



Clearwater Geosciences, LLP
Ground Water Development and Exploration

AQUIFER ANALYSIS WATER RIGHT TRANSFER

No. 82640

**Clinton K. Aston
Weston, Idaho**

February 11, 2019

**Prepared by
Clearwater Geosciences, LLP
Idaho Falls, ID**



Introduction

Water Right Transfer No. 82640 was filed by Clinton K. Aston is currently pending before the Idaho Department of Water Resources (IDWR). It is my understanding after visiting with Aston's counsel that the existing well (the Aston well) has been pumping at this location for many years (since at least 1962) and this transfer application was filed to "clean up" the water right documents for a point of diversion that has been used for many years. Water Right No. 13-4120 is a statutory claim for 2.80 cfs with the Aston well as the only authorized point of diversion for this right. A 0.62 cfs portion of Water Right No. 13-2209, a licensed water right that originally included 87 acres of property now owned by Aston, is proposed to be changed to have its point of diversion changed to the Aston well. The change on paper amounts to 0.62 cfs of additional water right associated with the Aston well, but the Aston well has been pumping at a rate of 3.42 cfs (including this 0.62 cfs) during the irrigation season for decades. The historic pumping of the Aston well will not change if the transfer is approved. Since the Aston well has been pumped in this manner for many years, we know with certainty that impacts to nearby users have also been occurring for many years. This aquifer analysis is being performed to understand if the pumping of an additional 0.62 cfs has injured nearby users or if there is an expectation that injury might occur in the future. According, the 2.80 cfs under Water Right No. 13-4120 is already authorized and is not part of this analysis.

This report is organized as follows:

Hydrogeology and Wells – What are the general aquifer characteristics and local distribution of wells? Is the Aston well pumping from the same water bearing unit as other nearby users.

Historical use of well - Has the pumping rate changed over time for the Aston well?

Aquifer impacts – What are the theoretical impact from pumping i.e. is it reasonable to expect that pumping causes excessive drawdown at the neighbors wells? Is there any evidence for it?

Aquifer Communication – Is the Aston well in direct hydraulic communication with nearby wells?

Discussion - Do any alleged impacts to other nearby well(s) have alternative causes that are more likely to reduce well yield and increased sand production than impacts from pumping the Aston well?

Hydrogeology and Wells

Hydrogeology

Cache Valley is a graben bounded by normal faults similar to others that form the many basins of the Basin and Range province. This means that the valley floor dropped while the flanking mountains rose creating the valleys in between. Near Weston the surrounding mountains consist of ancient meta-sediments, including, limestone, quartzite, shale, etc. These types of rock generally yield small volumes of water to wells unless they are fractured. Younger sediments eroded from the surrounding mountains have filled Cache Valley. Layers of sand and gravel in the valley are the primary sources of water for the area.



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During the ice ages, the climate was much wetter and the Great Salt Lake Basin and Cache Valley filled with water. This lake, called Lake Bonneville, covered about 20,000 square miles in Western Utah and Southern Idaho and at its highest stage had a maximum depth of about 1,000 feet; its highest shoreline was about 5,135 feet above mean sea level (msl) (the Aston property is about 4,950 feet msl). Subsurface sediments formed in a large inland lake that waxed and waned in the geologic past due to changes in the climate. The Aston property was once situated in a bay along the northern reaches of the ancient lake.

Lake Bonneville produced deltas, spits, bars, and beaches along its shoreline, particularly where streams and rivers carried sediment into the lake. Weston and the Aston property are situated upon what is called the Provo shoreline and a delta formed by Weston Creek. The Provo Shoreline formation is divided into gravel, sand, silt, and clay members. In places gravel at the base is overlain in turn by sand, then silt, and finally clay. At other places one member grades laterally into one or more of the others. Late in Provo time, after the lake had dropped at least as low as 4,700 feet, it again rose to about 4,770 feet, within about 30 feet of the former Provo stillstand. During the lake recession, loess, alluvium, and volcanic ash were locally deposited, and a submature soil was formed before deposition of the late Provo lake sediments.

The preceding discussion of the geology serves to establish a framework for the aquifer beneath the Aston property and surrounding area. In these types of geologic settings it is very difficult to correlate water bearing gravels and sands for any distance without very dense well coverage because sediments were deposited in bars and spits that were cut and refilled as the ancient lake level rose and fell. The difficulty in correlating water bearing units is demonstrated by several dry test wells drilled by the City of Weston and others in the area. Pockets of water bearing gravels and sand surrounded by low permeability clay sediment can create locally confined sub aquifers that form artesian conditions as seen in the Aston Well. These pockets of permeable gravel and sand are often isolated from other water bearing sub aquifers and exhibit unique hydraulic head and water quality parameters.

