

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

RECEIVED
MAR 25 2013
DEPT 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. 21-13048

1. Owner WDG Shadow Ridge LLC Phone No. (208) 523-3794
 Current address P.O. Box 51298, Idaho Falls, ID 83405
2. Examiner's name Charles G. Brockway EXAM DATE Various during 2007-12
3. Accompanied by Mike Vickers Email _____
 Address Same
- Relationship to permit holder Manager Phone No. (208) 351-6109
4. Source Groundwater tributary to _____

B. OVERLAP REVIEW

1. Other water rights with the same place of use 21-13120
2. Other water rights with the same source and point of diversion None

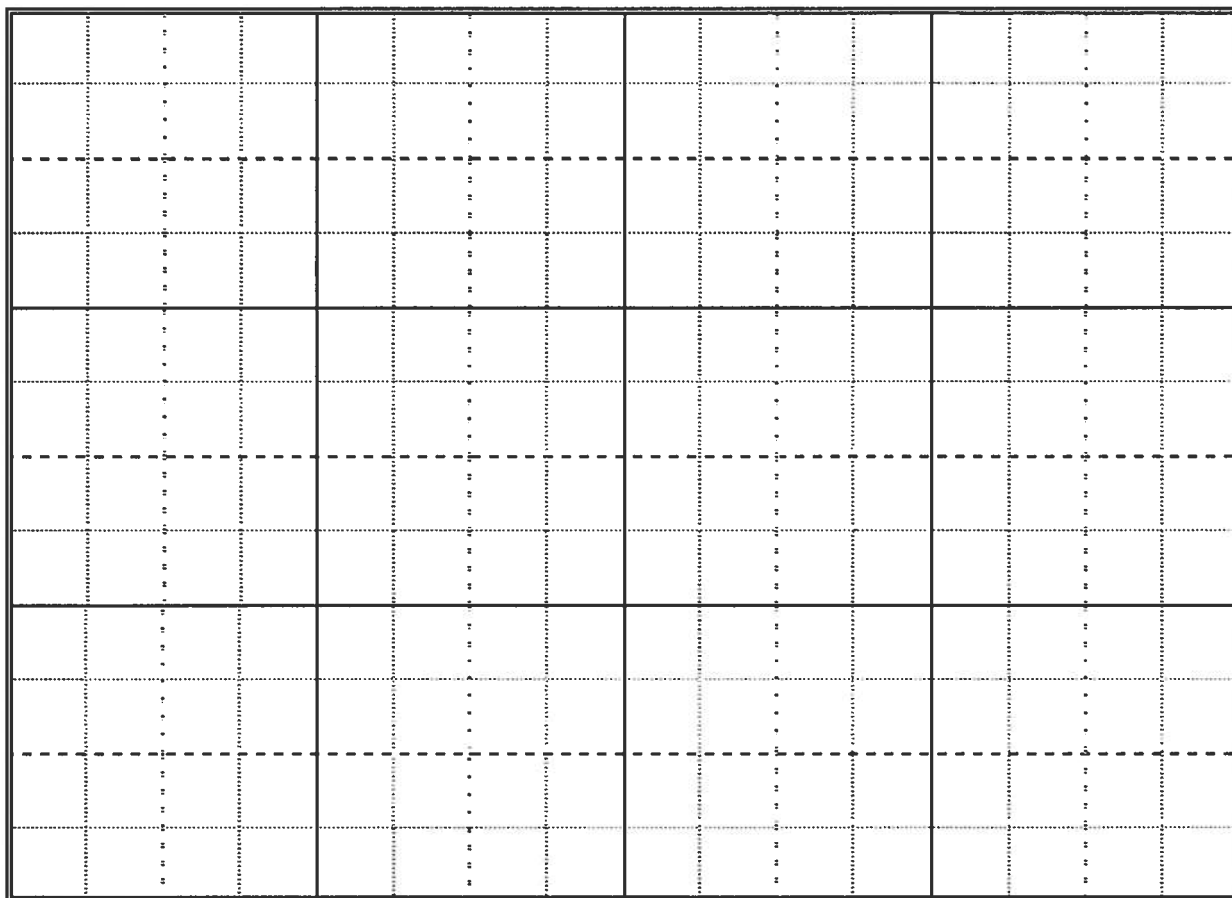
C. DIVERSION AND DELIVERY SYSTEM**1. Point(s) of Diversion:**

Ident. No.	Gov't Lot	¼	¼	¼	Sec	Twp	Rge	County	Method of Determination/Remarks
Well 1		SE	SE	NW	8	9N	44E	Fremont	GPS / Aerial photo
Well 2		NE	NE	SW	8	9N	44E	Fremont	GPS / Aerial photo

2. Place(s) of Use: Method of determination Aerial photo and plat

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
9N	44E	8	M	M	M		M			M	M				M	M	M		
9N	44E	9										M							

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	Berkeley	50	6TS50-230	Berkeley	3" (4" column)
Well #2	Berkeley	50	6TS30-115	Berkeley	3" (3" column)

*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
Please see attached narrative						

2. **Measurements:** _____

Please see attached narrative

E. NARRATIVE/REMARKS/COMMENTS

Please see attached narrative

[illegible]

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?

[illegible]

F. FLOW CALCULATIONS

☒ Additional computation sheets attached

Measured Method:

G. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$$V_{I,R} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = \underline{n/a}$$

$$V_{D,B} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 = \underline{n/a}$$

$$V = \text{Smaller of } V_{I,R} \text{ and } V_{D,R} = n/a$$

2. Volume Calculations for Other Uses:

Please see attached narrative

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use		Rate of Diversion	Annual Volume
	From	To	Q (cfs)	V (afa)
Municipal	1/1	12/31	0.70	214.8
	Totals:		0.70	214.8

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

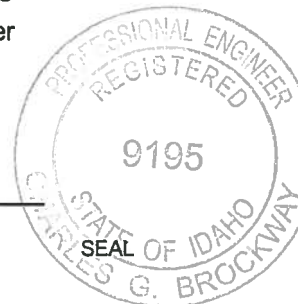
I. AUTHENTICATION

Field Examiner's Signature

Date _____

Reviewer

Date _____



Narrative for Beneficial Use Examination

Permit 21-13048

WDG Shadow Ridge, LLC

Brockway Engineering, PLLC
C. G. Brockway, P.E.
March 20, 2013

Overview

This permit allows usage of groundwater for municipal purposes within a residential subdivision located 10 miles northeast of Ashton. The subdivision is known as Shadow Ridge at Stephens Ranch, and is a rural development with 100 lots approximately 2 acres in size. The community water system developed under this permit serves Phase 1 of the subdivision. Phase 2 of the subdivision is served by individual wells and not covered by this permit. A copy of the subdivision lot layout is included with this report.

Brockway Engineering was the project engineer for the water system, overseeing all aspects of the development including planning, hydrogeologic evaluations, well design and development, water system modeling and design, system construction, and final testing of the system.

Wells

Two wells were drilled in September and October 2007. Well logs are included and the locations are shown on the attached map. Note that the legal description on the Well #1 log is incorrect, as the well is just west of the 40 line in the SENW of Section 8. 24-hour pump tests were conducted on the wells and it was found that sufficient yield was available for the subdivision. Well #1 had a sustainable yield of 250 gpm and Well #2 had a sustainable yield of 135 gpm. Additional details regarding the well pumping tests may be found on the attached completion report submitted to IDEQ. Please note that the Grundfos well pumps specified in this report are not the ones that were installed in the wells. The actual pumps are Berkeley pumps with nearly identical performance characteristics.

The other two wells authorized by the permit were not developed.

Distribution System and Usage

The water system was designed and constructed during 2007 and 2008 and all aspects of the system are currently complete. The system has been inspected approved for service

by IDEQ (see attached letter). Three (3) homes have been constructed and are being served from the system. The attached map shows the distribution system layout.

The system is divided into three pressure zones as shown on the attached map. The wells deliver water to a pumphouse at a pressure suitable for the middle zone. Booster pumps increase the pressure for the upper zone. A pressure reducing-sustaining valve is located in the distribution system to separate the middle and lower zones. The well pumps are operated by a variable-frequency drive, programmed to maintain 70 psi for the middle zone. The booster pumps are also operated by variable-frequency drives, programmed to increase the pressure by 24 psi which is suitable for the upper zone. Two pressure tanks are located in the pumphouse for the purpose of providing extremely low flows.

Throughout the distribution system, 2-inch flushing hydrants are located to provide fire flow and to allow flushing of the system. Isolation valves are located at each pipe tee and on long pipe runs.

A service connection is located at each lot. Water service is provided for the purposes of in-house usage and irrigation. Although the permit would allow 0.5 acres of irrigation per lot under I.C. 42-111(a), the estimated average irrigation will likely not exceed 0.25 acres per lot due to the heavily wooded nature of the subdivision and the fact that the homes will chiefly be vacation or second homes.

Pumps

The well pumps are Berkeley submersible units. Well #1 contains a 50HP unit, model 6TS50-230. Well #2 contains a 30HP unit, model 6TS30-115. The operating point of these pumps when providing 70 psi at the pumphouse was computed by accounting for the known drawdown in the well from the well tests, plus all head losses in the column pipe, check valves, pitless adapter, and discharge line to the pumphouse. It was found that the pump TDH must be 649 feet for Well #1 and 729 feet for Well #2. At these heads, Well #1 can deliver 250 gpm and Well #2 can deliver 125 gpm, for a total of 375 gpm or 0.84 cfs (see attached pump curves).

The two booster pumps are identical Grundfos inline centrifugal pumps, 5hp, model CR32-1 A-G-S-E-KUBE. The variable-frequency drive units are ABB units, the 50 HP model is ACH 550-uh-072A-4 and the 30 HP model is ACH 550-uh-045A-4.

The piping in the wellhouse is 6-inch steel pipe with flanged connections.

Flow meter

A flow meter has been installed on the inlet the pipeline from the wells, before the booster pumps. This meter measures all of the water pumped from the wells. The meter

is a Seametrics IP115B insertion-type magnetic meter. The meter depth setting was measured and verified to be correct according to the manufacturer's requirement.

Capacity measurement

A site visit was made on November 6, 2012 for the purpose of measuring the maximum capacity of the system. Flushing hydrants were opened to achieve a target of 300 to 350 gpm. However, an over-current error repeatedly occurred on the 50HP well pump and this pump would not run continuously. The pump contractor was notified and provided a new controller; however, the same problem continued. Throughout November and December, the pump company performed various diagnostics and equipment tests. It was eventually determined that the 50HP pump was either seized or the motor was shorted.

By that time, the snow depth on the ground prevented safe access to the well to pull and inspect or replace the pump. Therefore, it was decided to postpone the pump work until the snow had melted and the ground had dried sufficiently to allow safe access. IDWR staff suggested that the beneficial use examination be prepared and submitted by the proof date with all available information, with the indication that the pump work will be done in May or June, and supplemental information including a capacity measurement will be submitted prior to June 30, 2013.

As noted above, the system capacity calculation using the pump performance curves and the calculated head losses is greater than 0.7 cfs as allowed by the water right (see attached calculations). This will be confirmed after the pump work is completed.

Annual volume determination

Annual volume for in-house purposes was determined using per-capita water usage estimates. The following excerpt was taken from the engineering design report prepared for the subdivision by Brockway Engineering:

The most detailed study to date [regarding per-capita water use] is Mayer, et al. (1999), as reported in EPA (2002). This study is commonly known as the Residential End Uses of Water Study, funded by the American Water Works Association Research Foundation (AWWARF). The study resulted in mean daily in-house water use for 12 study communities, and a standard deviation of the daily volume to allow determination of statistical exceedance levels. In this study, the mean daily in-house use ranged from 57.1 gpcd in larger urban communities to 83.5 gpcd in smaller, less dense residential areas. For all study sites, the mean was 69.3 gpcd and the standard deviation was 39.6 gpcd. A conservative value for per-capita volume estimation is the 90% exceedance value of the AWWARF data, which is 120 gpcd. The average number of persons per household was taken to be 2.96, which is the value given for Fremont County by the U.S. Census (2000). This yields an annual per-household effluent discharge

of 355 gpd...For the project, average daily in-house usage will be 35,500 gpd, which equates to a total annual withdrawal of 39.8 acre-feet.

Table 1. Domestic water requirement estimation

Number of units	100	
Average per-capita demand	120	gpcd
Average persons per unit	2.96	
Average per-unit demand	355	gpd
Average daily demand	35,500	gpd
Total annual withdrawal	39.8	acre-feet/year

For irrigation purposes, the maximum allowable acreage would be 0.5 acres per lot, or 50 acres. The subdivision is within the IDWR-defined zone having an allowable irrigation field headgate per-acre volume of 3.5 ac-ft. The volume for irrigation would therefore be $3.5 \times 50 = 175$ ac-ft. Summing the two components, the total annual volume would be $39.8 + 175 = 214.8$ ac-ft.

Other water rights

The owner of the development also holds water right 21-13120, an irrigation right from Fish Creek, which is a waterway running through the subdivision. This water source is not connected to the potable distribution system nor is it used for irrigation on the lots covered by permit 21-13048. The Fish Creek source provides water for irrigation of common pastures within the boundary of the subdivision.

Condition compliance analysis

Condition #2. Drilling permits were obtained for both wells.

Condition #4. No large tracts are irrigated from the system.

