

MEMORANDUM

DATE: September 12, 2017

TO: Nick Miller – Western Region Manager, Idaho Department of Water Resources
Charles Honsigner – Attorney for Protestant The Terteling Company, Inc.

FROM: Sean Albertson, E.I.T.
Terry Scanlan, P.E., P.G.

CC: Zeke Johnson – ZWJ Properties, LLC

RE: Winsome Road Well Pumping Test and Temperature Profile

Summary. A pumping test was conducted on September 1, 2017, for the Winsome Road well in the NE quarter of the SW quarter of Section 27 in Township 4 North, Range 2 East (Figure 1) for ZWJ Properties, LLC, in accordance with the conditions of approval for water right No. 63-34242.



Figure 1. Winsome Road Well Location Map

The results of testing indicated the well was capable of producing a sustained rate over the test duration of 9 gallons per minute (gpm) with approximately 159 feet of drawdown.

On September 6, 2017, water temperature readings were collected at various depths in the well to verify that the bottom-hole temperature was below 85°F.

IDWR Water Permit Conditions. The Winsome Road well is authorized to divert water under water permit 63-34242 (Attachment A). The permit allows a total diversion of 0.16 cfs (72 gpm) for the irrigation of 8 acres within the parcels owned by ZWJ Properties (identified in Figure 1) between March 1 and November 15 of each year. The Idaho Department of Water Resources (IDWR) approval of permit 63-34242 included the follow conditions.

- Permit holder shall provide IDWR with a temperature log of any well borehole (prior to casing and constructing such well), together with a subsequent temperature log for any well constructed as a point of diversion for permit no. 63-34242.
- The well used as a point of diversion for this water right shall be drilled using the direct mud rotary drilling method and shall be constructed and maintained with unperforated casing and sealed over the full length of the casing to a depth of 200 feet or more below ground surface.
- Permit holder shall test pump any well that is constructed as a point of diversion for permit no. 63-34242. Permit holder shall:
 - (1) notify IDWR of the testing date and time a minimum of 48 hours prior to testing;
 - (2) conduct test pumping for at least six hours at a constant pumping rate of no less than 75% of the nominal pumping rate selected for the permanent pump;
 - (3) measure static water level prior to testing;
 - (4) measure pumping water level, water temperature, and pumping rate at intervals of no less than once per hour; and
 - (5) measure recovery water level for a minimum of one hour following the end of pumping.

Water levels shall be measured with an accuracy of 0.1 feet or better. Pumping rate shall be measured with a calibrated flow meter or a volumetric means with an accuracy of 5% or better. The pumping test shall be conducted under the supervision of a professional engineer or geologist registered in the state of Idaho. IDWR may observe the pump test if desired. The engineer or geologist shall submit a stamped pumping test report to IDWR within 30 days of the completion of testing.

With the submittal of this memo to IDWR, all of these permit conditions have been met.

Well Description. Well construction was completed by Ron Stevens of Stevens & Sons Well Drilling on August 30, 2017. A 13.5-inch borehole was drilled to 227 feet and a 10-inch borehole was drilled to 600 feet below ground surface (bgs). The well was constructed with 8-inch casing sealed to approximately 227 feet bgs. Drilling was conducted using the mud-

rotary method. A temperature log was conducted on August 11, 2017 and submitted to IDWR and the protestant's representative by email on that date.

Static water level at the time of completion was 90 feet bgs, which rose to 69.5 feet bgs by the time of the pumping test on September 1. The measured static level was about 62 feet bgs at the start of the temperature data collection on September 6.

A Well Driller's Report is provided as Attachment B.

Pumping Test. The pumping test occurred on September 1, 2017. IDWR and the protestant's representative were notified 48-hours prior to the start of test.

The test utilized a generator-powered electric submersible pump placed at a depth of approximately 265 feet bgs. Depth to water (DTW) measurements were made using an electric-line well sounder and measuring tape. Discharge from the test was pumped through a 4-inch hose, and a flow totalizer was used to monitor instantaneous flow.

