows necessary for the heat exchange system and that water would be injected into the municipal storm drain system and return water to the Boise River. SPF also filed an application for transfer to add a point of diversion to water right 63-12342 so the former injection well could be used to supply more water for heating and cooling in the Union Block Building. SPF also filed an application for permit, no. 63-33245, for heating and cooling purposes at a rate of 0.41 cfs to provide additional water up to the capacity of the heat exchange system.

The water injection requirement is intended to mitigate for injury to Boise River water users upstream from Star Bridge. It may be reasonable to allow the right holder to inject the water used for cooling purposes into the municipal storm drain system since it will flow to the Boise River. However, this

change did not occur during the authorized development period of the permit and should be considered in processing the application for transfer. This seems like a significant change for which the public should have the opportunity to protest. The water bearing zone for this right should be described on the license as completed during the authorized development period, from 79 to 89 feet below ground surface.

Using information provided by the well driller and field examiner, the maximum diversion rate can be estimated using two different operating pressures for the heat exchange system, 50 psi (Q_{50}) and 70 psi (Q_{70}). Both estimates are greater than the 0.26 cfs diversion rate authorized by permit 63-12342.

$$Q_{50} = (8.8 \times 10 \text{ hp} \times 0.70) / (70 \text{ ft} + (2.31 \times 50 \text{ psi})) = 0.33 \text{ cfs}$$

$$Q_{70} = (8.8 \times 10 \text{ hp} \times 0.70) / (70 \text{ ft} + (2.31 \times 70 \text{ psi})) = 0.27 \text{ cfs}$$

A memo in the water right file from Cindy Zimmerman, dated August 15, 1996, provides an estimate of the size of the Union Block Building, 28,000 ft², based on personal communication from Jim Campbell, the building construction manager at the time. The website for Parklane Management Company (<http://www.parklaneco.com/>) currently lists the building size as 39,189 ft² and indicates the building was last renovated in 1996. 39,189 ft² may be a more accurate estimate of the actual size of the building after the 1996 renovation.

IDWR Administrator's Memorandum, Application Processing No. 23, describes a method for estimating the rate of flow necessary for heating purposes. This method can be modified and used to estimate the annual volume of water beneficially used for cooling purposes under permit 63-12342.

1) Change in temperature across the heat exchange system, ΔT_s :

$$\Delta T_s = 0.3(t - S) = 0.3(72 - 67) = 1.5^\circ\text{F}$$

Where, S = source water temperature in °F

t = temperature required by system in °F

2) Annual volume of water needed for cooling, (V_A):

$$V_A = \frac{e \times \text{CDD} \times A \times 2.88}{\Delta T_s} = \frac{0.67 \times 807 \times 39,189 \times 2.88}{1.5} = 40,683,072.8 \text{ gallons} = 125 \text{ acre-feet}$$

Where, e = insulation efficiency of building, dimensionless coefficient

CDD = cooling degree days during season of use, 03/15 to 11/15 (see attached data sheet)

A = area of building being cooled in ft²

ΔT_s = change in water temperature across cooling system

The license for water right 63-12342 should be issued based on the beneficial use that occurred during the authorized development period in accordance with the permit, 0.26 cfs and 125 acre-feet per year for cooling purposes from March 15 to November 15.

NOWData - NOAA Online Weather Data

Boise Area (ThreadEx Station)

Daily Climate Normals

CDD (base 65)

1971-2000

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	2	7	11	5	1	0	0
2	0	0	0	0	0	2	7	11	5	1	0	0
3	0	0	0	0	0	2	8	11	5	1	0	0
4	0	0	0	0	0	2	8	11	5	1	0	0
5	0	0	0	0	0	2	8	10	4	1	0	0
6	0	0	0	0	0	3	8	10	4	0	0	0
7	0	0	0	0	1	3	8	10	4	0	0	0
8	0	0	0	0	1	3	9	10	4	0	0	0
9	0	0	0	0	1	3	9	10	3	0	0	0
10	0	0	0	0	1	3	9	10	3	0	0	0
11	0	0	0	0	1	3	9	10	3	0	0	0
12	0	0	0	0	1	3	9	10	3	0	0	0
13	0	0	0	0	1	3	10	10	3	0	0	0
14	0	0	0	0	1	4	10	10	2	0	0	0
15	0	0	0	0	1	4	10	9	2	0	0	0
16	0	0	0	0	1	4	10	9	2	0	0	0
17	0	0	0	0	1	4	10	9	2	0	0	0
18	0	0	0	0	1	4	10	9	2	0	0	0
19	0	0	0	0	1	4	10	9	2	0	0	0
20	0	0	0	0	1	5	10	8	1	0	0	0
21	0	0	0	0	1	5	10	8	1	0	0	0
22	0	0	0	0	1	5	10	8	1	0	0	0
23	0	0	0	0	1	5	10	8	1	0	0	0
24	0	0	0	0	1	6	11	8	1	0	0	0
25	0	0	0	0	1	6	11	7	1	0	0	0
26	0	0	0	0	2	6	11	7	1	0	0	0
27	0	0	0	0	2	6	11	7	1	0	0	0
28	0	0	0	1	2	6	11	7	1	0	0	0
29	0	0	0	1	2	7	11	6	1	0	0	0
30	0	-	0	1	2	7	11	6	1	0	0	0
31	0	-	0	-	2	-	11	6	-	0	-	0
Month	0	0	0	3	31	122	297	275	74	5	0	0