Wells

Figure 1 is a map showing many of the wells in the area around the Aston property. These are the wells on file with the IDWR on-line data base. Wells of significance for this report are shown in Figure 2. These wells include the Shaun Schvaneveldt domestic well and three wells owned by one of the protestants, Shelly and William Spradlin, referred to as the Spradlin wells (Figure 3-6). The wells range in depth from 109 ft to 320 ft, but the deepest wells have been plugged back from +300 ft to take water from a much shallower depth so that all wells now take water from above 157 ft. The Spradlin well drilled to 109 ft, is thought to be abandoned. The depth to water ranges from 5 to 30 feet. The reported shallow lithology is mostly clay with layers of gravel and the deeper lithology is thick layers of blue clay and hard grey shale. The specific capacity of each of the wells are calculated as follows from the well driller's logs:

Spradlin domestic well	18 gpm/70 ft = 0.26 gpm/ft
Spradlin irrigation well	150 gpm/12 ft = 12.9 gpm/ft
Spradlin irrigation well	450 gpm/25 ft = 18 gpm/ft
Schvaneveldt domestic well	40 gpm/2 ft = 10 gpm/ft



Three of the wells have specific capacities that range from 10 to 18 gpm/ft with an average of 13.6 gpm/ft, while the Spradlin domestic well has a specific capacity that is about 50 times less. The Spradlin domestic well did not encounter very much water bearing formation in a 310 ft deep hole. Only 7 ft of gravel was penetrated and the rest of the geologic section was clay. After drilling to 310 ft, the well driller abandoned the lower part of the hole and perforated casing from 136 to 140 ft and from 33 to 36 ft. The poor yield of the Spradlin domestic well demonstrates the wide variation in water bearing characteristics over short distances. This is consistent with the geologic conceptual model of a cut and fill sedimentary section.

Another line of evidence that sub aquifers in the area are isolated is the water chemistry. It is noted on the Schvaneveldt well log that the iron content is 0.04 ppm, which may be indicative of mineralized water possibly under reduced oxidation conditions. Unfortunately we have not been able to find other water quality data for nearby wells, but reports of discolored, smelly water is found in some wells while other wells have drinkable water are common in the valley.

The well log for the Aston Well is not on file with IDWR and a copy has never been found by Aston. The pump in the Aston well is set to a depth of 200 ft and the total depth of the well is thought to be about 220 ft. The Aston well flows artesian during the winter months but when the pump is on in the summer the well stops flowing. Aston estimates that when he is pumping at 1250 gpm he has about 15 ft of drawdown, which if accurate, is a specific capacity of 83 gpm/ft. This value is higher than the specific capacity of his neighbors' wells but probably a reasonable estimate for a highly productive well in this area.

Historical use of well

Aston took over operation of the well from Sid Schvaneveldt in 2004. It is critically important to understand if Aston increased pumping from the well after 2004 for this aquifer impact analysis. A standard approach to estimating pumping rates is evaluating power consumption for a well pump. The volume of water pumped is correlated to the power consumption. In Table 1 we present the raw power consumption in KWh and the estimated diversion volume for the years from 1997 to 2017. Both the average annual power consumption and the average annual diversion volume have decreased under Aston's management. These data are presented graphically in charts below Table 1. The demarcation between the changes in ownership is shown as a bold black line in the charts.

Aquifer impacts

A basic calculation (Theis) is presented here to estimate if it is reasonable to expect that pumping of the Aston Well will have an effect on the Spradlin well, which is 1300 ft away. Because there are no aquifer pumping tests nearby, the transmissivity is estimated from the specific capacity. Empirical equations based upon many well tests have been developed to estimate aquifer transmissivity from the specific capacity of a well (Driscoll, 1986). A description of the method is given in the inset box below.

For this calculation we will assume a specific capacity of 48.5 gpm/ft, which was calculated by averaging 13.6 gpm/ft (the average specific capacity for the neighboring wells) with 83 gpm/ft (the specific capacity for Aston's well). . Rearranging the Jacob's equation and calculating the aquifer transmissivity as shown in Driscoll (1986) indicates that the transmissivity of the well is



12,950 ft²/day. The aquifer storativity is assumed to be typical for a confined aquifer and is taken as 0.001.

This transfer is for 0.62 cfs or 278 gpm of pumping to this well. For assessing the potential impact to nearby wells it is only necessary to calculate the additional drawdown caused by pumping an additional 278 gpm and not the entire volume pumped by Mr. Aston, which includes an already-existing water right. This is a standard approach that is appropriate because of the linear relationship between pumping and drawdown (Freeze and Cherry, 1979).

Transmissivity from Specific Capacity

by Glenn M. Duffield, President, HydroSOLVE, Inc.

The following equation, based on the [Cooper and Jacob \(1946\) solution](#) for flow to a well in a confined aquifer, computes the specific capacity, Q/s_w , of a well:

$$\frac{Q}{s_w} = \frac{T}{0.183 \log \left(\frac{2.25 T t}{r_w^2 S} \right)} \dots (1)$$

where Q is constant discharge rate [L³/T], r_w is pumped well radius [L], S is [storativity](#) [dimensionless], s_w is [drawdown](#) in the well [L], T is [transmissivity](#) [L²/T] and t is time [T].

Approximate Formulas for Estimating Transmissivity from Specific Capacity

Using equation (1), [Driscoll \(1986\)](#) assumed the following values to develop approximate formulas for estimating transmissivity from specific capacity in [confined](#) and [unconfined](#) aquifers:

$T = 30,000$ US gal/day/ft

$S = 0.001$ (confined) or 0.075 (unconfined)

$r_w = 0.5$ ft

$t = 1$ day

Given these assumed values, Driscoll (1986) estimates transmissivity given the specific capacity of a well as follows:

$T = 2000(Q/s_w)$ confined aquifer

$T = 1500(Q/s_w)$ unconfined aquifer

where T is transmissivity [US gal/day/ft], Q is constant discharge rate [US gal/min] and s_w is drawdown in the pumped well after 1 day [ft].