The pump was turned on at 9:48 AM and the instantaneous flow rate was measured at 12 gallons per minute (gpm). The flow rate was immediately adjusted to approximately 10 gpm, and the rate was not adjusted for the remainder of the pumping test. DTW measurements were collected at 10-minute intervals for the first 40 minutes, then 15-minute intervals for the next hour, and then 30-minute intervals for the remainder of the test. The pumping test was run at a constant rate for 6 hours. Instantaneous flow rate, pH, and temperature measurements were collected throughout the pump test. Near the end of the pump test, a groundwater sample was collected from the discharge hose and the pump was subsequently shut off. Well water level recovery was monitored after turning off the pump by taking several DTW measurements for a period of one hour.

Over the course of the pumping test, discharge rate dropped slightly to around 9 gpm. Average water temperature and pH were about 25°C (77°F) and 9, respectively. Discharge water was initially fairly turbid with some sand visible, but cleared as the test progressed. Little to no sand was visible in the discharge water by the end of the test. DTW in the well at the end of the pumping test was measured at 228.5 feet, which corresponds to a drawdown of 159.0 feet (Figure 2). Water levels recovered to 113.9 feet bgs, or 44.4 feet of residual drawdown, within an hour of the pump being shut off. Pumping test measurements are provided as Attachment C.

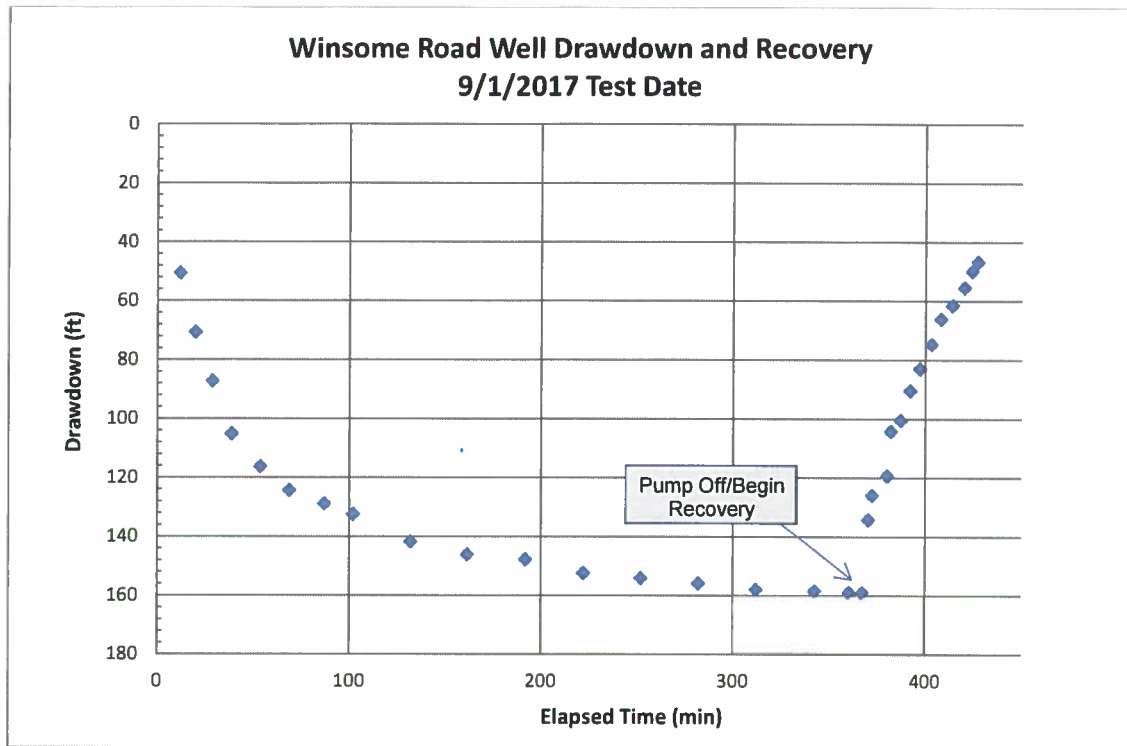


Figure 2. Pump Test Results

Water Temperature Profile. Water temperature data was collected from the completed well using a HOBO TidbiT® water temperature data logger from Onset Computer Corporation, attached to a weighted well sounder lowered into the well. The data logger collected a temperature reading every 10 seconds for the duration of the logging period. Temperature readings were collected at below top of casing depths of 200 feet, 300 feet, 400 feet, 500 feet, 600 feet, and at the bottom of the well. The logger recorded temperature at each depth interval for 10 to 12 minutes to allow for stabilization of the temperature readings.