Sum/average of daily normals might not match monthly normal due to rounding.

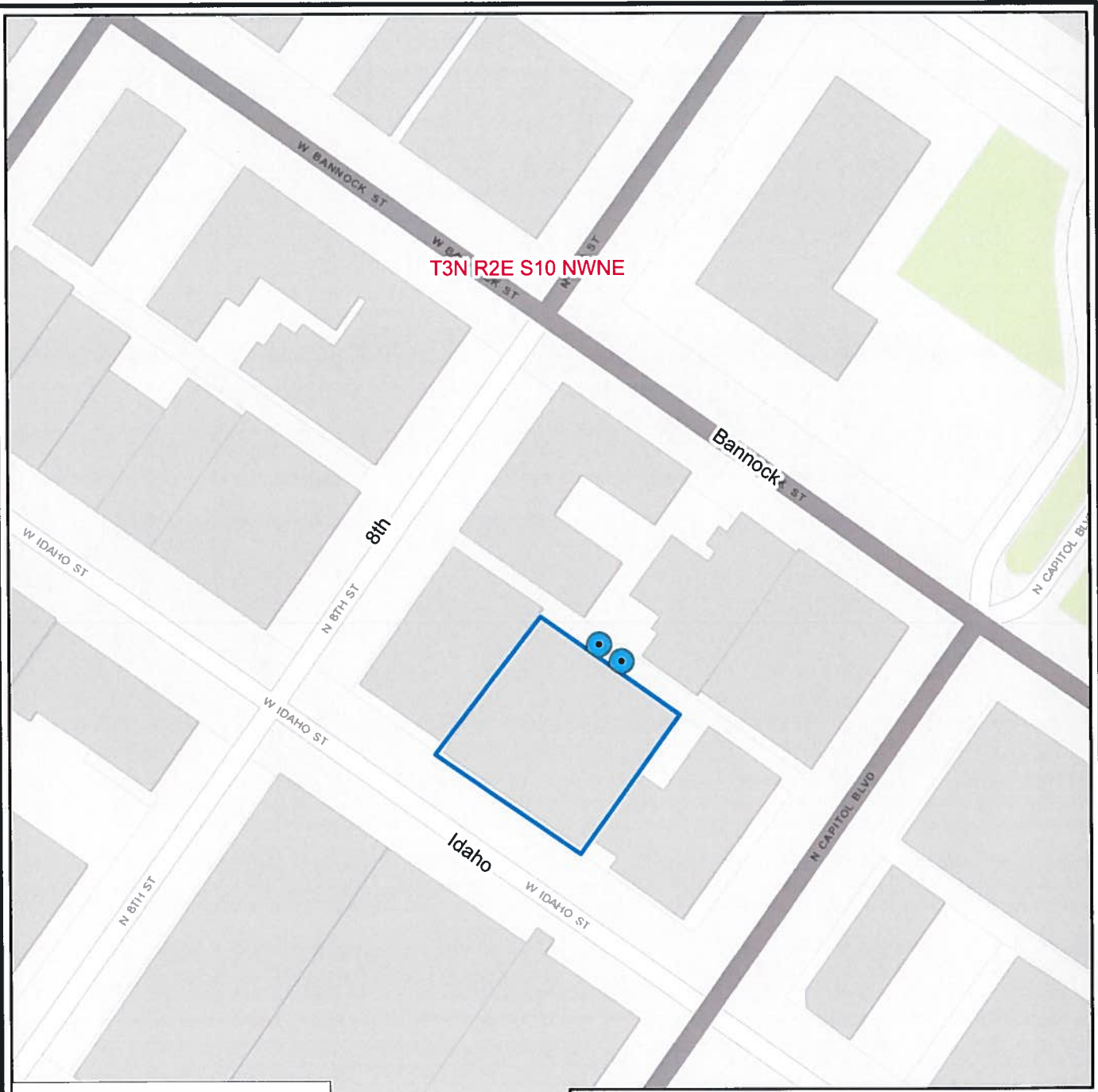
Normals used in this product are from BOISE AIR TERMINAL

Official data and data for additional locations and years are available from the Regional Climate Centers and the National Climatic Data Center.