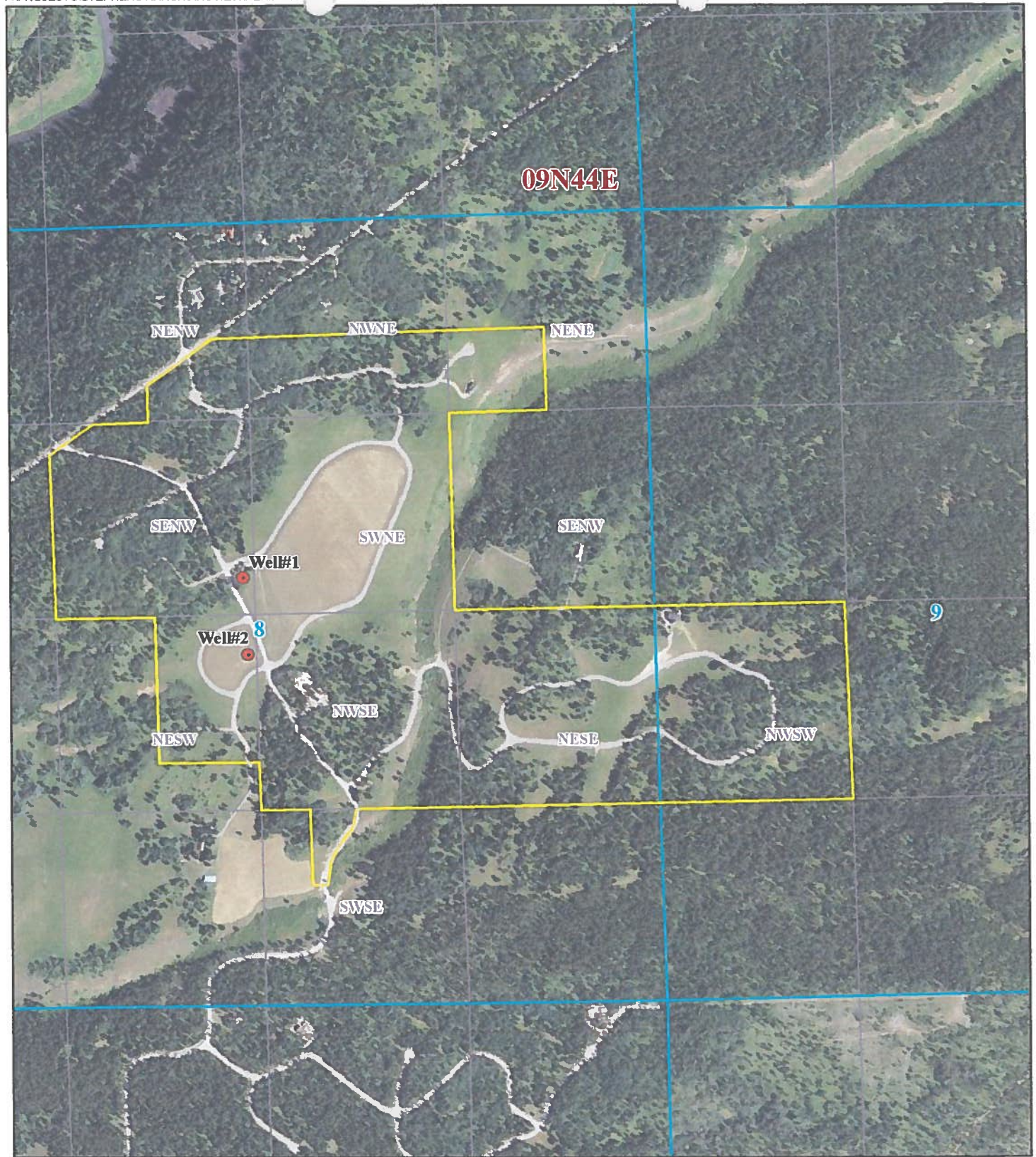
Condition #6. A measuring device is in place.

Condition #9. The permit was issued on April 11, 2007 and the project construction began in the summer of 2007.

Condition #10. IDEQ approval to serve letter is included with this report.

The permittee appears to have adequately complied with all pertinent conditions.





SHADOW RIDGE AT STEPHENS RANCH - PHASE I
21-13048 PERMIT POD & POU
NAIP 2011 AERIAL

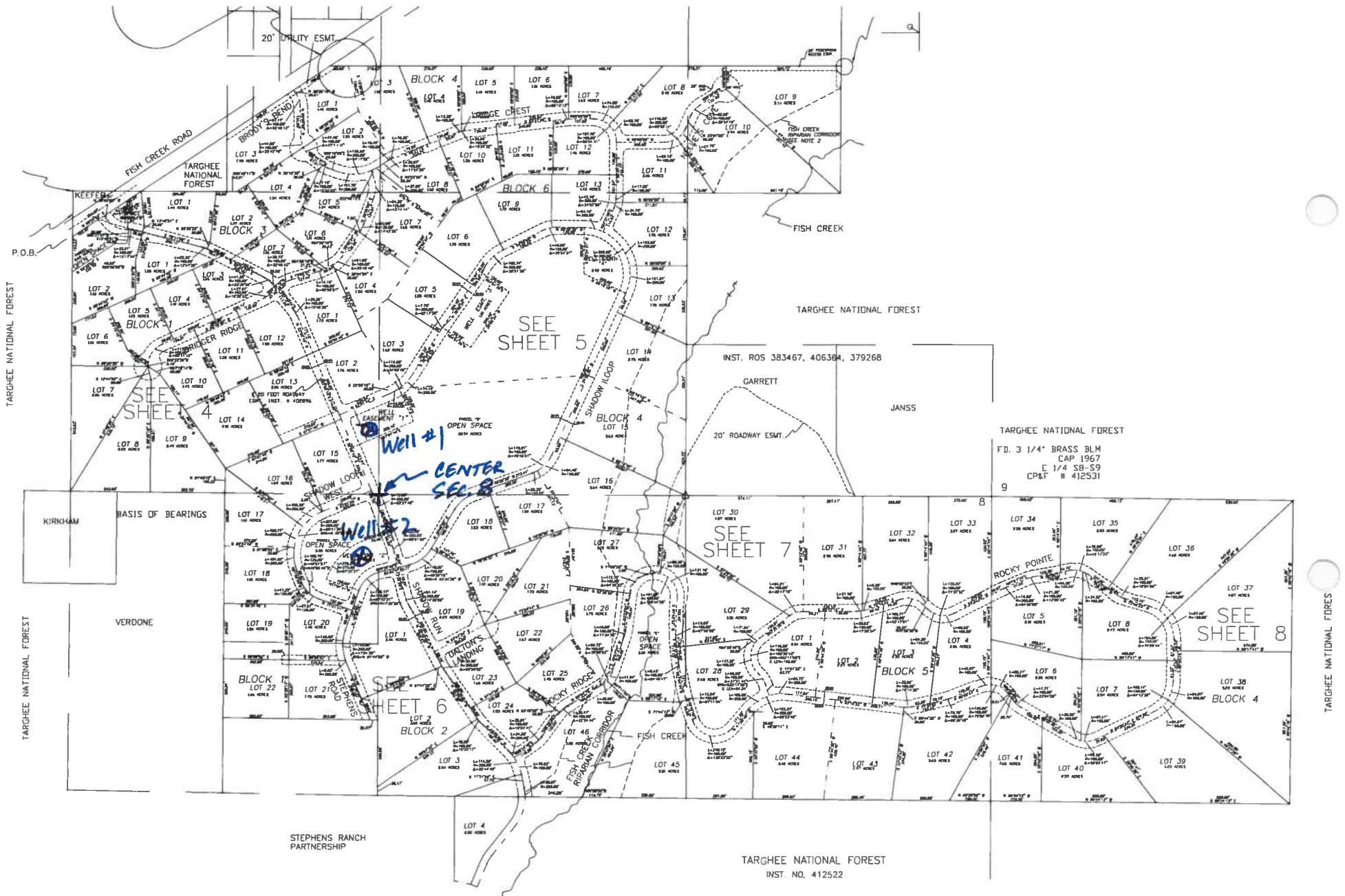
0 355 710 1,420 Feet

Legend

- 21-13048_Permit_POD
- 21-13048 Permit POU
- Township/Range
- Sections
- QQ



SHADOW RIDGE AT STEPHENS RANCH (PHASE 1)



Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D D0048449
DRILLING PERMIT NO. _____
Water Right or Injection Well No. 21-13048

2. OWNER:

Name WDA Shadow Ridge, LLC
Address 1985 E. 183 N.
City Reubens State ID Zip 83440

3. LOCATION OF WELL by legal description:

You must provide address or Lot, Blk, Sub. or Directions to well.

Twp. 9 North ☒ or South ☐
Rge. 44 East ☒ or West ☐
Sec. 8 NE 1/4 NE 1/4 SW 1/4
Gov't Lot _____ County Fremont
Lat: _____ Long: _____
Address of Well Site Fish Creek Rd. 10 miles E
of Ashton City Ashton
(Give at least name of road + 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 Material	From	To	Weight / Volume	Seal Placement Method
Concrete	0	275	14 yds	Overbore + pressure

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 10" - 330' 8" - 325'

Was drive shoe seal tested? ☒ Y ☐ N How? pressure 8" - 800'

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
10"	2	330	.365	Steel	☒	☐	☒	☐
8"	325	800	.250	Steel	☐	☒	☒	☐

Length of Headpipe _____ Length of Tailpipe _____

Packer ☐ Y ☐ N Type _____

9. PERFORATIONS/SCREENS PACKER TYPE

Perforation Method _____

Screen Type & Method of Installation _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
330	800	3/16	22800	8"	Steel	☒	☒

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:

242 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____

12. WELL TESTS:

☐ Pump ☐ Bailor ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
140		580	24 hrs

Water Temp. _____ Bottom hole temp. _____

Water Quality test or comments: _____

Depth first Water Encounter _____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
18"	0	10	Dirt		X
18"	10	40	LAVA		X
16"	40	48	Fractured LAVA		X
	48	60	Red LAVA + Clay		X
	60	80	LAVA		X
	80	120	LAVA		X
	120	160	LAVA		X
	160	168	Red LAVA		X
	168	170	LAVA		X
	170	180	LAVA		X
	180	200	LAVA + Clay		X
	200	220	Rhyolite		X
	220	240	Rhyolite		X
	240	260	Rhyolite		X
	260	330	Soft Rhyolite	X	
10"	330	380	Rhyolite		X
	380	420	Fractured Rhyolite	X	
	420	480	Rhyolite		X
	480	500	Fractured Rhyolite	X	
	500	520	Rhyolite		X
	520	526	Fractured Rhyolite	X	
	526	640	Rhyolite		X
	640	642	Fractured Rhyolite	X	
	642	645	Rhyolite		X
	645	721	Fractured Rhyolite	X	
	721	730	Rhyolite		X
	730	740	Soft Fractured Rhyolite	X	
	740	785	Rhyolite		X
	785	800	Fractured Rhyolite	X	

Completed Depth 800'
Date: Started 5-21-07 Completed 10-20-07

14. DRILLER'S CERTIFICATION

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

Company Name Volunteer Drilling Firm No. 383

Principal Driller _____ Date 10-25-07

and Driller or Operator II _____ Date _____

Operator I _____ Date _____

Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 10048448
DRILLING PERMIT NO. 21-13048
Water Right or Injection Well No. _____

2. OWNER:

Name WOG Shadow Ridge, LLC
Address 1985 E 183 N.
City Lewistown State ID Zip 83440

3. LOCATION OF WELL by legal description:

You must provide address or Lot, Blk, Sub. or Directions to well.

Twp. 9 North ☒ or South ☐
Rge. 44 East ☒ or West ☐
Sec. 8 SW 1/4 SW 1/4 NE 1/4
Gov't Lot _____ County Fremont

Lat: _____ Long: _____
Address of Well Site Fish Creek Rd. 10 miles
E. of Ashton City Ashton
(Give at least name of road + 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 Material	From	To	Weight / Volume	Seal Placement Method
<u>Cement</u>	<u>0</u>	<u>318</u>	<u>18 yds</u>	<u>pressure grout</u>

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 10"-330", 8"-660
Was drive shoe seal tested? ☐ Y ☐ N How? 8"-320

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
<u>10"</u>	<u>2</u>	<u>330</u>	<u>.365</u>	<u>Steel</u>	☒	☐	☒	☐
<u>8"</u>	<u>320</u>	<u>660</u>	<u>.250</u>	<u>Steel</u>	☒	☒	☒	☐

Length of Headpipe _____ Length of Tailpipe _____

Packer ☐ Y ☐ N Type _____

9. PERFORATIONS/SCREENS PACKER TYPE

Perforation Method Factory

Screen Type & Method of Installation _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
<u>320</u>	<u>660</u>	<u>3/16</u>	<u>16320</u>	<u>8"</u>	<u>Steel</u>	☐	☒

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:

252 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____

12. WELL TESTS:

☒ Pump ☐ Bailor ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
<u>250</u>	<u>235</u>	<u>487</u>	<u>24 hrs</u>

Water Temp. _____ Bottom hole temp. _____

Water Quality test or comments: _____

Depth first Water Encounter _____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Water

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
<u>18"</u>	<u>0</u>	<u>7</u>	<u>Soil</u>		☒
<u>1</u>	<u>7</u>	<u>19</u>	<u>LAVA</u>		☒
<u>16"</u>	<u>19</u>	<u>30</u>	<u>LAVA</u>		☒
<u>1</u>	<u>30</u>	<u>40</u>	<u>Broken Rock</u>		☒
<u>1</u>	<u>40</u>	<u>45</u>	<u>CLAY</u>		☒
<u>1</u>	<u>45</u>	<u>50</u>	<u>Broken Rock</u>		☒
<u>1</u>	<u>50</u>	<u>75</u>	<u>Rock</u>		☒
<u>1</u>	<u>75</u>	<u>85</u>	<u>Red Clay + Rock</u>		☒
<u>1</u>	<u>85</u>	<u>105</u>	<u>Rock</u>		☒
<u>1</u>	<u>105</u>	<u>110</u>	<u>Red Rock</u>		☒
<u>1</u>	<u>110</u>	<u>230</u>	<u>Rock</u>		☒
<u>1</u>	<u>230</u>	<u>245</u>	<u>CLAY + Rock</u>		☒
<u>1</u>	<u>245</u>	<u>315</u>	<u>Rock</u>		☒
<u>10"</u>	<u>315</u>	<u>325</u>	<u>Rock</u>	☒	
<u>1</u>	<u>325</u>	<u>445</u>	<u>Mountain Rock</u>	☒	
<u>1</u>	<u>445</u>	<u>465</u>	<u>Fractured Rock</u>	☒	
<u>1</u>	<u>465</u>	<u>475</u>	<u>Mountain Rock</u>	☒	
<u>1</u>	<u>475</u>	<u>500</u>	<u>Fractured Rock</u>	☒	
<u>1</u>	<u>500</u>	<u>576</u>	<u>Fractured Rock</u>	☒	
<u>1</u>	<u>576</u>	<u>580</u>	<u>Solid Rock</u>		☒
<u>1</u>	<u>580</u>	<u>583</u>	<u>Fractured Rock</u>	☒	
<u>1</u>	<u>583</u>	<u>600</u>	<u>Solid Rock</u>		☒
<u>1</u>	<u>600</u>	<u>607</u>	<u>Fractured Rock</u>	☒	
<u>1</u>	<u>607</u>	<u>660</u>	<u>Solid Rock</u>	☒	

RECEIVED

OCT 29 2007

Department of Water Resources
Eastern RegionCompleted Depth 660 (Measurable)Date: Started 5-21-07 Completed 10-20-07