In order to be considered low-temperature geothermal groundwater, the water temperature must reach at least 85°F. At the shallowest depth measured (200 feet below top of casing), the water temperature was measured at approximately 68.9°F. The water temperature increased with depth. The highest recorded temperature was approximately 82.1°F at the well bottom (Figure 3), below the low-temperature geothermal threshold.

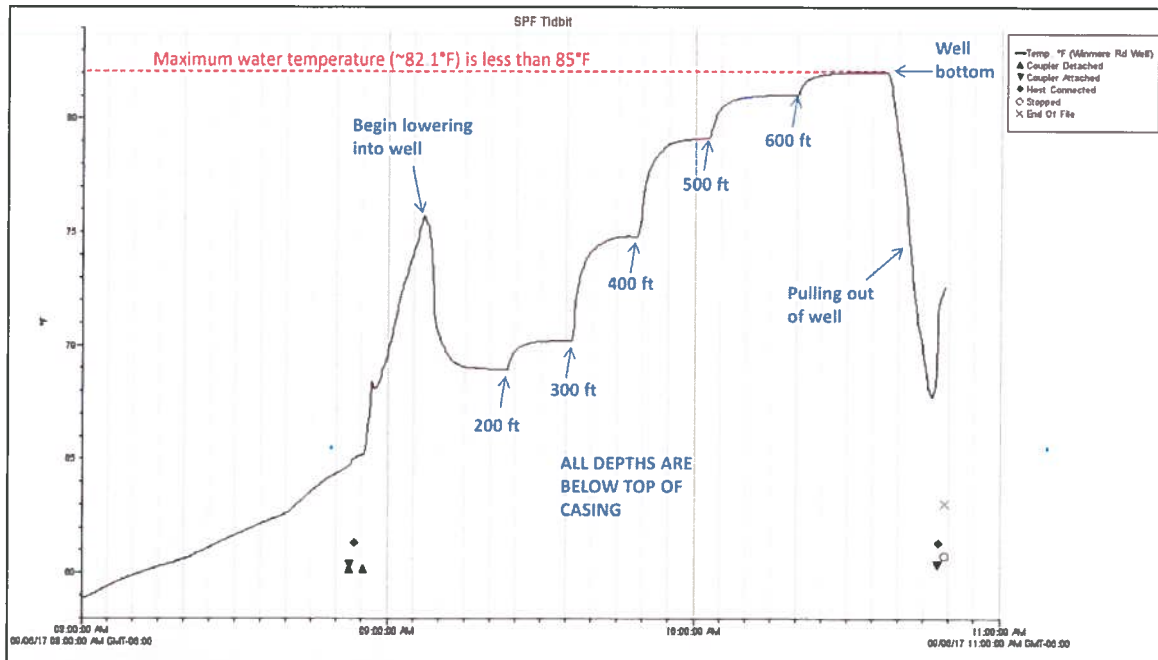


Figure 3. Well Temperature Profile Data

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State of Idaho
Department of Water Resources