ATTACHMENT D
2015 AERIAL PHOTO AND TOPO MAP



T3N R2E S10 NWNE



Legend

-  Wells
-  Union Block Building

Permit 63-33245

0 50 100
Feet

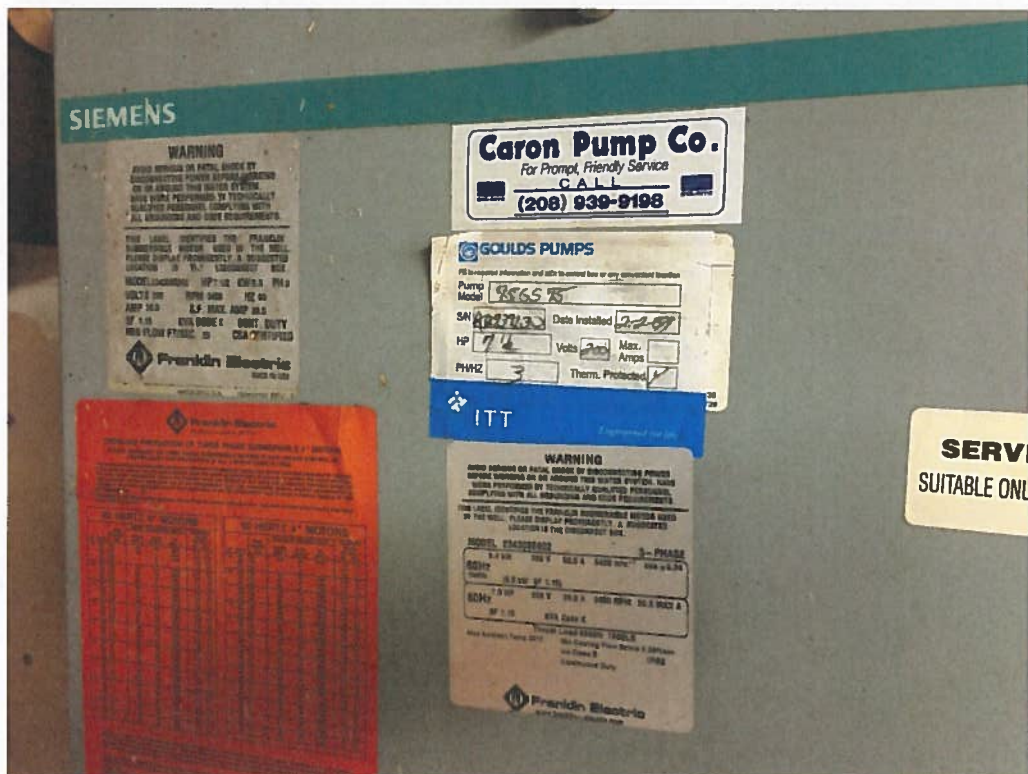


ATTACHMENT E

PHOTOS



Well 1



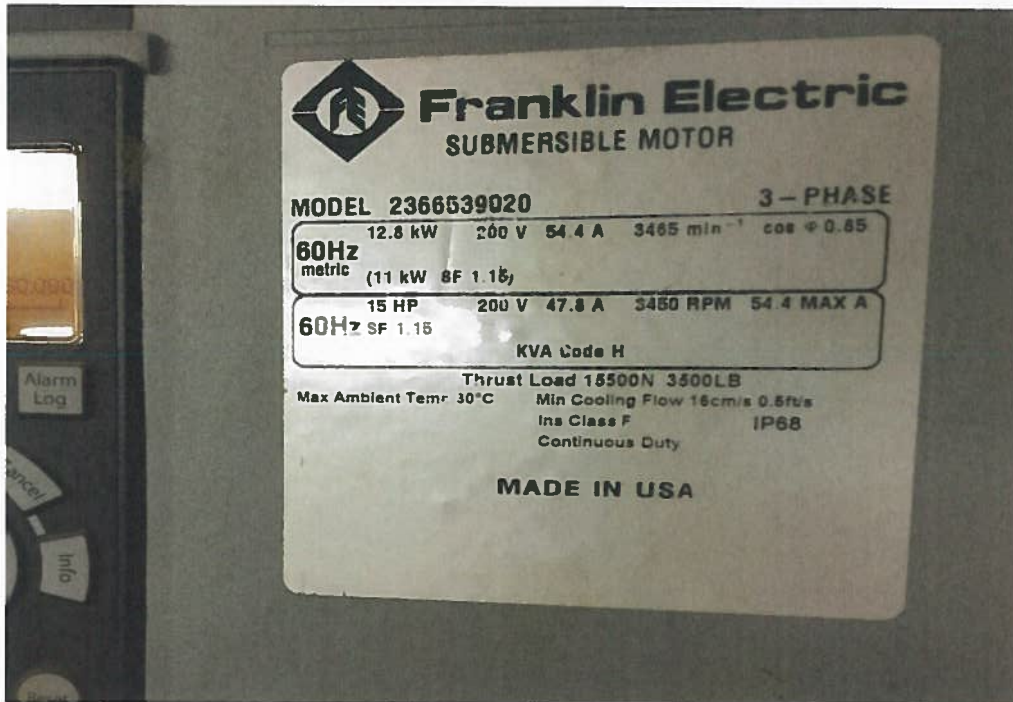
Well 1 Submersible Pump Info