14. DRILLER'S CERTIFICATION

10-20-07

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

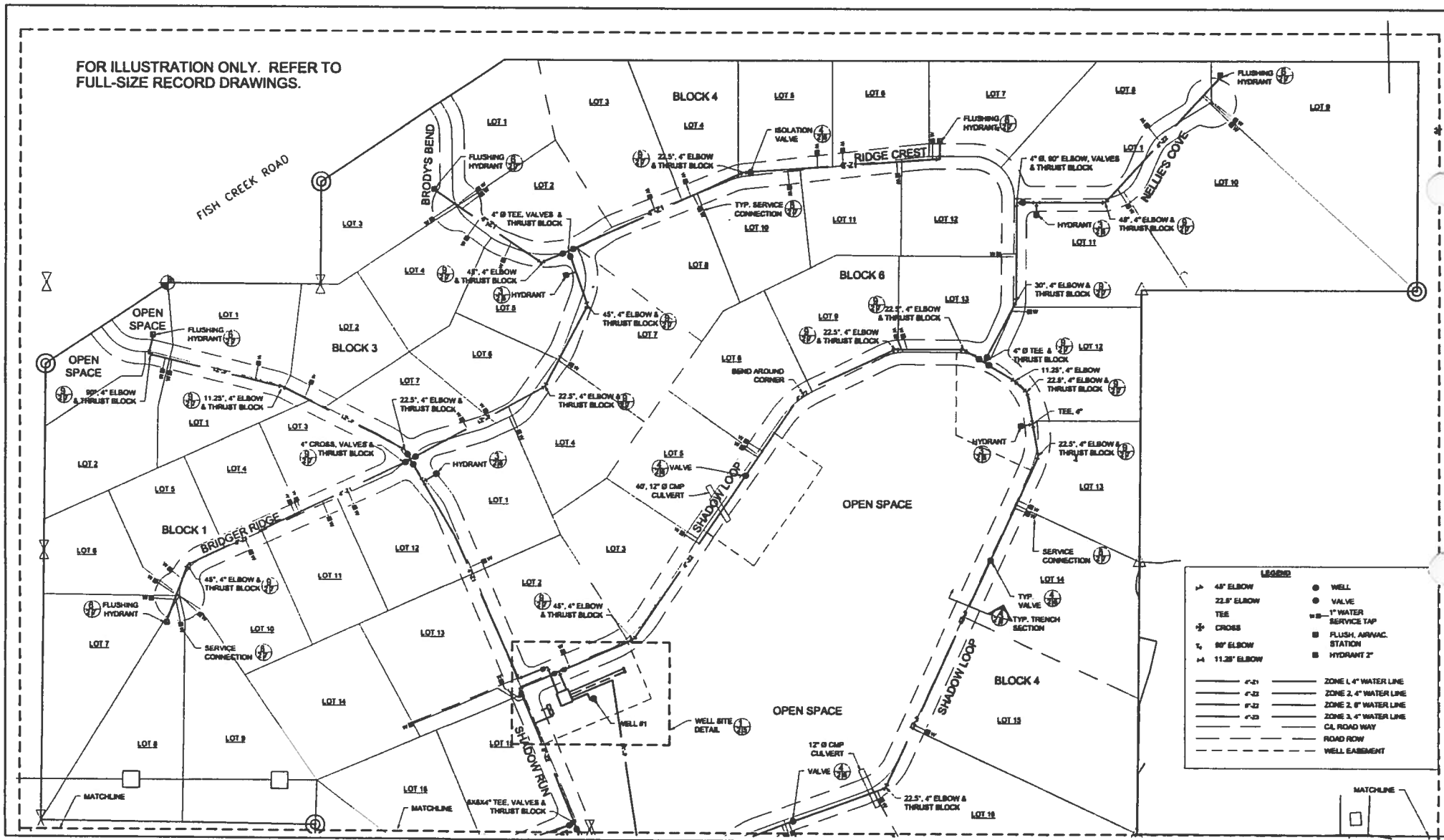
Company Name Vollmer Well Drilling Firm No. 383Principal Driller [Signature] Date 10-25-07

and Driller or Operator II _____ Date _____

Operator I _____ Date _____

Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

FOR ILLUSTRATION ONLY. REFER TO
FULL-SIZE RECORD DRAWINGS.



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REV	DESCRIPTION	DATE	DESIGNED BY	DRAWN BY
C	RECORD DRAWINGS	8/4/2008		
B	PIPE AND VALVING CHANGES	7/16/2007	CGS	
A.1	ISSUED FOR CONSTRUCTION	8/8/2007	CGS	
A	ISSUE FOR REVIEW	5/1/2007	CGS	

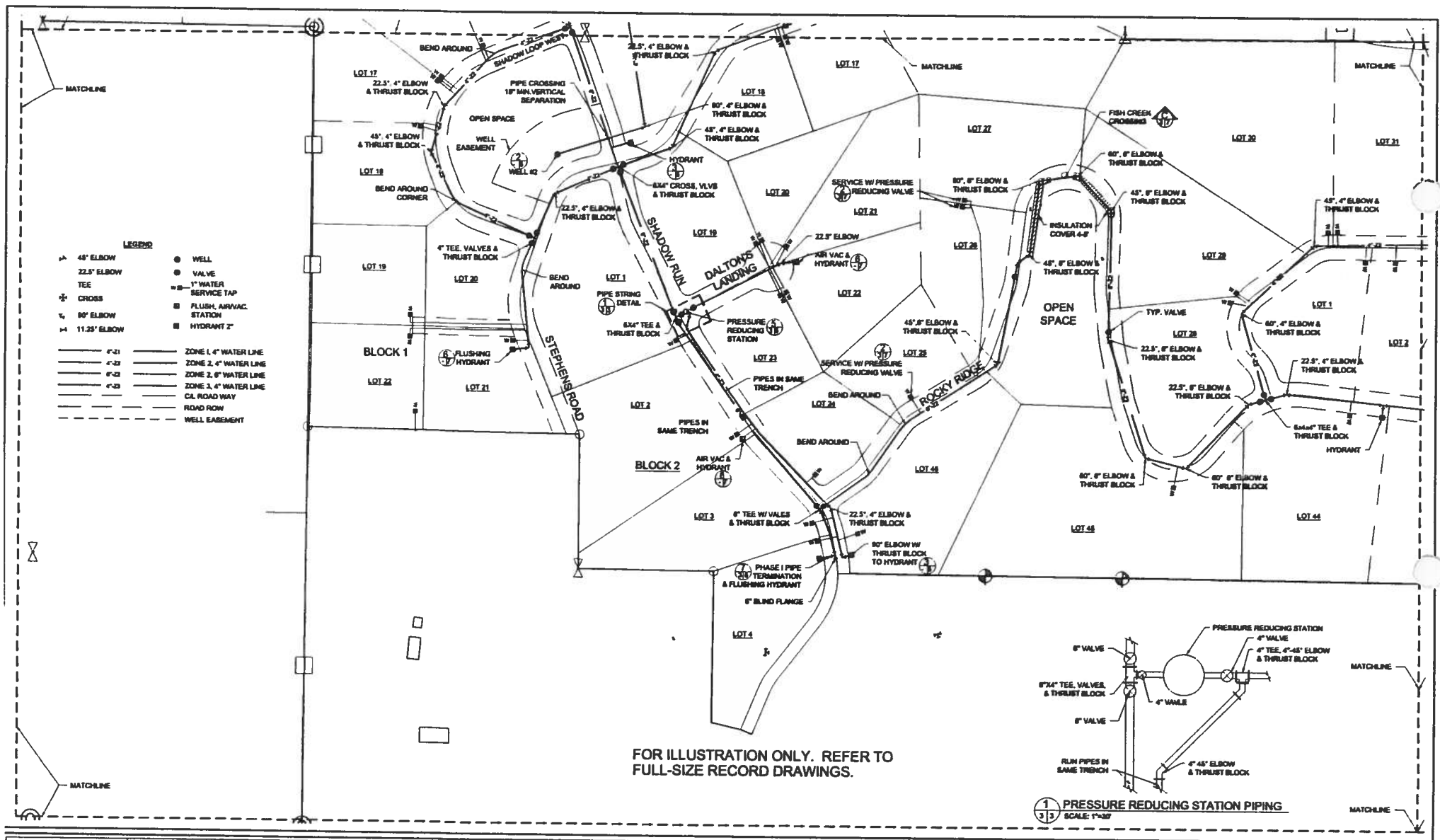
SCALE 1" = 100'

BROCKWAY ENGINEERING, PLLC.
HYDRAULICS - HYDROLOGY - WATER RESOURCES
2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, ID 83301
(208) 736-8543

SHADOW RIDGE AT STEPHENS RANCH
PHASE I - WATER SYSTEM

SITE PLAN I

PROJECT #
881-03-2007
DWG #
REV



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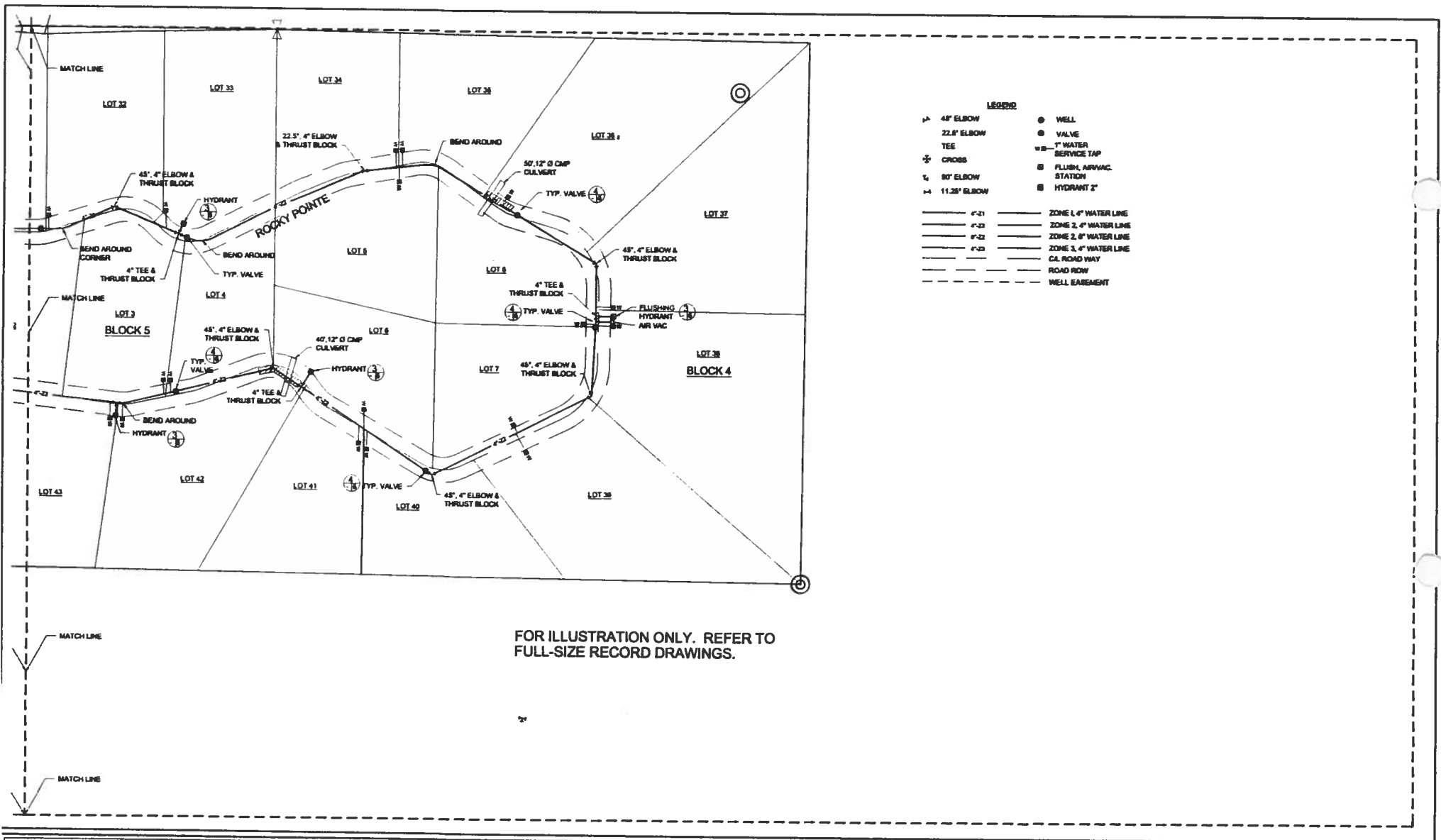
REV	DESCRIPTION	DATE	APP'D	REFERENCE DRAWINGS
C	RECORD DRAWINGS	8/4/2008		
B	PIPE AND VALVING CHANGES	7/19/2007	CGB	
A.1	ISSUED FOR CONSTRUCTION	8/6/2007	CGB	
A	ISSUE FOR REVIEW	6/11/2007	CGB	

DESIGNED BY	DRAWN BY
CGB	ALT
SCALE	DATE
1"=30'	8/4/2008

BROCKWAY ENGINEERING, PLLC.
HYDRAULICS - HYDROLOGY - WATER RESOURCES
2018 NORTH WASHINGTON, SUITE 4
TWIN FALLS, ID 83301
(208) 736-8643

SHADOW RIDGE AT STEPHENS RANCH
PHASE I - WATER SYSTEM
SITE PLAN II

PROJECT #	DWG #	REV
881-03-2007		A



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REV	DESCRIPTION	DATE	APP'D	REVISIONS/TREATMENT
C	RECORD DRAWINGS	8/4/2008		
B	PIPE AND VALVING CHANGES	7/10/2007	CGS	
A.1	ISSUED FOR CONSTRUCTION	8/5/2007	CGS	
A	ISSUE FOR REVIEW	5/11/2007	CGS	

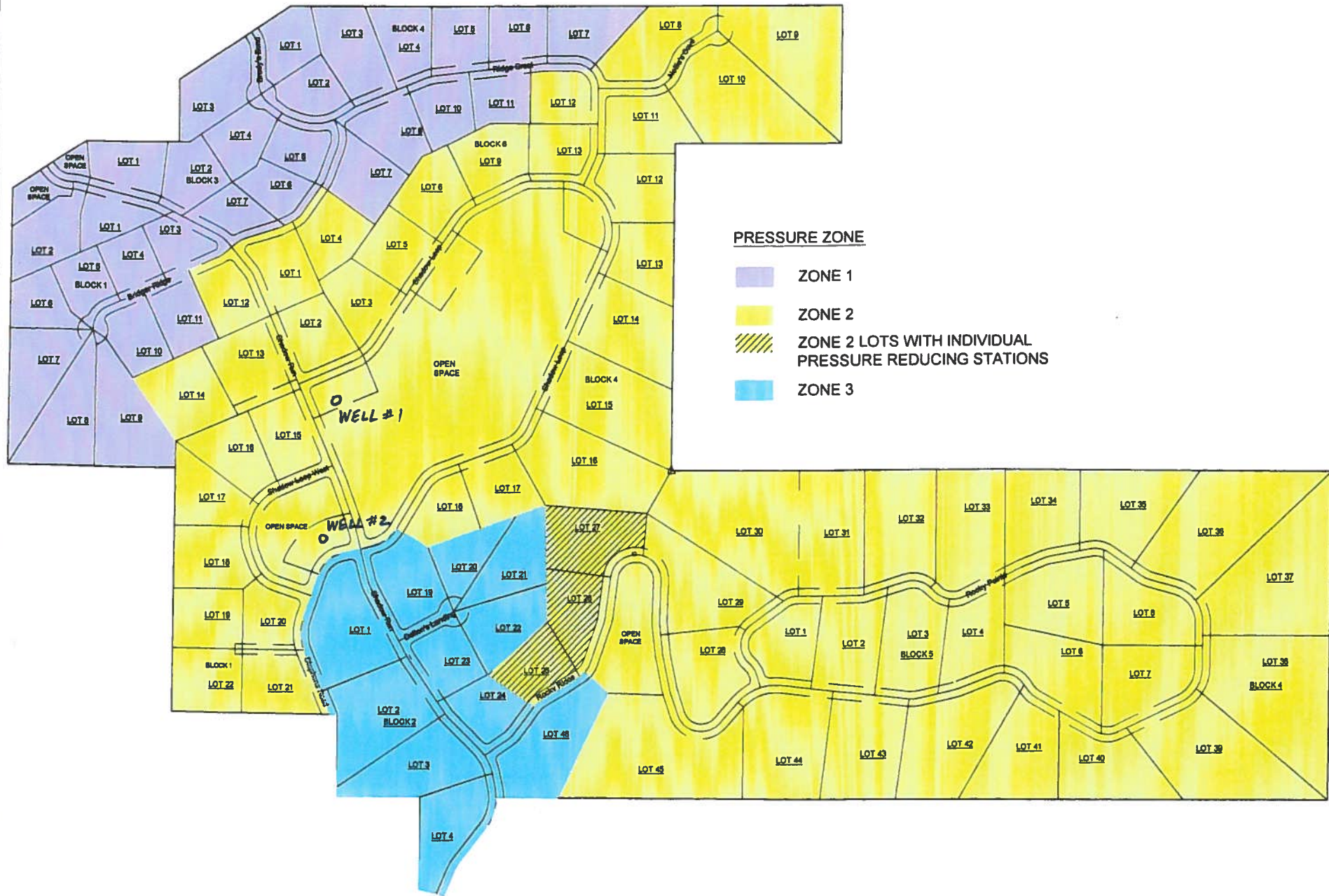
DESIGNED BY	CGS	DRAWN BY	ALB
SCALE	1"=100'		