Permit to Appropriate Water

NO. 63-34242

9. Permit holder shall provide IDWR with a temperature log of any well borehole (prior to casing and constructing such well), together with a subsequent temperature log for any well constructed as a point of diversion for permit no. 63-34242.
10. Permit holder shall test pump any well that is constructed as a point of diversion for permit no. 63-34242. Permit holder shall: (1) notify IDWR of the testing date and time a minimum of 48 hours prior to testing; (2) conduct test pumping for at least six hours at a constant pumping rate of no less than 75% of the nominal pumping rate selected for the permanent pump; (3) measure static water level prior to testing; (4) measure pumping water level, water temperature, and pumping rate at intervals of no less than once per hour; and (5) measure recovery water level for a minimum of one hour following the end of pumping. Water levels shall be measured with an accuracy of 0.1 feet or better. Pumping rate shall be measured with a calibrated flow meter or a volumetric means with an accuracy of 5% or better. The pumping test shall be conducted under the supervision of a professional engineer or geologist registered in the state of Idaho. IDWR may observe the pump test if desired. The engineer or geologist shall submit a stamped pumping test report to IDWR within 30 days of the completion of testing.
11. Permit holder shall permit IDWR an opportunity to measure the temperature of water pumped from any well that is a constructed as a point of diversion for permit no. 63-34242 upon reasonable request.
12. The diversion and use of water described in this right may be subject to additional conditions and limitations agreed to by the protestant and the right holder under a separate agreement to which the Department is not a party. Because the Department is not a party, the Department is not responsible for enforcement of any aspect of the agreement not specifically addressed in other conditions herein. Enforcement of those portions of the agreement not specifically addressed in other conditions shall be the responsibility of the protestant and the water right holder.
13. Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code and applicable Well Construction Rules of the Department.
14. 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.
15. 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.
16. The Director retains jurisdiction to require the right holder to provide purchased or leased natural flow or stored water to offset depletion of Lower Snake River flows if needed for salmon migration purposes. The amount of water required to be released into the Snake River or a tributary, if needed for this purpose, will be determined by the Director based upon the reduction in flow caused by the use of water pursuant to this permit.

This permit is issued pursuant to the provisions of Section 42-204, Idaho Code.

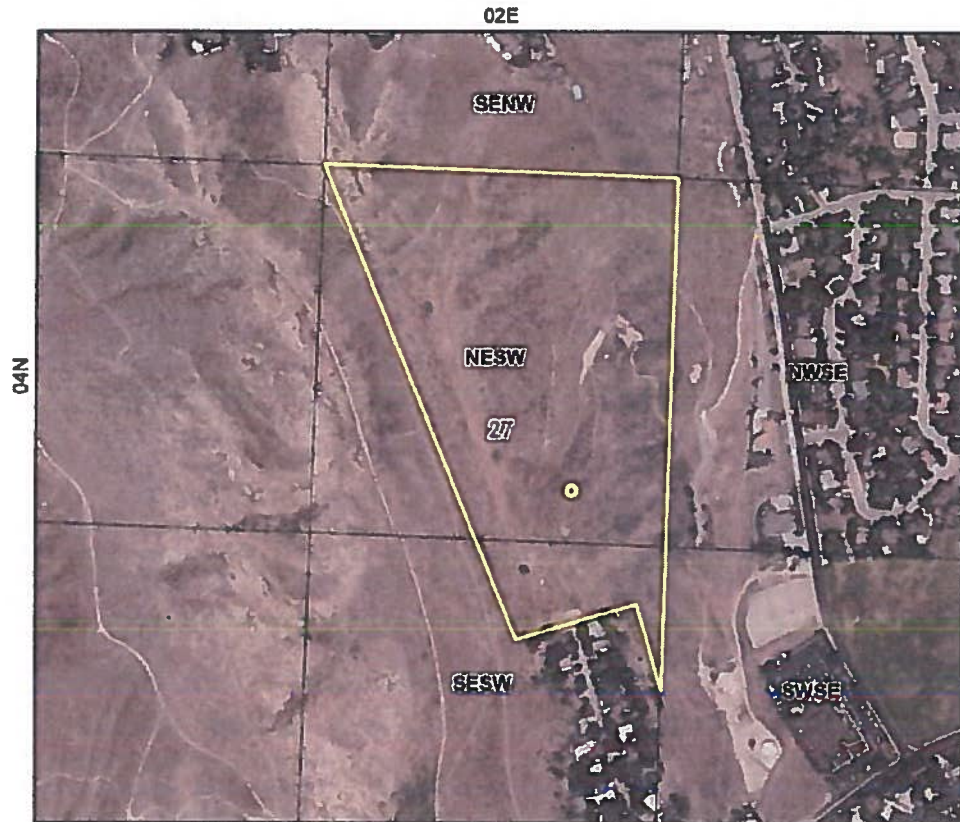
Signed this 17th day of July, 2017.