To estimate the long-term drawdown and impact to neighboring wells from pumping of the proposed increase, the forward solution capabilities of the AQTESOLV program were employed. The Theis analytical solution for a confined aquifer was used. Figure 7 shows the AQTESOLV[®] output plot of the forward calculation for the Aston well pumping at 278 gpm constantly for 7 months (April 1 to Oct 31). At the end of the time period the predicted drawdown is estimated to be about 7.5 feet in the Aston well. The calculated drawdown for Schvaneveldt well is about 3 ft. The calculated drawdown for the Spradlin Well is 2.8 ft. This calculation over-predicts the amount of drawdown to be expected in nearby wells because Aston will never pump his well 24/7 for 7 straight months. A limitation of the model is that it is very simplified representation of the subsurface. It assumes a layer cake geometry to the geologic units and that the wells are in direct hydraulic communication with each other. As will be discussed below, this is not the case



and the actual impacts from pumping the Aston well on other wells will be even less than calculated here.

Based on the Theis analysis, even if the wells were in good hydraulic communication, it is unlikely that pumping of the Aston well has caused injury to the Spradlin well. The Spradlin protest claims their domestic well has gone dry and that they cannot use their irrigation well, but 2.8 ft of drawdown is not of sufficient magnitude to cause these issues.

Aquifer Communication

As previously mentioned, the Aston well is flowing artesian or can be flowing if not sealed during the winter months. Flowing artesian water is caused when the head (or pressure) in a well is greater than the elevation of land surface. Since the nearby wells are not flowing, the Aston well must be at a greater head than other wells (without a detailed elevation survey it is difficult to quantify). For instance, the Schvaneveldt well, which is 695 ft away from the Aston well has a depth to water of about 19 feet below land surface. This is consistent with water level measurements made while drilling (see well log) and with iron staining on the pump riser pipe (Figure 8). Personal communication between Aston and Shaun Schvaneveldt indicates that he has never noticed a change in water levels in his well when the Aston well is pumped.

Another line of evidence supporting the hydraulic isolation from other nearby wells is provided in the description of the geology on the drillers logs. The Spradlin Irrigation well log describes 40 feet of water bearing formation or 25% of the 157 ft drilled hole, the abandoned Spradlin Irrigation well has 20 feet of water bearing formation (18% of the 109 ft deep hole), the Schvaneveldt domestic well has 10 ft of gravel (3% of the 320 ft deep hole) and the Spradlin domestic well has 7 ft of gravel (2% of the 310 ft deep hole). We don't know how much water bearing formation is in the Aston well, but it must be significant based on the water yield. The point here is that there is not a single layer or sedimentary package that is distributed across the area. Water bearing formations are a small percentage of the subsurface in many locations and communication between wells is probably limited.

Conclusions

The data and analyses considered for this water right transfer indicate that the Aston well taps a high yielding sedimentary package that seems to be unique for the area. Wells with this capacity and water quality are rare in this area. The hydraulic head and the geology indicate that the Aston well is isolated from neighboring wells and probably is recharged from a water source that is distinct, perhaps from fracture flow entering the basin from the mountain front. There is no evidence that the Aston well has, over the several decades that it has been operating, impacted the neighboring wells. Therefore, there is no reason to think that it will negatively impact the neighboring wells in the future.

The Spradlins report that their domestic well has gone dry, that their irrigation well is useless, and that they get so much debris in their water that they can't maintain their garden. Issues like this occur in wells for many reasons. Without some evidence to support a decline in well water levels associated with pumping of the Aston well, it is unreasonable to first point to pumping of Aston well as the cause because the Aston well been pumped at the same rate for decades. The first factor to consider is the age of the Spradlin irrigation well; it was drilled in 1961 and



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constructed of ¼ inch wall, mild steel pipe and the perforations are 3/8 by 4 inches—probably cut with a mills knife. We don't know the quality of the original perforations or how they have aged over the years. Wells of this nature typically have a lifetime of 50 to 60 years. The casing rusts and the perforations become filled with scale. This is especially true in the reactive waters in this area. Consider the pump riser pipe shown in Figure 8. After less than two decades of use, the pipe is rusted and corroded so badly that it needed to be replaced. The Spradlin Irrigation well is 58 years old and is nearing the end of its life. It is my understanding that the well has not had certain maintenance performed on it, for instance, removing scale and rust build up from the perforations. Without cleaning the perforations, they can become filled with scale and rust, thereby, inhibiting flow into the well. Another problem is that the casing can eventually rust through and allow clay and sediment to enter the well, filling in the bottom of the well and reducing water yield. With respect to the Spradlin domestic well, it was not much of a well even when it was new. According to the well log, it was pumped at 18 gpm for 20 hours with 70 ft of drawdown. Having only 7 ft of perforations makes this well very sensitive to scale and rust that might plug off the perforations and reduce flow. Without scrubbing or cleaning the perforations to remove scale the life expectancy of this 28 year old well is less than the average for wells in southeastern Idaho. Issues associated with the age of the wells and lack of maintenance are the more likely causes of the well problems reported by the Spradlins.