BROCKWAY ENGINEERING, PLLC.
HYDRAULICS - HYDROLOGY - WATER RESOURCES
2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, ID 83301
(208) 738-6543

SHADOW RIDGE AT STEPHENS RANCH
PHASE I - WATER SYSTEM

SITE PLAN III

PROJECT #	861-03-2007
DWG #	REV
	Λ



PRESSURE ZONE

- ZONE 1
- ZONE 2
- ZONE 2 LOTS WITH INDIVIDUAL PRESSURE REDUCING STATIONS
- ZONE 3

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REV	DESCRIPTION	DATE	APPR. BY
B	ISSUED FOR FINAL OMM	8/4/08	

DESIGNED BY
CGB
DRAFTED BY
ALR

BROCKWAY ENGINEERING, PLLC
HYDRAULICS - HYDROLOGY - WATER RESOURCES
2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, ID 83301
(208) 736-8543

SHADOW RIDGE AT STEPHENS RANCH
PHASE I - WATER SYSTEM
PRESSURE ZONING MAP

PROJECT #
881-03-2007
DWG#
1
REV
B

SHADOW RIDGE WELLS #1 AND #2 - PUMP DESIGN

CGB 9/25/07

Rev 6/16/08 - Add check valves every 200' per Vollmer request

Design condition: Only meet Phase 1 demand (314 gpm)

Add 10%: design flow = 345 gpm

	Well #1	Well #2
Design flow (gpm)	230	120
(cfs)	0.51	0.27
Design pumping level (ft)	463	517 <-- 20' lower than test data
Pump setting (ft)	520	580 <-- Set pump 50'+/- below pumping level
Column diam (ft)	0.33	0.25
Friction factor	0.014	0.014
Column velocity (ft/s)	5.99	5.45
Column loss (ft)	12.3	15.0
Check valves:		
No. of units	2	3
Head loss per unit (from manuf.)	3.7	4.8
Total loss for check valves	7.4	14.4
Head loss well to house	2.0	5.0
dZ from wellhead to house	2.0	16.0
Required pressure at house (psi)	70	70
TDH of pump (ft)	648.5	728.9
Pump efficiency	0.75	0.75
HP required max	50.3	29.5
HP nominal	50	30

Well #1: Berkeley 6TS50-230

Well #2: Berkeley 6TS30-115

Both pumps have a 3" discharge, but Well #1 pump must have a 4" discharge pipe.

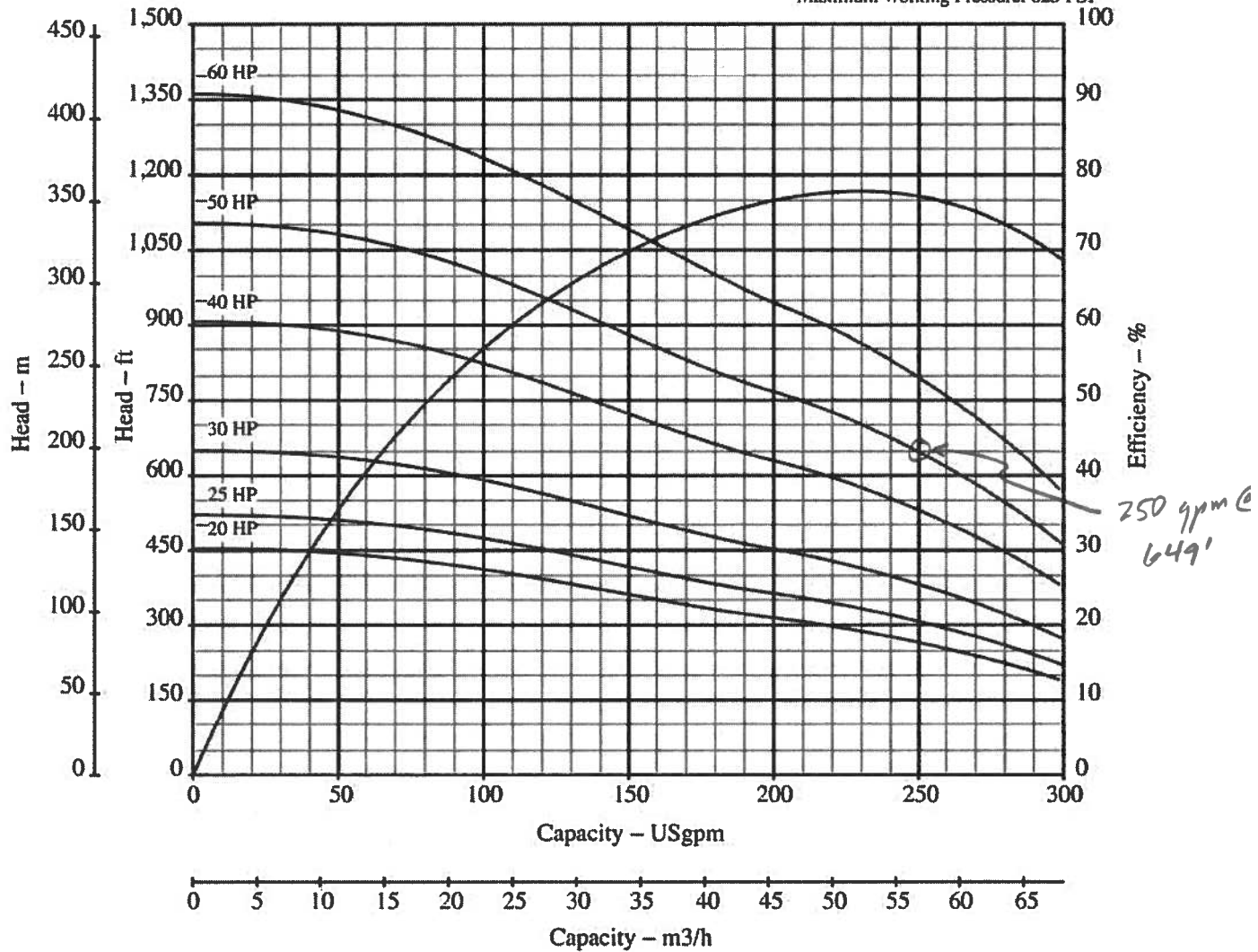
Goulds stainless steel submersible line: no pump can easily meet or exceed specs; can find one that can meet spec within a few feet TDH, but this leaves no room for error or pump performance degradation over time.

Similar for Goulds non-stainless steel -- couldn't find one that would work well and had adequate "factor of safety".

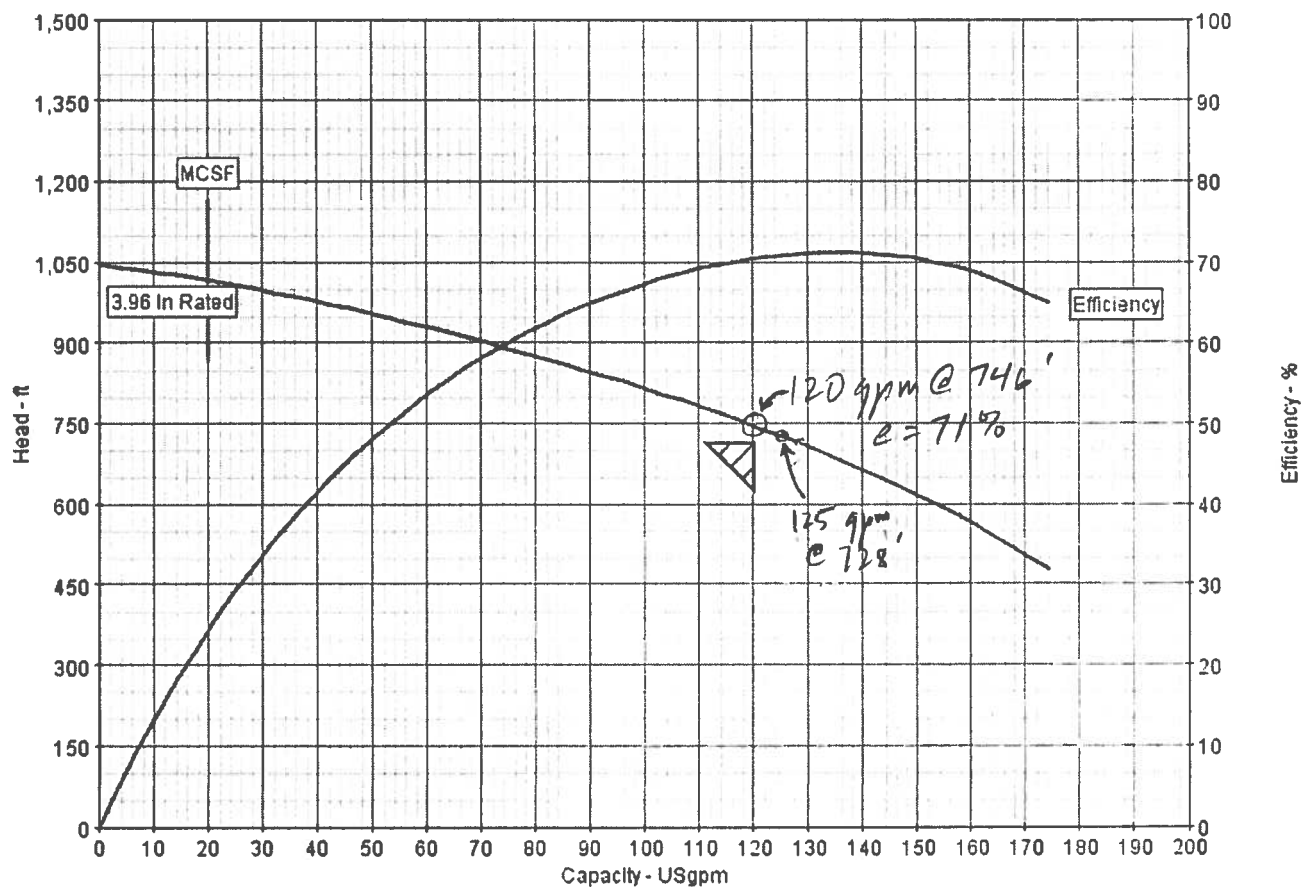
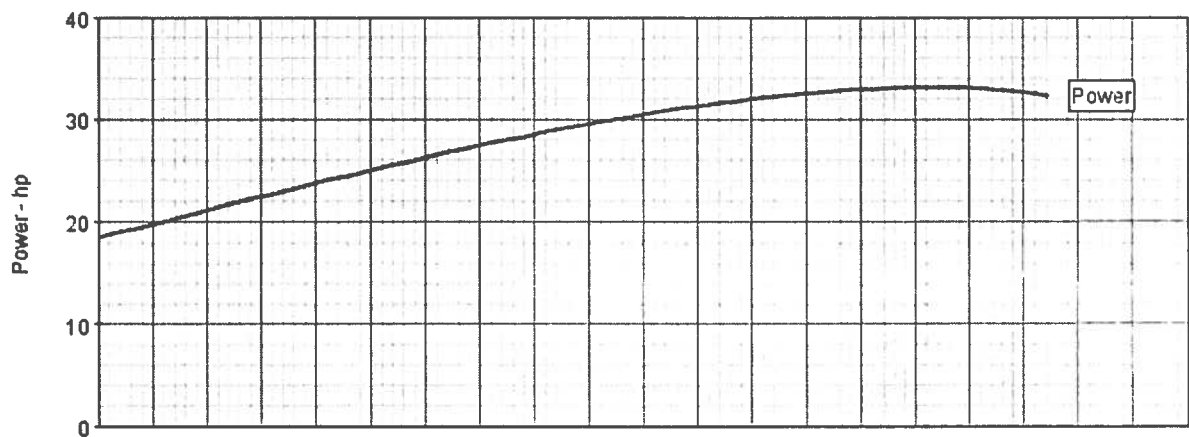
Wch #1

6TS-230, 20-60 HP

Nominal RPM: 3450
Based on Fresh Water @ 68 F.
Maximum Working Pressure: 625 PSI



Pump Performance Curve



Customer	:	Pump size	: 6TS30-115
Customer reference	:	Stages	: 17
Item number	:	Pump speed, rated	: 3,450 rpm
Service	:	Based on curve number	: 6TS30-115 Ph2 New
Quantity of pumps	: 1	Flow, rated	: 120.0 USgpm
Quote number	:	Head, rated	: 715.0 ft
Date last saved	: 14 Dec 2007 11:36 AM	Fluid density, rated / max	: 0.998 / 0.998 SG
-	:	Viscosity	: 1.00 cP
-	:	CQ / CH / CE	: 1.00 / 1.00 / 1.00



BROCKWAY
ENGINEERING
P.L.L.C.

Hydraulics

Hydrology

Water Resources

October 26, 2007

FILE

Mr. Carlin Feisthamel
Idaho Department of Environmental Quality
900 N. Skyline, Suite B
Idaho Falls, ID 83402

Re: Shadow Ridge at Stephens Ranch Subdivision
Report on public water supply well drilling and testing
Project No. 881-03-2007

Dear Mr. Feisthamel:

By this letter I am providing a report on the drilling and testing of two (2) public water supply wells for the above-referenced project, as approved by IDEQ on June 4, 2007. The wells were drilled by Vollmer Drilling, and were completed according to the approved plans, subject to the variations described in this letter. Stamped as-built drawings are included for each well.

Well #1

This well is located near the pump house as shown on the construction drawings. A 15.5-inch hole was drilled from the surface to a depth of 330 feet BGS and a 10-inch steel, 0.365" wall casing was placed. A 10-inch hole was drilled from 330 to depth. Formations encountered were as expected and included basalt to approximately 325 feet underlain by rhyolite tuff to depth. The first water was encountered in a fracture zone from 315 to 325 feet, and additional water-yielding zones were encountered as drilling proceeded. Static water level in the borehole rose to 257 feet, indicating that the aquifer is confined or semi-confined. No significant alluvial deposits were found, and no water-bearing strata exist above 315 feet. Although the original anticipated depth was 600 feet, it was decided to drill deeper since significant fracturing appeared to be present at 600 feet and below. Fracturing continued until 607 feet, below which dense rhyolite was encountered with little yield potential.