Nick Miller
Manager, IDWR Western Region

State of Idaho
 Department of Water Resources
Attachment to Permit to Appropriate Water
 63-34242

This map depicts the IRRIGATION place of use boundary for this water right at the time of this approval and is attached to the approval document solely for illustrative purposes.



- Point of Diversion
- Place Of Use Boundary
- Townships
- PLS Sections

0 0.05 0.1 0.2 Miles



ATTACHMENT C – PUMPING TEST MEASUREMENTS

Winsome Road Well								
9/1/2017								
Tested by Stevens and Sons Well Drilling. Supervised by Sean Albertson (SPF Water Engineering)								
Pump type: 5-hp submersible set at 260 feet								
Flow measured with flow meter								
Constant-rate test: ~9 gpm								
Water level measured with electric well sounder								
Measurement point top of sounding tube = 4.5 feet above ground surface								
Date	Time (MST)	t (min)	t' (min)	t/t'	DTW (ft)	Drawdown (ft)	Q (gpm)	Remarks
9/1/2017	9:45				69.50		0	Static water level
9/1/2017	9:48	0					12	Pump on
9/1/2017	10:00	12			120.00	50.50	10	24.9°C, 9.9 pH
9/1/2017	10:08	20			140.20	70.70		
9/1/2017	10:17	29			156.70	87.20	10	24.8°C, 9.4 pH
9/1/2017	10:27	39			174.70	105.20		25°C, 9.2 pH
9/1/2017	10:42	54			185.75	116.25		
9/1/2017	10:57	69			193.85	124.35	9.5	24.9°C, 9.0 pH
9/1/2017	11:15	87			198.40	128.90	9	
9/1/2017	11:30	102			202.00	132.50	9	25.1°C, 8.9 pH
9/1/2017	12:00	132			211.30	141.80	9.5	
9/1/2017	12:30	162			215.60	146.10	9	25.1°C, 8.8 pH
9/1/2017	13:00	192			217.30	147.80	9	
9/1/2017	13:30	222			221.90	152.40	9	25.0°C, 8.9 pH
9/1/2017	14:00	252			223.60	154.10	9	
9/1/2017	14:30	282			225.30	155.80	9.5	25.0°C, 9 pH
9/1/2017	15:00	312			227.40	157.90	9.5	
9/1/2017	15:30	342			228.00	158.50	9	24.8°C, 9.0 pH
9/1/2017	15:48	360			228.40	158.90	9	24.8°C, 8.7 pH
9/1/2017	15:55	367	0		228.50	159.00		Pump off
9/1/2017	15:56	368	1	368.00	203.70	134.20	0	Recovery
9/1/2017	15:58	370	3	123.33	195.40	125.90	0	
9/1/2017	16:00	372	5	74.40	188.80	119.30	0	
9/1/2017	16:08	380	13	29.23	173.70	104.20	0	
9/1/2017	16:10	382	15	25.47	170.00	100.50	0	

9/1/2017	16:15	387	20	19.35	159.90	90.40	0	
9/1/2017	16:20	392	25	15.68	152.40	82.90	0	
9/1/2017	16:25	397	30	13.23	144.20	74.70	0	
9/1/2017	16:31	403	36	11.19	135.60	66.10	0	
9/1/2017	16:36	408	41	9.95	130.90	61.40	0	
9/1/2017	16:42	414	47	8.81	124.80	55.30	0	
9/1/2017	16:48	420	53	7.92	119.30	49.80	0	
9/1/2017	16:52	424	57	7.44	116.10	46.60	0	
9/1/2017	16:55	427	60	7.12	113.90	44.40	0	End recovery