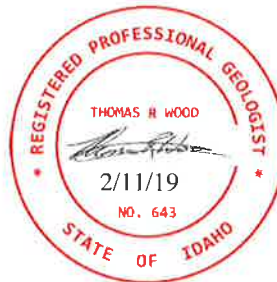
The Spradlins also report that Weston Creek has gone dry. There are many causes for this, the most likely are the many years of drought that Southern Idaho has experienced in recent decades. It is not clear where or when the creek has gone dry. If it is near the Spradlin property it probably is not related to pumping of the Aston well. The artesian head in the Aston well is at depth and because of the many clay layers in the shallow subsurface the deep artesian water is sealed from discharging to the surface. This is demonstrated by the shallow wells that have a depth to water of 20 to 30 ft. Water moving under pressure from depth would tend to elevate water levels in shallow wells. It is unlikely artesian head at the Aston well extends to land surface near this area. As mentioned, the upper layers of surface sediments were deposited in a deep inland lake creating a thick, clay-rich layer that blankets much of the shallow subsurface. This low permeability layer will also limit communication of deep artesian waters with surface waters.

Overall, it is my professional opinion that the changes sought in the Aston water right transfer application will not injure nearby neighbors' rights to divert water, nor will it impact flow in the Weston Creek.

Respectfully,

A handwritten signature in black ink, appearing to read "Thomas R. Wood".

Thomas R. Wood, PhD, PG

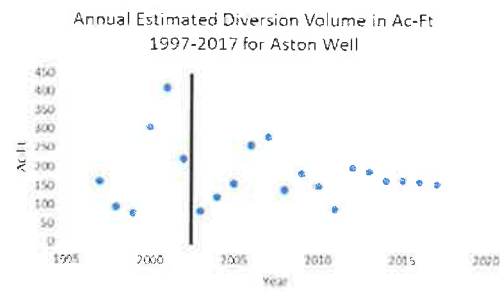
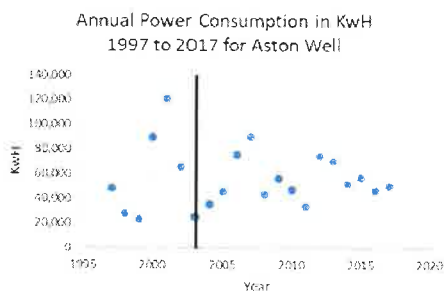




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Table 1. Power consumption record and estimated diversion volume for Aston well from 1997 to 2017.

COMPARISON OF HISTORICAL POWER USE						CONVERSION TO VOLUME OF WATER DIVERTED					
						Aston Water Right cfs	3.42				
						AF per day per cfs	1.985				
						Volume of water per day	6.7887				
Year	kWh	Max kW Demand	Estimated Total Hours of Operation (kW/Max kW Demand)	Estimated Total Days of Operation (Hours/24)	Owner of Well	Estimated Diversion Volume (Total Days of Operation X Water Right cfs X AF/day/cfs]	Notes				
2017	50,236	90	558	23	Aston	158					
2016	47,244	82	576	24	Aston	163					
2015	57,002	97	588	24	Aston	166					
2014	52,390	89	589	25	Aston	167					
2013	69,856	104	672	28	Aston	190					
2012	73,706	104	709	30	Aston	200					
2011	33,960	104	327	14	Aston	92	Year that variable speed drive was installed,				
2010	46,960	87	540	22	Aston	153					
2009	56,161	86	653	27	Aston	185					
2008	43,280	87	497	21	Aston	141					
2007	89,216	90	991	41	Aston	280					
2006	75,200	82	917	38	Aston	259	High power use; May be an outlier in data.				
2005	45,760	82	558	23	Aston	158					
2004	35,200	82	429	18	Aston	121					
2003	24,800	83	299	12	Schvaneveldt	85					
2002	65,280	83	787	33	Schvaneveldt	222					
2001	120,640	83	1453	61	Schvaneveldt	411	High power use; May be an outlier in data.				
2000	89,600	83	1080	45	Schvaneveldt	305					
1999	23,360	83	281	12	Schvaneveldt	80					
1998	28,000	83	337	14	Schvaneveldt	95					
1997	48,000	83	578	24	Schvaneveldt	164					
Schvaneveldt Average					57,097	83	688	29		195	
Aston Average					55,441	90	615	26		174	





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Figure 1. Map of wells in the vicinity of Aston property (some well locations are estimated from the IDWR website).



Figure 2 Map of wells near the Aston Property.

Form 238-7
1/97

DMD

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT 054653

Office Use Only
Inspected by _____
Twp _____ Rge _____ Sec _____
1/4 _____ 1/4 _____
Lat: _____ Long: _____
☐ Air ☐ Flowing Artesian

1. WELL TAG NO. D 0006964
DRILLING PERMIT NO. 13-99-E-0037-000
Other IDWR No. _____

2. OWNER:
Name Shawn Schanefeldt
Address P.O. Box 141
City Weston State Id Zip 83286

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N

W

S

Twp. 16 North ☐ or South ☒

Rge. 38 East ☒ or West ☐

Sec. 8 NW 1/4 NE 1/4 1/4

Gov't Lot _____ 10 acres County _____ 40 acres 160 acres

Lat: _____ Long: _____

Address of Well Site 6755 W 3200 So.