The original design called for an open hole in the rhyolite tuff. To provide protection against caving or falling rock fragments that may interfere with the pump, it was decided to place an 8-inch slotted-pipe liner from 330 feet BGS to the bottom of the hole. This liner was designed to provide adequate hydraulic transmission capacity based conservative assumptions outlined in my letter to IDEQ dated August 1, 2007. In addition, a gravel pack was placed around the 10-inch casing from 330 feet up to 315 feet, to preserve the possibility of field-perforating this section to obtain additional yield. These design changes were approved by IDEQ by telephone.

CHARLES E.
BROCKWAY,
PH.D., P.E.

CHARLES G.
BROCKWAY,
PH.D., P.E.

2016 NORTH
WASHINGTON
STREET • SUITE 4

TWIN FALLS,
IDAHO 83301

208•736•8543

FAX: 736•8506

A surface seal consisting of cement grout as required by IDWR was placed from 315 feet to the surface using a tremie pipe and grout pump. The placement proceeding according to the specifications. A total of 18.75 cubic yards of grout was placed, which is 136% greater than the annular volume, indicating that significant fracture zones exist above 315 feet; however as indicated above these were not water-bearing.

The well was pump-tested on August 20, 2007 using a 40HP submersible pump and trailer-mounted generator. The pump intake was set at 550 feet BGS. Discharge was measured with an in-pipe impeller meter provided by the driller, which was checked for accuracy with an orifice meter provided by Brockway Engineering. Water level was measured with an air line and an electric probe.

The attached sheet show the results of the Well #1 pumping test. The water was initially slightly muddy, but cleared up during the testing indicating that adequate development was achieved. Sand content was nil. A step-drawdown test was conducted in order to develop the well response at different discharges and to develop a yield-drawdown curve for the well. After the water level equalized at the final step, a 24-hour continuous test was commenced. The attached sheets show the results of the Well #1 pumping test. The well produced considerably greater yield than anticipated, and stabilized at 252 gpm with a pumping level of 488 feet, corresponding to a drawdown of 231 feet (specific capacity 1.09 gpm/foot).

Water quality samples were taken approximately midway through the 24-hour test. Energy Laboratories in Idaho Falls tested the samples for nitrate-nitrogen, nitrite-nitrogen, and total coliform. The lab reports are attached. Nitrate was 0.22 mg/l, nitrite was below the detection limit, and coliform was absent.

The testing of Well #1 indicates that this well is suitable for potable water supply and can provide up to 250 gpm of instantaneous yield.

Well #2

This well is located approximately 700 feet south-southwest of Well #1 as shown on the construction drawings. A 15.5-inch hole was drilled from the surface to a depth of 330 feet BGS and a 10-inch steel, 0.365" wall casing was placed. A 10-inch hole was drilled from 330 to depth. Formations encountered were as expected and included basalt to approximately 200 feet underlain by rhyolite tuff to depth. The first water was encountered in a fracture zone at 260 feet, and additional water-yielding zones were

encountered as drilling proceeded. However, significantly less water yield was estimated by the driller compared to Well #1. Therefore, it was decided to proceed deeper to a completed well depth of 800 feet. Significant additional water was obtained in the 600 to 800-foot zone. Static water level in the borehole rose to 241 feet, indicating that the aquifer is confined or semi-confined. No significant alluvial deposits were found, and no water-bearing strata exist above 220 feet.

An 8-inch slotted-pipe liner was placed from 330 feet BGS to the bottom of the hole. This liner was designed using similar assumption as the Well #1 liner design. A gravel pack was placed around the 10-inch casing from 330 feet up to 268 feet, to preserve the possibility of field-perforating this section to obtain additional yield.

A surface seal consisting of cement grout as required by IDWR was placed from 268 feet to the surface using a tremie pipe and grout pump. The placement proceeding according to the specifications. A total of 10.0 cubic yards of grout was placed, which is 48% greater than the annular volume, indicating that the degree of fracturing is considerably less than indicated at Well #1.

The well was pump-tested on September 12, 2007 using a 40HP submersible pump and trailer-mounted generator. The pump intake was set at 620 feet BGS. Discharge was measured with an in-pipe impeller meter provided by the driller, which was checked for accuracy with an orifice meter provided by Brockway Engineering. Water level was measured with an air line and an electric probe.

The attached sheet show the results of the Well #2 pumping test. The water was initially slightly muddy, and a significant amount of time was required to fully develop the well. The water was very clear by the end of the test. Sand content by the end of the test was nil. A step-drawdown test was conducted in order to develop the well response at different discharges and to develop a yield-drawdown curve for the well. After the water level equalized at the final step, a 24-hour continuous test was commenced. The attached sheets show the results of the Well #2 pumping test. The well produced considerably less yield than Well #1. Discharge stabilized at 138 gpm with a pumping level of 592 feet, corresponding to a drawdown of 351 feet (specific capacity 0.39 gpm/foot).

Water quality samples were taken approximately midway through the 24-hour test. Energy Laboratories in Idaho Falls tested the samples for nitrate-nitrogen, nitrite-nitrogen, and total coliform. The lab reports are attached. Nitrate was 0.18 mg/l, nitrite was below the detection limit, and coliform was absent.

The testing of Well #2 indicates that this well is suitable for potable water supply and can provide up to 135 gpm of instantaneous yield.

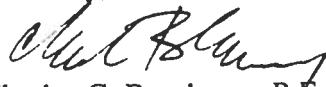
Pump design

The attached sheets show the hydraulic calculations used to select a pump for the two wells. The peak-hourly demand for Phase 1 of Shadow Ridge is 314 gpm. To provide an additional safety factor, the pumps were designed to produce a maximum of 350 gpm (230 gpm from Well #1 and 120 gpm from Well #2). The pumps will operate in a variable-speed mode to match demand and maintain the required pressure at the wellhouse. Due to the large yield obtained at Well #1, the wells need not be pumped at their absolute maximum capacity, which will reduce the drawdown significantly and may result in a longer service life of the wells.

Grundfos stainless-steel submersible pumps were selected, a 50HP pump for Well #1 and a 30HP pump for Well #2. The performance curves of the selected pumps show that the actual operating point at maximum RPM is greater than the required operating point, which will allow for typical pump performance degradation over time.

Based on the completed well construction, the pump test results, and the water quality results, the two wells appear to be suitable for public water supply and I would request that IDEQ certify the wells for up to 250 gpm (Well #1) and 135 gpm (Well #2).

Cordially,

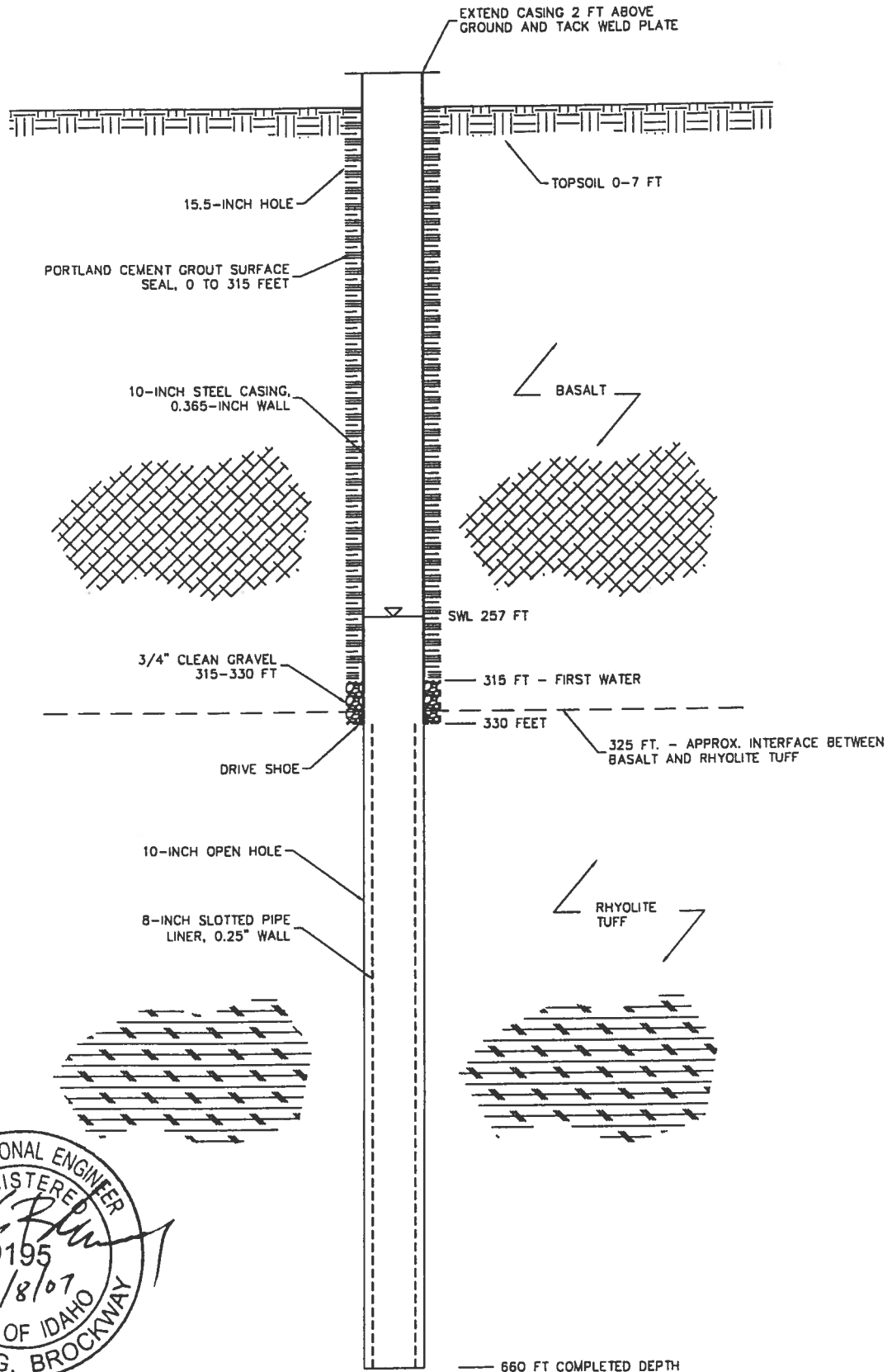


Charles G. Brockway, P.E.

Enc: As-built drawings
Well drilling records from driller
Test data and yield-drawdown curves
Pump design and specs
Water quality data

Cc: Mike Vickers
Ray Finch





— 660 FT COMPLETED DEPTH

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SCALE: N.T.S.
(AS SHOWN ON DRAWING)

APPROVED
CGB

DRAWN
CGB

DATE
10/8/07

BROCKWAY ENGINEERING, PLLC
HYDRAULICS • HYDROLOGY • WATER RESOURCES
2016 NORTH WASHINGTON, SUITE 4
WTIN FALLS, ID 83301
(208) 736-8543

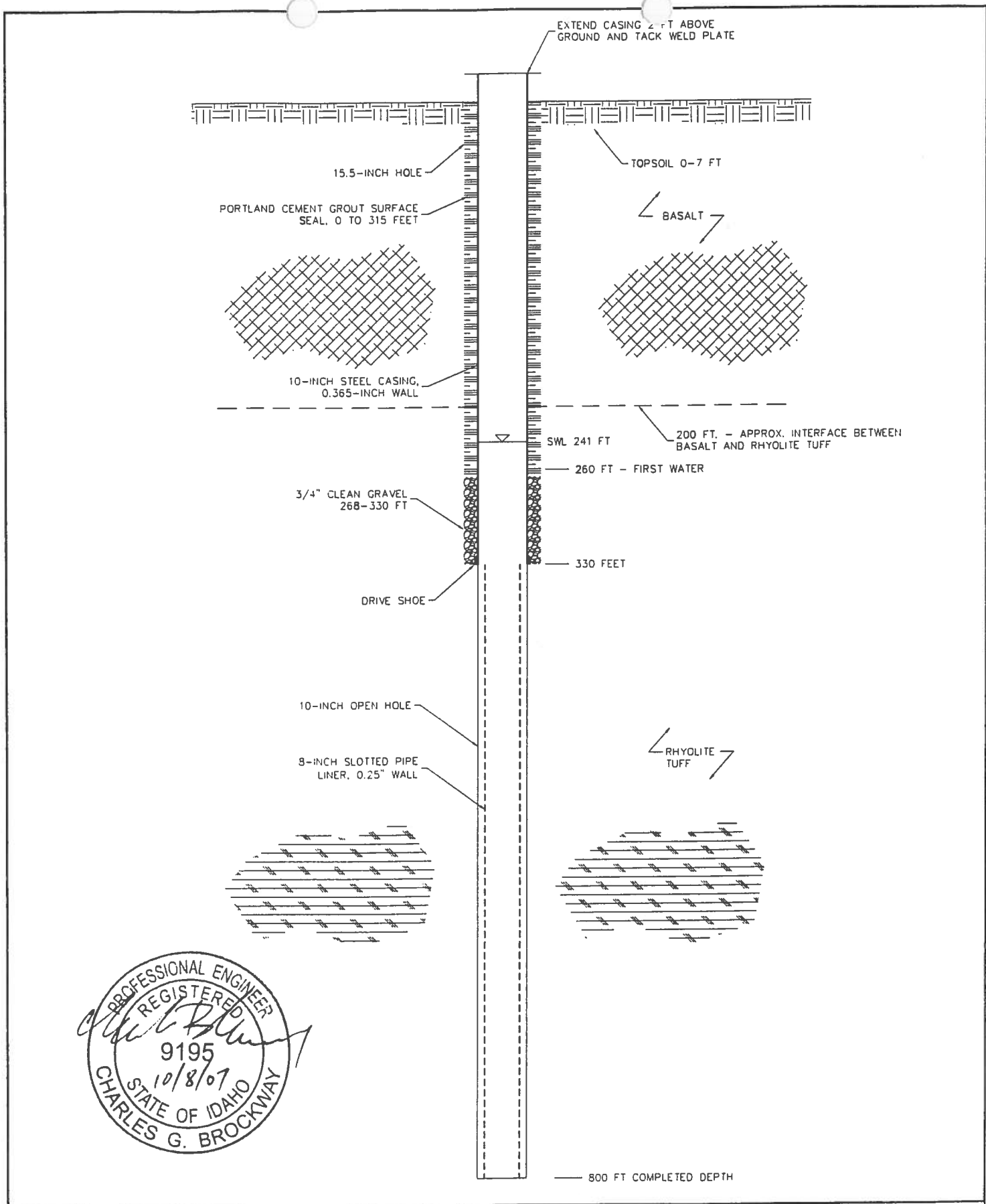
SHADOW RIDGE AT STEPHENS RANCH

**MUNICIPAL WELL #1
AS-BUILT**

PROJECT #
881-02-2007

DWG#
1

REV
B



THIS DRAWING HAS BEEN PREPARED BY BROCKWAY ENGINEERING, PLLC FOR A SPECIFIC PROJECT TAKING INTO ACCOUNT THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH BROCKWAY ENGINEERING & THE CLIENT IS GRANTED.	SCALE: N.T.S. (8.5 X 11 DWG ONLY) APPROVED: CGB DRAWN: CGB DATE: 10/8/07	BROCKWAY ENGINEERING, PLLC HYDRAULICS - HYDROLOGY - WATER RESOURCES 2016 NORTH WASHINGTON, SUITE 4 WTIN FALLS, ID 83301 (208) 736-8543	SHADOW RIDGE AT STEPHENS RANCH MUNICIPAL WELL #2 AS-BUILT	PROJECT # 881-02-2007 DWG# 1 REV B
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Well #1