Well 1 Pump Control Panel



Well 2



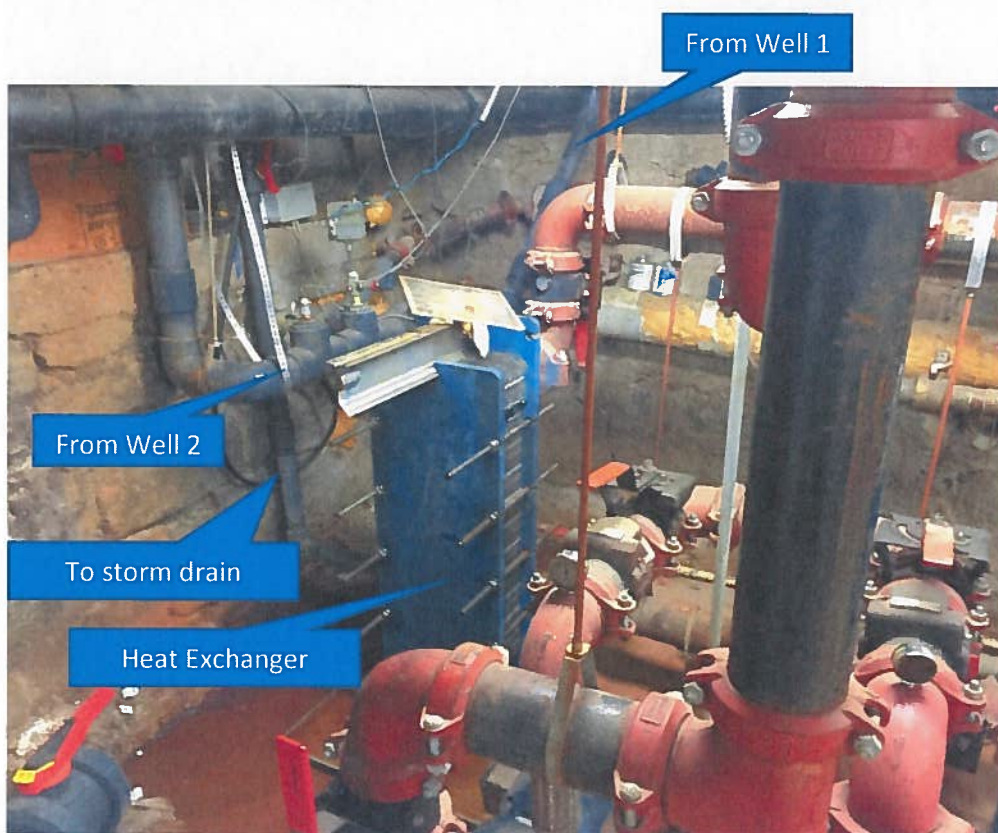
Well 2 Submersible Pump Info



Well 2 Pump Control Panel



Heating/Cooling System Controlling Works



Heating/Cooling Pipe Network



Discharge to storm drain manhole



Sample Heating Unit



Sample Cooling Unit



Place of Use