City Weston

(Circle at least three of read - Distance to Road or Landmark)

Lt. _____ Blk. _____ Sub. Name _____

4. USE:
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other _____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other _____

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other _____

7. SEALING PROCEDURES

SEAL/FILTER PACK			AMOUNT		METHOD
Material	From	To	Sacks or Pounds		
Bentonite hole			100# powder	mixed slurry	Full during drilling
Plug & Bentonite Slurry	0	20	25# chips	kept hole	

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) _____

Was drive shoe seal tested? ☐ Y ☐ N How? _____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
8	4.5'	130	250	Steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe _____ Length of Tailpipe _____

9. PERFORATIONS/SCREENS

Perforations _____ Method mill's knife

Screens _____ Screen Type _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
20	30	3/64"	120			☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
19 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: Steel plate temporary taced to casing.

11. WELL TESTS:
☐ Pump ☒ Bailor

Yield gal./min.	Drawdown	Pumping Level	Time
40	2	21	3/4 hr.

Water Temp. 47° F Bottom hole temp. _____

Water Quality test or comments: 0.9 ppm iron

Depth first Water Encounter _____

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
12	0	2	clay, silt		☒
12	2	19	Brown clay		☒
8	19	37	Gravel w/ some green clay	☒	
8	27	118	Hard Grey Clay		☒
8	118	126	Grey mudstone (trace of water)	☒	
8	126		Hard Grey mudstone		☒

RECEIVED

AUG 27 1999

Department of Water Resources
Eastern Region

RECEIVED

SEP 10 1999

MICROFILMED by Department of Water Resources

NOV 30 1999

Completed _____ Depth Drilled to 320' (Measurable)
Date: Started 6-22-99 Completed 8-10-99

13. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Wright Drilling Inc. Firm No. 422

Firm Official Ken Wright Date 8-29-99

and

Driller or Operator Don Jensen Date 8-29-99

(Sign once if Firm Official & Operator)

Figure 3. Well log for Shaun Schvaneveldt domestic well.



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Form 238-77
9/82

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR
BALLPOINT PEN

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources
within 30 days after the completion or abandonment of the well.