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No. _____
Inspected by _____
Twp _____ Rge _____ Sec _____
1/4 _____ 1/4 _____ 1/4 _____
Lat: _____ : _____ : _____ Long: _____ : _____ : _____

1. WELL TAG NO. D D0048448
DRILLING PERMIT NO. 21-13048
Water Right or Injection Well No. _____

2. OWNER:
Name WOG Shadow Ridge, LLC
Address 1985 E 183 N.
City Lewburg State ID Zip 83440

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 9 North ☒ or South ☐
Rge. 44 East ☒ or West ☐
Sec. 8 SW 1/4 SW 1/4 NE 1/4
Gov't Lot _____ County Fremont
Lat: _____ : _____ Long: _____ : _____
Address of Well Site Fish Creek Rd. 10 miles
E. of Ashton City Ashton
(Give at least name of road - Distance to Road or Landmark)
Li. _____ 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 Material	From	To	Weight / Volume	Seal Placement Method
<u>Cement</u>	<u>0</u>	<u>318</u>	<u>18 yds</u>	<u>pressure grout</u>

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 10'-330', 8"-660'
Was drive shoe seal tested? ☐ Y ☐ N How? 8"-320

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
<u>10"</u>	<u>+2</u>	<u>320</u>	<u>.365</u>	<u>Steel</u>	☒	☐	☒	☐
<u>8"</u>	<u>320</u>	<u>660</u>	<u>.280</u>	<u>Steel</u>	☒	☒	☒	☐

Length of Headpipe _____ Length of Tailpipe _____
Packer ☐ Y ☐ N Type _____

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method Factory
Screen Type & Method of Installation

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
<u>320</u>	<u>660</u>	<u>7/16</u>	<u>16320</u>	<u>8"</u>	<u>Steel</u>	☐	☒

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
252 ft. below ground Artesian pressure _____ ft.
Depth flow encountered _____ ft. Describe access port or control devices: _____

12. WELL TESTS:
☒ Pump ☐ Bailor ☐ Air ☐ Flowing Artesian

Yield gal/min.	Drawdown	Pumping Level	Time
<u>250</u>	<u>235</u>	<u>487</u>	<u>24 hr</u>

Water Temp. _____ Bottom hole temp. _____
Water Quality test or comments: _____

13. LITHOLOGIC LOG: (Describe repairs or abandonment) W:

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y
<u>18"</u>	<u>0</u>	<u>7</u>	<u>Soil</u>	
<u>1</u>	<u>7</u>	<u>19</u>	<u>LAVA</u>	
<u>16"</u>	<u>19</u>	<u>30</u>	<u>LAVA</u>	
<u>1</u>	<u>30</u>	<u>40</u>	<u>Broken Rock</u>	
<u>1</u>	<u>40</u>	<u>45</u>	<u>CLAY</u>	
<u>1</u>	<u>45</u>	<u>50</u>	<u>Broken Rock</u>	
<u>1</u>	<u>50</u>	<u>75</u>	<u>Rock</u>	
<u>1</u>	<u>75</u>	<u>85</u>	<u>Red Clay + Rock</u>	
<u>1</u>	<u>85</u>	<u>105</u>	<u>Rock</u>	
<u>1</u>	<u>105</u>	<u>110</u>	<u>Red Rock</u>	
<u>1</u>	<u>110</u>	<u>230</u>	<u>Rock</u>	
<u>1</u>	<u>230</u>	<u>265</u>	<u>CLAY + Rock</u>	
<u>1</u>	<u>265</u>	<u>315</u>	<u>Rock</u>	
<u>1</u>	<u>315</u>	<u>325</u>	<u>Rock</u>	X
<u>10"</u>	<u>325</u>	<u>445</u>	<u>Mountain Rock</u>	X
<u>1</u>	<u>445</u>	<u>465</u>	<u>Fractured Rock</u>	X
<u>1</u>	<u>465</u>	<u>475</u>	<u>Mountain Rock</u>	X
<u>1</u>	<u>475</u>	<u>500</u>	<u>Fractured Rock</u>	X
<u>1</u>	<u>500</u>	<u>576</u>	<u>Fractured Rock</u>	X
<u>1</u>	<u>576</u>	<u>580</u>	<u>Solid Rock</u>	
<u>1</u>	<u>580</u>	<u>583</u>	<u>Fractured Rock</u>	X
<u>1</u>	<u>583</u>	<u>600</u>	<u>Solid Rock</u>	
<u>1</u>	<u>600</u>	<u>607</u>	<u>Fractured Rock</u>	X
<u>1</u>	<u>607</u>	<u>660</u>	<u>Solid Rock</u>	X

Completed Depth 660 (Measure)
Date: Started 5-21-07 Completed 5-21-07

14. DRILLER'S CERTIFICATION 10-20-
We certify that all minimum well construction standards were complied with at the time the rig was removed.
Company Name Vollmer Well Drilling Firm No. 3
Principal Driller [Signature] Date 10-25
and
Driller or Operator II _____ Date _____
Operator I _____ Date _____
Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

10:50 10 92

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D D0048449
DRILLING PERMIT NO. _____
Water Right or Injection Well No. 21-13048

2. OWNER:
Name WDA Shadow Ridge, LLC
Address 1985 E. 183 N.
City Reubens State ID Zip 83440

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 9 North ☒ or South ☐
Rge. 44 East ☒ or West ☐
Sec. 8 NE 1/4 NE 1/4 SW 1/4
Gov't Lot _____
Lat: _____ Long: _____
Address of Well Site Fish Creek Rd. 10 miles E
of Ashton City Ashton
(Give at least name of road - 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 Material	From	To	Weight / Volume	Seal Placement Method
Concrete	0	275	14 yds	Overbore + pressure

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 10" - 330' 8" - 325'
Was drive shoe seal tested? ☒ Y ☐ N How? pressure 8" - 800'

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
10"	+2	330	.365	Steel	☒	☐	☒	☐
8"	325	800	.250	Steel	☐	☒	☒	☐

Length of Headpipe _____ Length of Tailpipe _____
Packer ☐ Y ☐ N Type _____

9. PERFORATIONS/SCREENS PACKER TYPE

Perforation Method _____

Screen Type & Method of Installation _____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
330	800	3/16	22800	8"	Steel	☒	☒

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
24.2 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____

Well #2

Office Use Only			
Well ID No.	_____		
Inspected by	_____		
Twp	Rge	Sec	
1/4	1/4	1/4	
Lat: _____	_____	Long: _____	_____

12. WELL TESTS:
☐ Pump ☐ Bailor ☐ Air ☐ Flowing Artesian

Yield gal/min.	Drawdown	Pumping Level	Time
140		580	24 hrs

Water Temp. _____ Bottom hole temp. _____
Water Quality test or comments: _____

13. LITHOLOGIC LOG: (Describe repairs or abandonment) Water

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
18"	0	10	Dirt		X
18"	10	40	LAVA		X
16"	40	48	Fractured LAVA		X
	48	60	Red LAVA + clay		X
	60	80	LAVA		X
	80	120	LAVA		X
	120	160	LAVA		X
	160	168	Red LAVA		X
	168	170	LAVA		X
	170	180	LAVA		X
	180	200	LAVA + clay		X
	200	220	Rhyolite		X
	220	240	Rhyolite		X
	240	260	Rhyolite		X
	260	330	Soft Rhyolite	X	
10"	330	380	Rhyolite		X
	380	420	Fractured Rhyolite	X	
	420	480	Rhyolite		X
	480	500	Fractured Rhyolite	X	
	500	520	Rhyolite		X
	520	526	Fractured Rhyolite	X	
	526	640	Rhyolite		X
	640	642	Fractured Rhyolite	X	
	642	645	Rhyolite		X
	645	721	Fractured Rhyolite	X	
	721	730	Rhyolite		X
	730	740	Soft Fractured Rhyolite	X	
	740	785	Rhyolite		X
	785	800	Fractured Rhyolite	X	

Completed Depth 800' (Measurable)
Date: Started 5-21-07 Completed 10-20-07

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

Company Name Valley Drilling Firm No. 383
Principal Driller [Signature] Date 10-25-07
and
Driller or Operator II _____ Date _____
Operator I _____ Date _____

Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

SHADOW RIDGE WELL #1 TEST

Brockway Engineering, PLLC

Date of test: 8/20/2007

Project: Shadow Ridge at Stephens

Location: Well #1

Well diameter: 10"

Depth: 660

Bowls @: 550

Supervisor: CGB

SWL to MP: 257.66

MP to ground: 2.5

Q meas: In-pipe impeller meter

Blue-White RB 40054

Checked w/ Brockway orifice

540

Air line depth:

Effective air line depth: 541.55 (calibrated w/ probe)

Remarks:

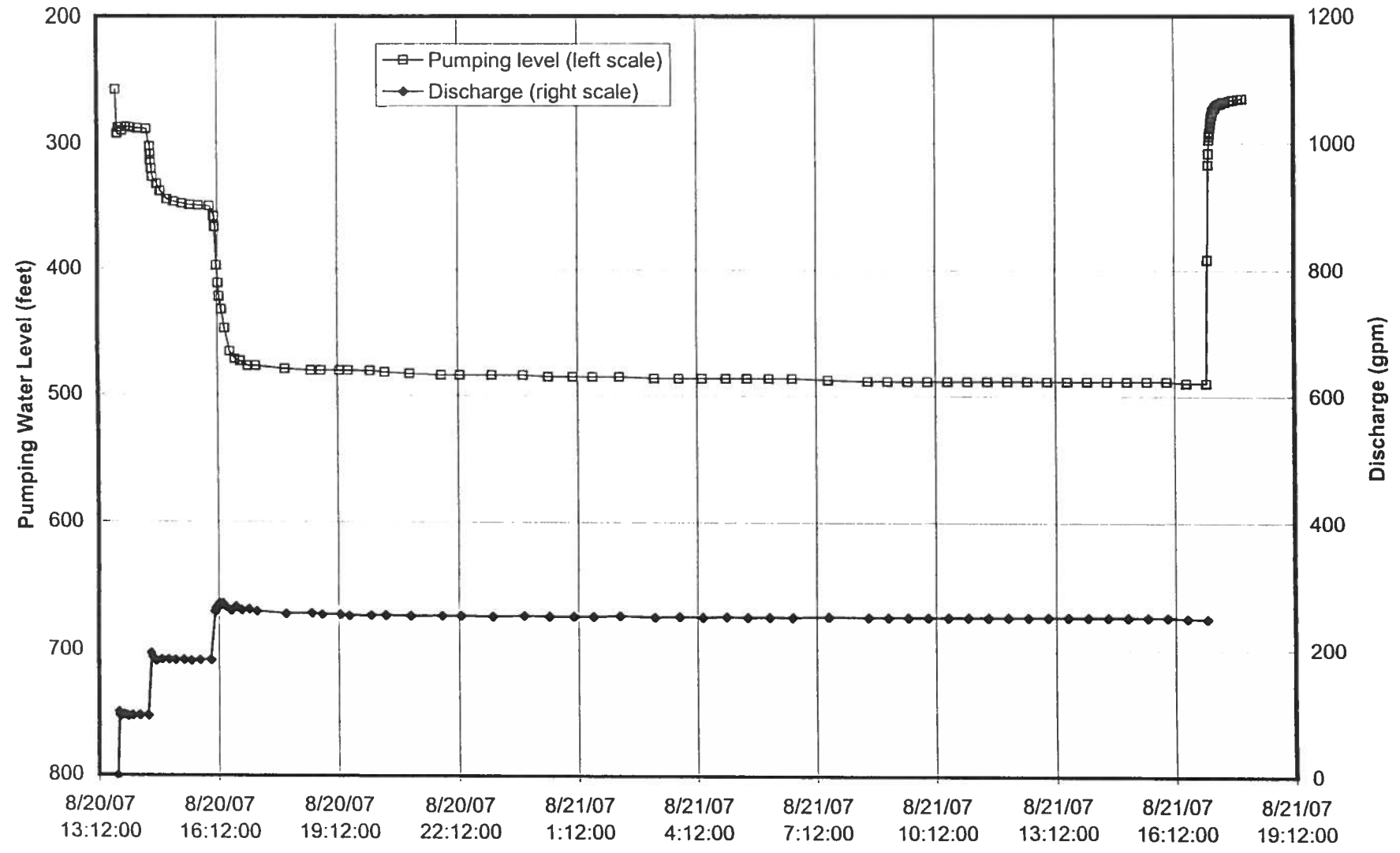
Date/Time	Elapsed Time (hrs)	Q (gpm)	Probe Rdg (Red = air line) (feet)	Air line P (psi)	Drawdown (feet)	Remarks
8/20/07 13:40:00	0.000	0	257.66		0.00	Start - Step 1
8/20/07 13:42:15	0.038	100	292.4	108	34.74	Probe would not descend >320
8/20/07 13:44:00	0.067	94	287.8	110	30.12	
8/20/07 13:45:00	0.083	95	287.8	110	30.12	Water clear
8/20/07 13:50:00	0.167	96	290.1	109	32.43	
8/20/07 13:55:00	0.250	94	286.87	109	29.21	
8/20/07 14:02:00	0.367	95	287.51	108	29.85	
8/20/07 14:13:00	0.550	95	288.32	107	30.66	
8/20/07 14:26:00	0.767	95	288.78		31.12	
8/20/07 14:30:30	0.842					Q incr. to Step 2, opened valve
8/20/07 14:31:30	0.858	194	302.60		44.94	
8/20/07 14:32:00	0.867		309		51.29	
8/20/07 14:32:30	0.875		313.50		55.84	
8/20/07 14:33:30	0.892	187	320		62.49	
8/20/07 14:35:15	0.921		327.08		69.42	
8/20/07 14:38:00	0.967	182		92.00		
8/20/07 14:42:00	1.033		332.66	92.00	75.00	
8/20/07 14:47:00	1.117	184	338.31		80.65	
8/20/07 14:57:00	1.283	184	344.76		87.10	Water nearly clear, no sand
8/20/07 15:07:00	1.450	183	346.64	87.5	88.98	
8/20/07 15:20:00	1.667	183	348.03		90.37	
8/20/07 15:31:00	1.850	182	349.15		91.49	
8/20/07 15:44:00	2.067	183	349.65	85	91.99	
8/20/07 16:00:00	2.333	183	350.17		92.51	
8/20/07 16:06:00	2.433					Q incr. to Step 3
8/20/07 16:06:45	2.446	260	358.30		100.64	
8/20/07 16:08:00	2.467	265	366.60		108.94	Valve opened to hold Q. Probe no go.
8/20/07 16:11:00	2.517	270	397	62.5	139.71	
8/20/07 16:13:30	2.558	273	411	56.5	153.55	Valve incr.
8/20/07 16:15:00	2.583	270	422	52	163.93	Water nearly clear
8/20/07 16:18:30	2.642	273	432	47.5	174.31	
8/20/07 16:23:00	2.717	268	447	41	189.31	Valve full open
8/20/07 16:30:30	2.842	262	465	33	207.76	
8/20/07 16:38:00	2.967	268	471	30.5	213.53	
8/20/07 16:46:00	3.100	263	473	29.7	215.38	
8/20/07 16:57:30	3.292	264	477	28	219.30	
8/20/07 17:09:00	3.483	261	477	28	219.30	
8/20/07 17:53:00	4.217	257	479	27	221.60	
8/20/07 18:32:00	4.867	258	480	26.5	222.76	
8/20/07 18:47:00	5.117	256	480	26.5	222.76	
8/20/07 19:15:00	5.583	256	480	26.5	222.76	
8/20/07 19:28:00	5.800	254	480	26.5	222.76	