1. WELL OWNER Name <u>Wend Williams</u> Address <u>6959 W. Hwy 36 Western</u> Owner's Permit No. <u>13-910-014</u>		7. WATER LEVEL <i>Well log for Spradlin Domestic Well as shown by IDWR</i> Static water level <u>30</u> feet below land surface. Flowing? ☐ Yes ☒ No G.P.M. flow <u>0</u> Artesian closed-in pressure _____ p.s.i. Controlled by: ☐ Valve ☐ Cap ☐ Plug Temperature <u>C</u> °F. Quality <u>good</u> Describe artesian or temperature notes below.																																				
2. NATURE OF WORK ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)		8. WELL TEST DATA ☐ Pump ☐ Bailer ☒ Air ☐ Other _____ <table border="1"><thead><tr><th>Discharge G.P.M.</th><th>Pumping Level</th><th>Hours Pumped</th></tr></thead><tbody><tr><td><u>18</u></td><td><u>100</u></td><td><u>20</u></td></tr></tbody></table>		Discharge G.P.M.	Pumping Level	Hours Pumped	<u>18</u>	<u>100</u>	<u>20</u>																													
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3. PROPOSED USE ☒ Domestic ☐ Irrigation ☐ Test ☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection ☐ Other _____ (specify type)		9. LITHOLOGIC LOG <u>84291</u> <table border="1"><thead><tr><th>Bore Diam.</th><th>Depth From</th><th>To</th><th>Material</th><th>Water Yes No</th></tr></thead><tbody><tr><td><u>10</u></td><td><u>0</u></td><td><u>8</u></td><td><u>top soil</u></td><td><u>✓</u></td></tr><tr><td><u>8</u></td><td><u>8</u></td><td><u>33</u></td><td><u>white clay</u></td><td><u>✓</u></td></tr><tr><td><u>6</u></td><td><u>33</u></td><td><u>136</u></td><td><u>gravel 1/4</u></td><td><u>✓</u></td></tr><tr><td><u>36</u></td><td><u>136</u></td><td><u>143</u></td><td><u>Blue clay</u></td><td><u>✓</u></td></tr><tr><td><u>135</u></td><td><u>143</u></td><td><u>30</u></td><td><u>gravel</u></td><td><u>✓</u></td></tr><tr><td><u>143</u></td><td><u>30</u></td><td></td><td><u>Blue clay</u></td><td><u>✓</u></td></tr></tbody></table>		Bore Diam.	Depth From	To	Material	Water Yes No	<u>10</u>	<u>0</u>	<u>8</u>	<u>top soil</u>	<u>✓</u>	<u>8</u>	<u>8</u>	<u>33</u>	<u>white clay</u>	<u>✓</u>	<u>6</u>	<u>33</u>	<u>136</u>	<u>gravel 1/4</u>	<u>✓</u>	<u>36</u>	<u>136</u>	<u>143</u>	<u>Blue clay</u>	<u>✓</u>	<u>135</u>	<u>143</u>	<u>30</u>	<u>gravel</u>	<u>✓</u>	<u>143</u>	<u>30</u>		<u>Blue clay</u>	<u>✓</u>
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<u>10</u>	<u>0</u>	<u>8</u>	<u>top soil</u>	<u>✓</u>																																		
<u>8</u>	<u>8</u>	<u>33</u>	<u>white clay</u>	<u>✓</u>																																		
<u>6</u>	<u>33</u>	<u>136</u>	<u>gravel 1/4</u>	<u>✓</u>																																		
<u>36</u>	<u>136</u>	<u>143</u>	<u>Blue clay</u>	<u>✓</u>																																		
<u>135</u>	<u>143</u>	<u>30</u>	<u>gravel</u>	<u>✓</u>																																		
<u>143</u>	<u>30</u>		<u>Blue clay</u>	<u>✓</u>																																		
4. METHOD DRILLED ☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary ☐ Cable ☐ Dug ☐ Other _____		RECEIVED JUN 17 1992 Department of Water Resources Eastern District Office RECORDED DEC 07 1992																																				
5. WELL CONSTRUCTION Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____ <table border="1"><thead><tr><th>Thickness</th><th>Diameter</th><th>From</th><th>To</th></tr></thead><tbody><tr><td><u>250</u> inches</td><td><u>6</u> inches</td><td><u>0</u> feet</td><td><u>140</u> feet</td></tr><tr><td>_____ inches</td><td>_____ inches</td><td>_____ feet</td><td>_____ feet</td></tr><tr><td>_____ inches</td><td>_____ inches</td><td>_____ feet</td><td>_____ feet</td></tr><tr><td>_____ inches</td><td>_____ inches</td><td>_____ feet</td><td>_____ feet</td></tr></tbody></table> Was casing drive shoe used? ☒ Yes ☐ No Was a packer or seal used? ☐ Yes ☒ No Perforated? ☒ Yes ☐ No How perforated? ☐ Factory ☐ Knife ☒ Torch Size of perforation <u>1/4</u> inches by <u>6</u> inches <table border="1"><thead><tr><th>Number</th><th>From</th><th>To</th></tr></thead><tbody><tr><td><u>32</u> perforations</td><td><u>33</u> feet</td><td><u>36</u> feet</td></tr><tr><td><u>40</u> perforations</td><td><u>136</u> feet</td><td><u>140</u> feet</td></tr><tr><td>_____ perforations</td><td>_____ feet</td><td>_____ feet</td></tr></tbody></table> Well screen installed? ☐ Yes ☒ No Manufacturer's name _____ Type _____ Model No. _____ Diameter _____ Slot size _____ Set from _____ feet to _____ feet Diameter _____ Slot size _____ Set from _____ feet to _____ feet Gravel packed? ☐ Yes ☒ No ☐ Size of gravel _____ Placed from _____ feet to _____ feet Surface seal depth <u>18</u> Material used in seal: ☐ Cement grout ☐ Bentonite ☐ Pudding clay Sealing procedure used: ☒ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☐ Cemented between strata Describe access port _____				Thickness	Diameter	From	To	<u>250</u> inches	<u>6</u> inches	<u>0</u> feet	<u>140</u> feet	_____ inches	_____ inches	_____ feet	_____ feet	_____ inches	_____ inches	_____ feet	_____ feet	_____ inches	_____ inches	_____ feet	_____ feet	Number	From	To	<u>32</u> perforations	<u>33</u> feet	<u>36</u> feet	<u>40</u> perforations	<u>136</u> feet	<u>140</u> feet	_____ perforations	_____ feet	_____ feet			
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_____ perforations	_____ feet	_____ feet																																				
6. LOCATION OF WELL Sketch map location <u>must</u> agree with written location. <table border="1"><tr><td>N</td><td></td><td></td><td></td></tr><tr><td>W</td><td></td><td></td><td>E</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>S</td><td></td><td></td><td></td></tr></table> Subdivision Name _____ Lot No. _____ Block No. _____ County <u>Franklin</u> <u>SE</u> 1/4 <u>NW</u> 1/4 Sec. <u>8</u> T. <u>16</u> N. R. <u>38</u> E. W.		N				W			E									S				10. Work started <u>7-15-91</u> finished <u>7-25-91</u>																
N																																						
W			E																																			
S																																						
11. DRILLERS CERTIFICATION I/We certify that all minimum well construction standards were complied with at the time the rig was removed. Firm Name <u>Gardner Drilling</u> Firm No. <u>454</u> Address <u>151 South Main St</u> Date <u>6-14-92</u> <u>Malad Idaho</u> Signed by (Firm Official) <u>Cole J. Gardner</u> and _____ (Operator)		11. DRILLERS CERTIFICATION I/We certify that all minimum well construction standards were complied with at the time the rig was removed. Firm Name <u>Gardner Drilling</u> Firm No. <u>454</u> Address <u>151 South Main St</u> Date <u>6-14-92</u> <u>Malad Idaho</u> Signed by (Firm Official) <u>Cole J. Gardner</u> and _____ (Operator)																																				

USE ADDITIONAL SHEETS IF NECESSARY - FORWARD THE WHITE COPY TO THE DEPARTMENT

Figure 4. Well log for Spradlin domestic well.