8/20/07 20:01:00	6.350	255	480	26.5	222.76
8/20/07 20:23:00	6.717	255	482	26	223.91
8/20/07 21:00:00	7.333	254	483	25.5	225.06
8/20/07 21:47:00	8.117	254	484	25	226.22
8/20/07 22:15:00	8.583	254	484	25	226.22
8/20/07 23:03:00	9.383	253	484	25	226.22
8/20/07 23:50:00	10.167	254	484	25	226.22
8/21/07 0:28:00	10.800	253	485	24.5	227.37
8/21/07 1:05:00	11.417	253	485	24.5	227.37
8/21/07 1:35:00	11.917	253	485	24.5	227.37
8/21/07 2:15:00	12.583	254	485	24.5	227.37
8/21/07 3:08:00	13.467	252	486	24	228.53
8/21/07 3:45:00	14.083	253	486	24	228.53
8/21/07 4:20:00	14.667	252	486	24	228.53
8/21/07 4:56:00	15.267	253	486	24	228.53
8/21/07 5:28:00	15.800	252	486	24	228.53
8/21/07 6:01:00	16.350	252	486	24	228.53
8/21/07 6:36:00	16.933	252	486	24	228.53
8/21/07 7:30:00	17.833	253	487	23.5	229.68
8/21/07 8:30:00	18.833	252	488	23	230.83
8/21/07 9:00:00	19.333	252	488	23	230.83
8/21/07 9:30:00	19.833	252	488	23	230.83
8/21/07 10:00:00	20.333	252	488	23	230.83
8/21/07 10:30:00	20.833	252	488	23	230.83
8/21/07 11:00:00	21.333	252	488	23	230.83
8/21/07 11:30:00	21.833	252	488	23	230.83
8/21/07 12:00:00	22.333	252	488	23	230.83
8/21/07 12:30:00	22.833	252	488	23	230.83
8/21/07 13:00:00	23.333	252	488	23	230.83
8/21/07 13:30:00	23.833	252	488	23	230.83
8/21/07 14:00:00	24.333	252	488	23	230.83
8/21/07 14:30:00	24.833	252	488	23	230.83
8/21/07 15:00:00	25.333	252	488	23	230.83
8/21/07 15:30:00	25.833	252	488	23	230.83
8/21/07 16:00:00	26.333	252	488	23	230.83
8/21/07 16:30:00	26.833	251	490	22.5	231.99
8/21/07 17:00:00	27.333	250	490	22.5	231.99
8/21/07 17:02:00	27.367		392	65	
8/21/07 17:03:30	27.392		317		
8/21/07 17:04:00	27.400		308.2		
8/21/07 17:05:00	27.417		297.5		
8/21/07 17:05:10	27.419		295		
8/21/07 17:05:40	27.428		293		
8/21/07 17:06:00	27.433		291.6		
8/21/07 17:06:35	27.443		287.5		
8/21/07 17:06:55	27.449		286.4		
8/21/07 17:07:10	27.453		284.6		
8/21/07 17:07:35	27.460		283		
8/21/07 17:07:55	27.465		281.2		
8/21/07 17:08:20	27.472		280		
8/21/07 17:08:45	27.479		279		
8/21/07 17:09:15	27.487		278		
8/21/07 17:09:35	27.493		277		
8/21/07 17:09:55	27.499		275.7		
8/21/07 17:10:55	27.515		274.8		
8/21/07 17:11:55	27.532		273.7		
8/21/07 17:13:55	27.565		272.5		

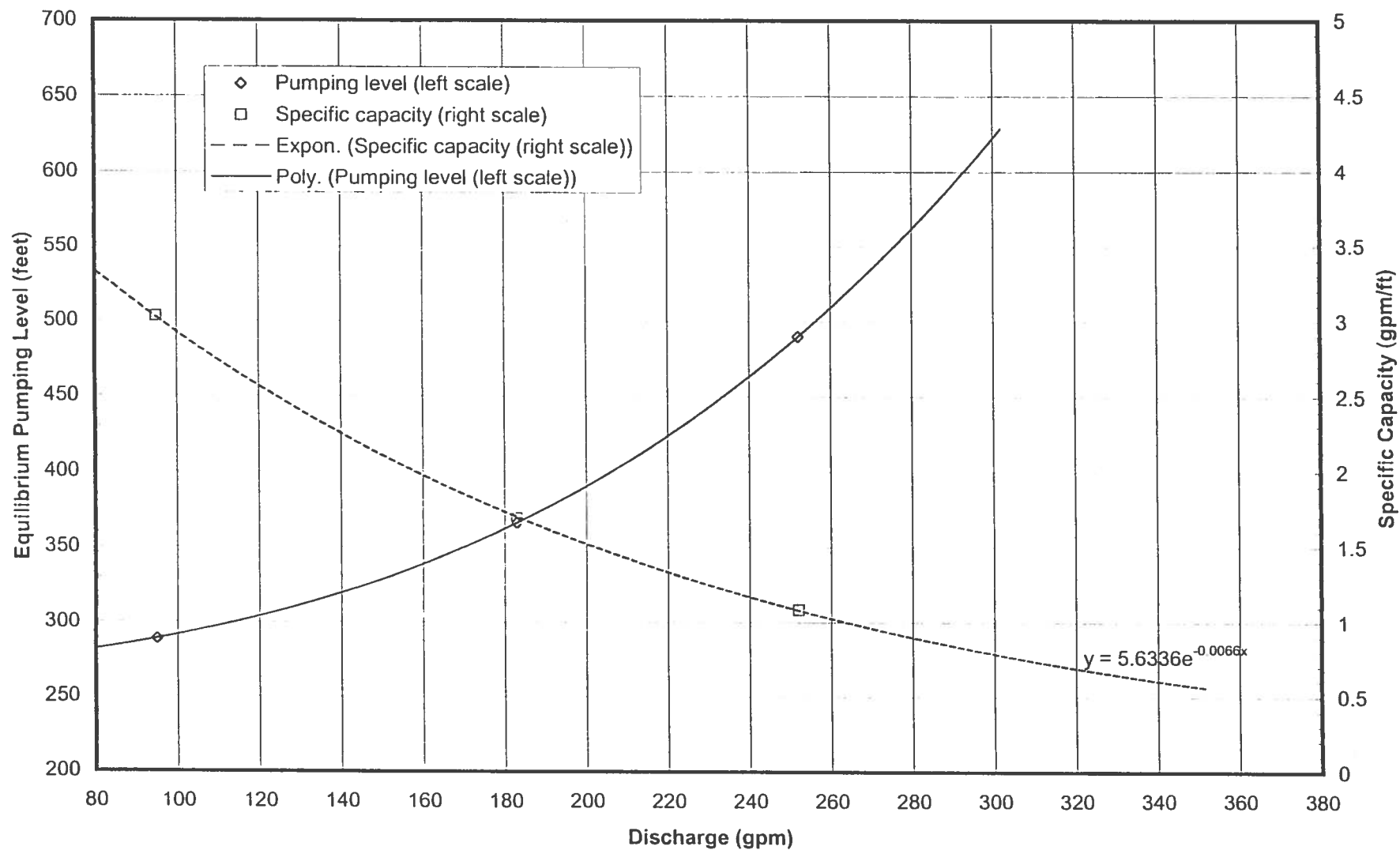
Stop Pump

8/21/07 17:14:45	27.579	271.9
8/21/07 17:16:30	27.608	270
8/21/07 17:20:00	27.667	269.4
8/21/07 17:23:00	27.717	268.8
8/21/07 17:25:00	27.750	268
8/21/07 17:27:00	27.783	267.5
8/21/07 17:30:00	27.833	267.7
8/21/07 17:36:00	27.933	266.6
8/21/07 17:40:00	28.000	266
8/21/07 17:49:00	28.150	265.4
8/21/07 17:55:00	28.250	265

Shadow Ridge Well #1 Pumping Test



Shadow Ridge Well #1 Observed Yield-Drawdown Curves and Projection



EQUILIBRIUM YIELD-DRAWDOWN CURVE SHADOW RIDGE WELL #1

SWL 257.66

Pumping levels based on step-drawdown test 8/22/07.

For Step 2 where equilibrium was not quite reached, the equilibrium drawdown was computed by projecting time-drawdown curve to 10 hours using logarithmic projection.

Discharge (gpm)	Pumping Level (feet)	Drawdown (feet)	Specific Capacity (gpm/ft)
0	257.66	0	
95	289	31.34	3.03
183	366	108.34	1.69
252	490	232.34	1.08

Drawdown prediction at higher flow rates using exponential projection
of specific capacity curves (Theis analysis did not fit):

Discharge (gpm)	Specific Capacity (gpm/ft)	Predicted drawdown (feet)	Predicted pumping level (ft)
260	1.01	257	514
270	0.95	285	542
280	0.89	315	573
290	0.83	349	607

Conclude: With a pump set at deepest possible level (640 feet), at most 290 gpm could be yielded to keep at least 20 feet of water above pump.

SHADOW RIDGE WELL #2 TEST

Brockway Engineering, PLLC

Date of test: 9/12/2007

Project: Shadow Ridge at Stephens

Location: Well #2

Well diameter: 10"

Depth: 800

Bowls @: 620

Remarks:

Supervisor: CGB

SWL to MP: 241

MP to ground: 3.0

Q meas: In-pipe impeller meter

Blue-White RB 40054

Checked w/ Brockway orifice

Air line depth: 614

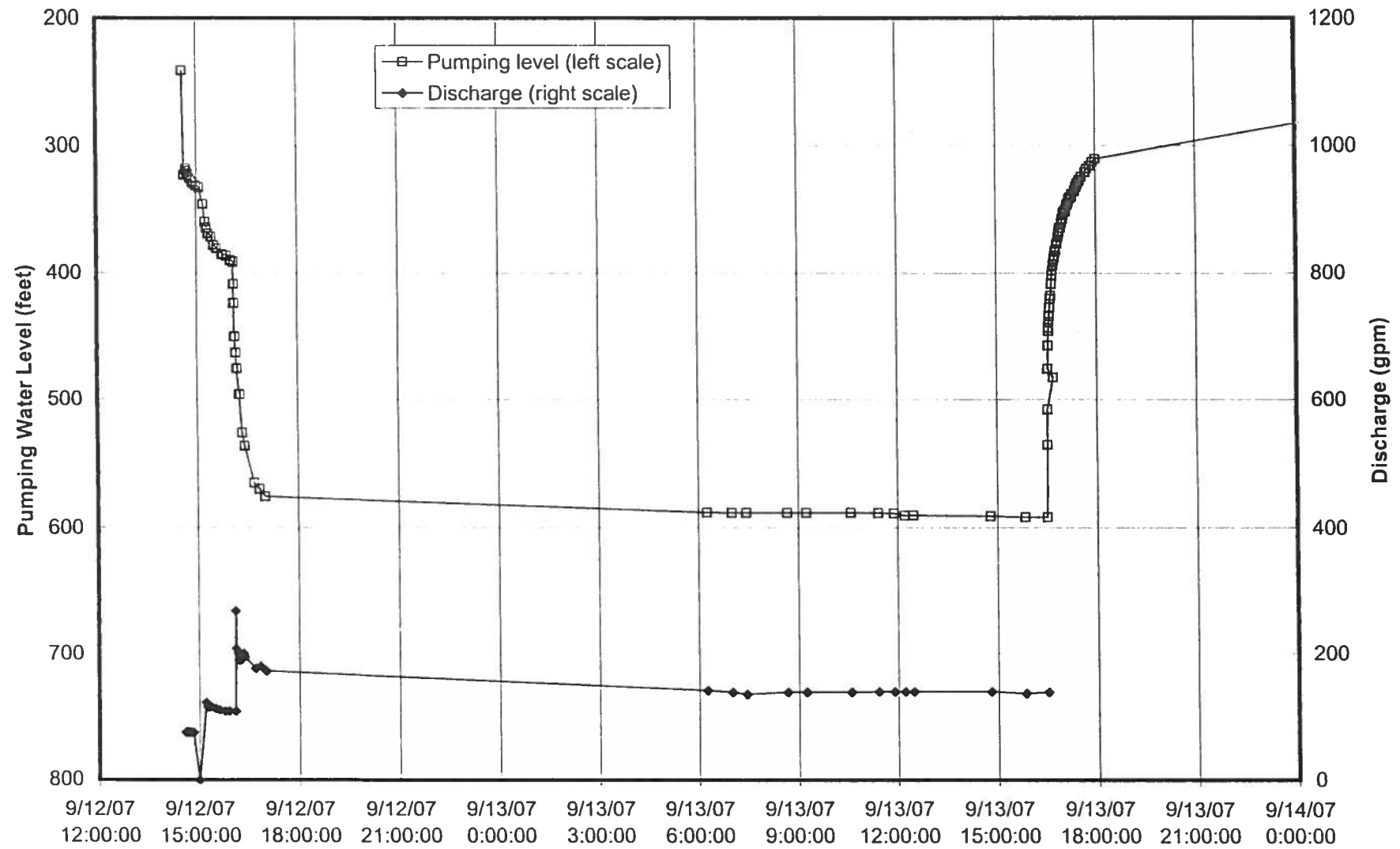
Effective air line depth: 607 (calibrated w/ probe)