Clearwater Geosciences, LLP
Ground Water Development and Exploration

Well log for Spradlin Irrigation
Well as shown by IDWR

REPORT OF WELL DRILLER
State of Idaho

OCT 8 1967

Department

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:

Name HERBERT N. WILLIAMS

Address WESTON, IDAHO

Owner's Permit No. 23553

NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐

Water is to be used for: IRRIGATION

METHOD OF CONSTRUCTION: Rotary ☒ Cable ☐
Dug ☐ Other ☐

(explain) _____

CASING SCHEDULE: Threaded ☐ Welded ☒

4" Diam. from 0 ft. to 109 ft.

"Diam. from _____ ft. to _____ ft.

"Diam. from _____ ft. to _____ ft.

"Diam. from _____ ft. to _____ ft.

Thickness of casing: 198 Material: _____

Steel ☒ concrete ☐ wood ☐ other ☐

(explain) _____

PERFORATED? Yes ☒ No ☐ Type of

perforator used: 70RCH

Size of perforations: 1/4" by 5"

26 perforations from 14 ft. to 23 ft.

20 perforations from 23 ft. to 28 ft.

24 perforations from 28 ft. to 38 ft.

perforations from _____ ft. to _____ ft.

WAS SCREEN INSTALLED? Yes ☐ No ☒

Manufacturer's name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.

Diam. _____ Slot size _____ Set from _____ ft. to _____ ft.

CONSTRUCTION: Well gravel packed? Yes ☒

No ☐ size of gravel 3/4" Gravel

placed from 4 ft. to 109 ft. Surface seal

provided? Yes ☒ No ☐ To what depth?

_____ ft. Material used in seal: BENTONITE

Did any strata contain unusable water? Yes ☐

No ☒ Type of water: _____

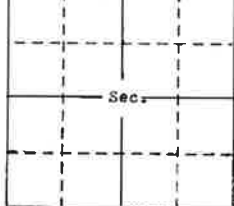
Depth of strata _____ ft. Method of sealing

strata off: _____

Surface casing used? Yes ☐ No ☐

Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County FRANKLIN
NE 1/4 NW 1/4 Sec. 8 T. 16 N. R. 28 E.

Use other side for additional remarks

Size of drilled hole: 9" Total
depth of well: 109 Standing water
level below ground: 5 Temp. _____
Fahr. _____ ° Test delivery: 150 gpm
or _____ cfs Pump? ☒ Bail ☐
Size of pump and motor used to make test:
10 H.P. Suction Pump
Length of time of test: 60 days _____ Min.
Drawdown: 12 ft. Artesian pressure: ft.
above land surface _____ Give flow _____ cfs
or _____ gpm. Shutoff pressure: _____
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☐

DEPTH MATERIAL WATER
FROM TO YES OR NO
FEET FEET

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
0	3	SOIL	
3	14	CLAY	
14	23	GRAVEL	yes
23	49	BLU CLAY	
49	60	BLU CLAY-VERY STIFF	
60	73	BLU CLAY MILD	
73	78	GRAVEL	yes
78	92	BLU CLAY	
92	98	GRAVEL	yes
98	109	BLU CLAY	

Work started: 4/5/61
Work finished: 4/6/61
Well Driller's Statement: This well was
drilled under my supervision and this report
is true to the best of my knowledge.
Name: CHARLES B. GARDNER
Address: 147 30. MAIN ST. MALAD, IDAHO
Signed by: Bernard Gardner
License No. 63 Date: 10/5/67

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Figure 5. Well log for Spradlin Irrigation well (abandoned?).



Clearwater Geosciences, LLP
Ground Water Development and Exploration

Well Log Form 1
4/09 2 M

Well log for Spradlin Well as
shown by IDWR

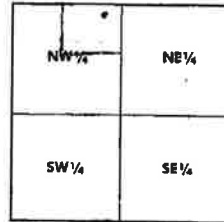
0695C3

RECEIVED
MAR 5 1963

WELL LOG AND REPORT OF THE
STATE RECLAMATION ENGINEER OF IDAHO
Department of Reclamation

Permit No. 9-2882
9-29552 Well No. _____ County Franklin
Owner Herbert M. Williams
Address Weston, Idaho
Driller Charles B. Gardner
Address Mohad, Idaho
Well location NE 1/4 NW 1/4 Sec. 8, T. 16 N, R. 38 E, B.M.
Size of drilled hole 10 1/4" I.D.
Total depth of well 157'

Locate well in section



Give depth to standing water from the ground 5' Water temp. _____ °Fahr.
On "Pumping Test" delivery was 450 g.p.m. or _____ c.f.s. Drawdown was 25 feet.
Size of pump and motor used to make test compressed air
Length of time of test 8 hours _____ minutes.
If flowing well, give flow _____ c.f.s. or _____ g.p.m. and of shut off pressure _____

If flowing well, described control works _____
Water will be used for Irrigation (TYPE AND SIZE OF VALVE, ETC.)
Weight of casing per lineal foot 28.04
Thickness of casing 1/4" Casing material steel (STEEL, CONCRETE, WOOD, ETC.)
Diameter, length and location of casing 10 1/4" from 0' - 157'
(CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER;
CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	Remarks—seals, grouting, etc.
<u>10 1/4" ID</u>	<u>0</u>	<u>157</u>	<u>157</u>	

Number and size of perforation six 3/8" x 4" ports located opposite all water-bearing gravel
feet to _____ feet from ground _____

Date of commencement of well June 1961 Date of completion of well June 1961

165-38E-8 NEW

Figure 6. Well log for Spradlin irrigation well 1961.