Date/Time	Elapsed Time (hrs)	Q (gpm)	Probe Rdg (Red = air line) (feet)	Air line P (psi)	Drawdown (feet)	Remarks
9/12/07 14:36:00	0.000	75	241.0		0.00	Start - Step 1
9/12/07 14:38:30	0.042	75	323.2	123	82.24	Probe would not descend
9/12/07 14:41:30	0.092	75	318.3		77.30	Probe ok now
9/12/07 14:43:00	0.117		320.2		79.18	Water muddy
9/12/07 14:45:00	0.150	75	322.3		81.25	
9/12/07 14:49:00	0.217	75	325.75		84.75	Clearing
9/12/07 14:53:00	0.283		328.20		87.20	
9/12/07 14:55:30	0.325		329.50		88.50	
9/12/07 15:00:00	0.400	70 to 75	331.45		90.45	Clearing
9/12/07 15:05:00	0.483		332.81		91.81	
9/12/07 15:10:00	0.567					Q incr. to Step 2
9/12/07 15:12:00	0.600	122	346.3	113	105.31	
9/12/07 15:15:30	0.658	115	360.2	107.00	119.15	Probe won't descend
9/12/07 15:18:00	0.700		364.8	105	123.77	
9/12/07 15:21:00	0.750	115	369.4	103.00	128.38	V. slight sand
9/12/07 15:26:00	0.833		371.7	102.00		
9/12/07 15:29:00	0.883	112				
9/12/07 15:31:00	0.917		378.6	99	137.61	
9/12/07 15:36:00	1.000	110	380.9	98	139.91	
9/12/07 15:46:00	1.167	108	385.5	96	144.53	
9/12/07 15:53:00	1.283	108	386.7	95.5	145.68	
9/12/07 16:00:00	1.400		390.1	94	149.14	Nearly clear, no sand
9/12/07 16:05:00	1.483	108	391.3	93.5	150.30	Q incr. to Step 3, full open valve
9/12/07 16:05:30	1.492		408.6	86	167.60	
9/12/07 16:06:00	1.500	268	423.6	79.5		Valve throttled to hold 200 gpm
9/12/07 16:07:30	1.525	208	450.1	68	209.12	
9/12/07 16:09:00	1.550		462.8	62.5	221.81	Valve opened to hold Q. Probe no go.
9/12/07 16:11:00	1.583	200	475.5	57	234.50	
9/12/07 16:12:00	1.600	189				Valve opened
9/12/07 16:15:00	1.650	190	496.3	48	255.26	Valve opened
9/12/07 16:19:00	1.717	200				
9/12/07 16:20:00	1.733	200	526.3	35	285.26	T = 54F, cloudy, clearing
9/12/07 16:22:00	1.767	195				
9/12/07 16:24:00	1.800		536.6	30.5	295.64	Valve opened full
9/12/07 16:41:00	2.083	176	565.5	18	324.47	Water cloudy, no sand
9/12/07 16:50:00	2.233	180	570.1	16	329.09	
9/12/07 17:00:00	2.400	172	575.9	13.5	334.86	WL dropping, begin throttling valve to keep adequate depth over bowls
9/13/07 6:15:00	13.250	141	588.3	8.1	347.31	
9/13/07 7:00:00	14.000	138	588.5	8	347.54	
9/13/07 7:26:00	14.433	135	588.5	8	347.54	
9/13/07 8:40:00	15.667	138	588.5	8	347.54	

9/13/07 9:14:00	16.233	138	588.5	8	347.54	
9/13/07 10:35:00	17.583	138	588.5	8	347.54	
9/13/07 11:25:00	18.417	139	588.8	7.9	347.77	
9/13/07 11:53:00	18.883	139	589.0	7.8	348.01	
9/13/07 12:12:00	19.200	139	590.9	7	349.85	
9/13/07 12:28:00	19.467	139	590.6	7.1	349.62	
9/13/07 14:47:00	21.783	139	591.1	6.9	350.08	
9/13/07 15:50:00	22.833	136	592.0	6.5	351.00	
9/13/07 16:30:00	23.500	138	592.0	6.5	351.00	Pump off
9/13/07 16:31:00	23.517		535.5	31	294.48	
9/13/07 16:31:30	23.525		507.8	43	266.80	
9/13/07 16:41:45	23.696		482.4	54	241.42	
9/13/07 16:32:00	23.533		475.5	57	234.50	
9/13/07 16:32:30	23.542		457.0	65	216.05	
9/13/07 16:33:00	23.550		445.5	70	204.51	
9/13/07 16:33:50	23.564		443.2	71	202.20	
9/13/07 16:34:00	23.567		438.6	73	197.59	
9/13/07 16:35:00	23.583		434.0	75	192.98	
9/13/07 16:36:00	23.600		427.1	78	186.05	
9/13/07 16:37:00	23.617		420.1	81	179.13	
9/13/07 16:38:00	23.633		417.8	82	176.83	
9/13/07 16:39:40	23.661		408.6	86	167.60	
9/13/07 16:40:30	23.675		401.7	89	160.68	
9/13/07 16:41:30	23.692		398.2	90.5	157.22	
9/13/07 16:42:30	23.708		393.6	92.5	152.60	
9/13/07 16:43:30	23.725		390.1	94	149.14	
9/13/07 16:44:30	23.742		389.0	94.5	147.99	
9/13/07 16:45:30	23.758		386.7	95.5	145.68	
9/13/07 16:46:30	23.775		383.2	97	142.22	
9/13/07 16:47:45	23.796		382.1	97.5	141.07	
9/13/07 16:49:00	23.817		377.5	99.5	136.45	
9/13/07 16:50:00	23.833		377.5	99.5	136.45	
9/13/07 16:51:00	23.850		375.1	100.5	134.15	
9/13/07 16:52:00	23.867		371.7	102	130.69	
9/13/07 16:53:00	23.883		369.4	103	128.38	
9/13/07 16:54:00	23.900		367.1	104	126.07	
9/13/07 16:55:00	23.917		364.8	105	123.77	Stop Pump
9/13/07 16:56:00	23.933		364.8	105		
9/13/07 16:57:00	23.950		364.8	105		
9/13/07 16:58:00	23.967		361.3	106.5		
9/13/07 16:59:00	23.983		359.0	107.5		
9/13/07 17:00:00	24.000		357.8	108		
9/13/07 17:01:00	24.017		357.8	108		
9/13/07 17:02:00	24.033		353.2	110		
9/13/07 17:03:00	24.050		352.1	110.5		
9/13/07 17:04:00	24.067		352.1	110.5		
9/13/07 17:05:00	24.083		352.1	110.5		
9/13/07 17:06:00	24.100		350.9	111		
9/13/07 17:07:00	24.117		349.8	111.5		
9/13/07 17:08:00	24.133		347.5	112.5		
9/13/07 17:09:00	24.150		346.3	113		
9/13/07 17:10:00	24.167		346.3	113		
9/13/07 17:11:00	24.183		345.2	113.5		
9/13/07 17:12:00	24.200		342.8	114.5		
9/13/07 17:13:00	24.217		341.7	115		
9/13/07 17:14:00	24.233		341.7	115		
9/13/07 17:15:00	24.250		340.5	115.5		

9/13/07 17:17:00	24.283	340.5	115.5
9/13/07 17:18:00	24.300	338.2	116.5
9/13/07 17:22:00	24.367	335.8	
9/13/07 17:23:00	24.383	334.8	
9/13/07 17:25:30	24.425	332.2	
9/13/07 17:27:00	24.450	331	
9/13/07 17:28:00	24.467	330.3	
9/13/07 17:30:00	24.500	328.6	
9/13/07 17:32:00	24.533	327.1	
9/13/07 17:35:00	24.583	324.6	
9/13/07 17:42:00	24.700	321	

Shadow Ridge Well #2 Pumping Test



**EQUILIBRIUM YIELD-DRAWDOWN CURVE
SHADOW RIDGE WELL #2**

SWL

241

Pumping levels based on step-drawdown test 8/20/07 - 8/21/07

For Steps 1 and 2 where equilibrium was not reached, the equilibrium drawdown was computed by projecting time-drawdown curve to 10 hours using logarithmic projection.

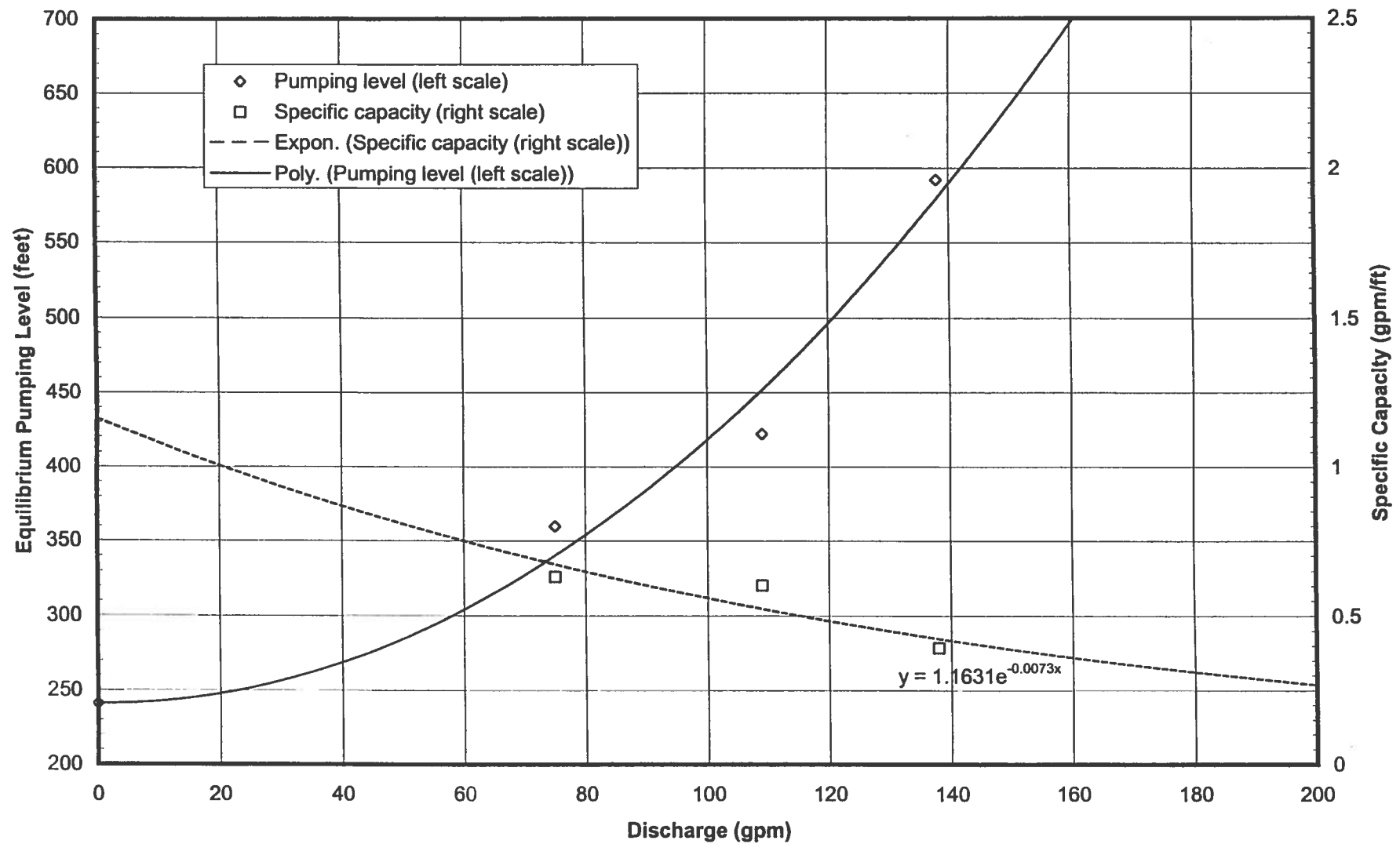
Discharge (gpm)	Pumping Level (feet)	Drawdown (feet)	Specific Capacity (gpm/ft)
0	241	0	
75	360	119	0.63
109	422	181	0.60
138	592	351	0.39

Drawdown prediction at higher flow rates using exponential projection
of specific capacity curves (Theis analysis did not fit):

Discharge (gpm)	Specific Capacity (gpm/ft)	Predicted drawdown (feet)	Predicted pumping level (ft)
150	0.39	386	627
160	0.36	442	683
170	0.34	506	747
180	0.31	576	817

Conclude: With a pump set at deepest possible level (780 feet), at most 170 gpm could be yielded to keep at least 20 feet of water above pump.

Shadow Ridge Well #2 Observed Yield-Drawdown Curves and Projection



SHADOW RIDGE WELLS #1 AND #2 - PUMP DESIGN

CGB 9/25/07

Design condition: Only meet Phase 1 demand (314 gpm)

Add 10%: design flow = 345 gpm

	Well #1	Well #2
Design flow (gpm)	230	120
(cfs)	0.51	0.27
Design pumping level (ft)	463	517 <-- 20' lower than test data
Pump setting (ft)	520	580 <-- Set pump 50'+/- below pumping level
Column diam (ft)	0.33	0.25
Friction factor	0.014	0.014
Column velocity (ft/s)	5.99	5.45
Column loss (ft)	12.3	15.0
Head loss well to house	2.0	5.0
dZ from wellhead to house	2.0	16.0
Required pressure at house (psi)	70	70
TDH of pump (ft)	641.1	714.5
Pump efficiency	0.75	0.75
HP required max	49.7	28.9
HP nominal	50	30

Well #1: Grundfos 230S500-15

Well #2: Grundfos 150S300-17

Both pumps have a 3" discharge, but Well #1 pump must have a 4" discharge pipe.

Goulds stainless steel submersible line: no pump can easily meet or exceed specs; can find one that can meet spec within a few feet TDH, but this leaves no room for error or pump performance degradation over time.

Similar for Goulds non-stainless steel -- couldn't find one that would work well and had adequate "factor of safety".



STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

RECEIVED
NOV 20 2008

BY:.....

900 North Skyline Drive, Suite B • Idaho Falls, Idaho 83402 • (208) 528-2650

C.L. "Butch" Otter, Governor
Toni Hardesty, Director

November 17, 2008

Mike Vickers
WDG Shadow Ridge, LLC
P.O. Box 51298
Idaho Falls, ID 83405

Re: As-built Plans, Inspection Report, and Water System Referral for Shadow Ridge at Stevens Ranch, Drinking Water, Near Ashton, Fremont County DEQ# 07-02-22

Dear Mr. Vickers:

We have received the as-built plans and specifications for the **Shadow Ridge at Stevens Ranch**. The plans and specifications meet State standards and the system is operating as intended. This submission satisfies the requirements set forth in Idaho Code Section 39-118.

The submitted as-built plans and specifications will be kept on file at this office. Please reference **DEQ No. 07-02-22** when submitting any future correspondence related to this project. In addition we have received the required sourcewater monitoring for both drinking water sources. The water quality monitoring is in compliance with the primary drinking water standards and the sources are approved for public consumption.

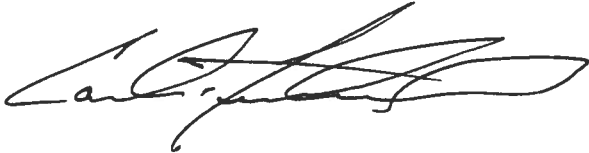
I am referring the **Shadow Ridge at Stevens Ranch** water system to the Eastern Idaho Public Health District for regulatory oversight. The water system design has been approved by the DEQ and is currently operating as intended. I have enclosed a complete copy of the inspection report that was completed for the system after the system became operational. The water system should be regulated as a transient non-community water system.

If you have any questions or comments please feel free to contact me at 208-528-2650.

SCANNED

NOV 17 2008

Sincerely,

A handwritten signature in black ink, appearing to read 'Carlin Feisthamel', with a stylized, flowing script.

Carlin Feisthamel, P.E.
Water Quality Engineer
Idaho Falls Regional Office

c: Greg Eager, Regional Engineering Manager, DEQ-Idaho Falls
Charles Brockway, Brockway Engineering, Inc.
John Moss, Eastern Idaho Public Health District