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Ground Water Development and Exploration

WELL LOG				
From Foot	To Foot	Type of Material	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0	3	soil		
3	14	clay		
14	23	gravel	Yes	Yes
23	49	Blue clay		
49	60	" " (some fine gravel)		
60	73	" "		
73	78	gravel	Yes	Yes
78	92	clay		
92	98	gravel	Yes	Yes
98	123	clay		
123	125	gravel	Yes	Yes
125	130	clay		
130	138	gravel	Yes	Yes
138	146	gravelly clay		
146	156	gravel	Yes	Yes
If more space is required use Sheet No. 2				

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed Charles B. Gardner

By _____

Dated Dec, 1961

License No. 63

Figure 6. (con't) Spradlin irrigation well 1967.

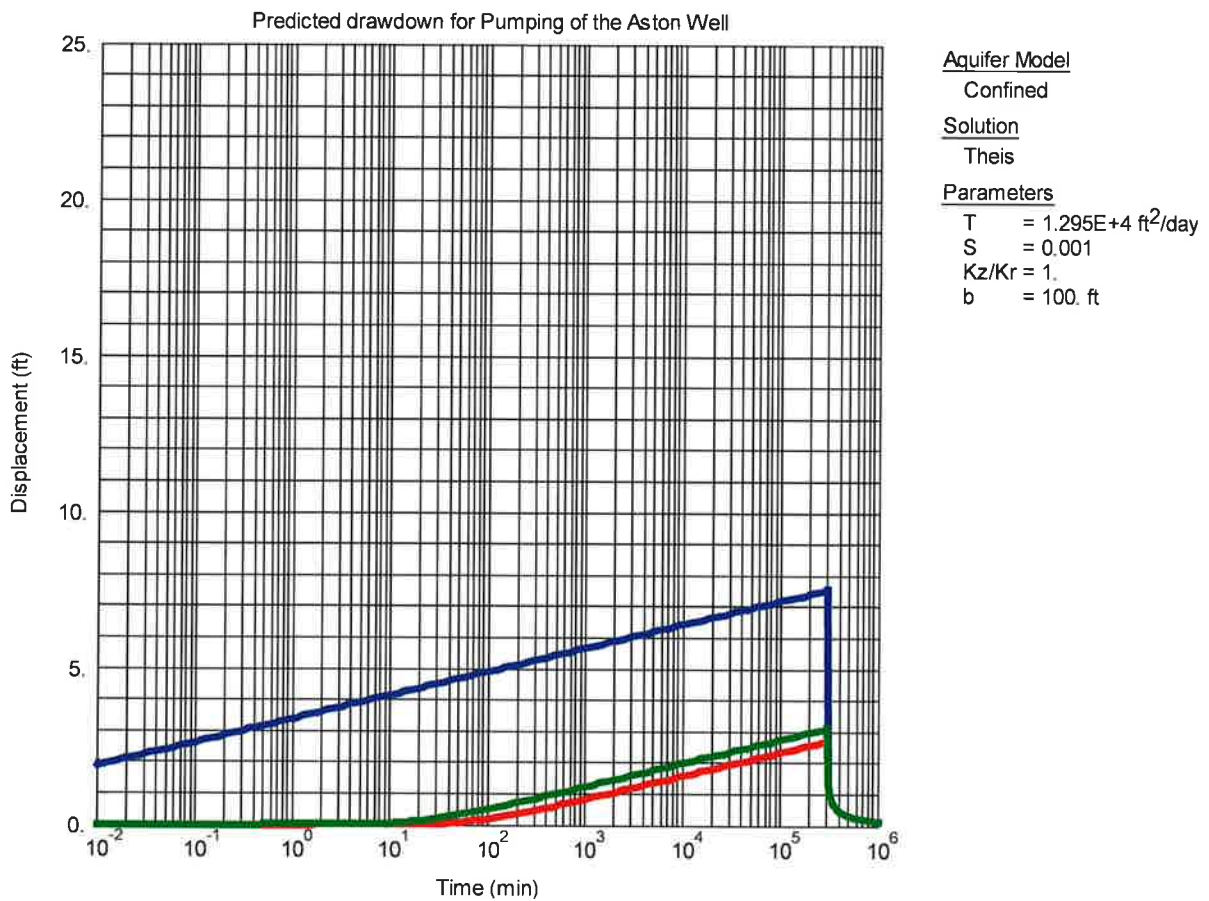


Figure 7. Predictive plot of drawdown at 278 gpm for the full period of use 210 days using the Theis Solution. The red line is for the water level in the Spradlin well, blue line is the water level predicted in the Aston well and the green line is the water level predicted in the Schvaneveldt well.



Figure 8. Pump and riser pipe recently removed from Schvaneveldt well.



Figure 8. (con't) Pump and riser pipe recently removed from Schvaneveldt well.