



January 5, 2015

Mr. James Cefalo
Idaho Department of Water Resources
900 North Skyline Drive, Suite A
Idaho Falls, ID 83402-1718

RE: HYDROLOGICAL ASSESSMENT FOR JUSTIN AND LINDSEY EDWARDS WATER RIGHTS APPLICATION

Dear Mr. Cefalo:

A groundwater impact assessment is provided in this letter report for Justin and Lindsey Edwards Water Right Application. They have approximately 285 acres of land northwest of Malad City, Idaho (Figure 1) and their application is for 5.7 cfs.

A pumping test was conducted on June 20-24, 2005 in a well about 2.75 miles southeast of the proposed drill site, labeled the Jeff Thomas Test Well in Figure 1. The parameters from the aquifer test are used in a computer simulation to predict the potential impacts to neighboring wells within ½ mile of the proposed point of diversion (POD). The results of the computer analysis show that the proposed diversion rate will have a minimal or negligible impact on neighboring wells.

Nearby PODs

The proposed well location is 14S, 35E, 1 SE NW as shown in Figure 2. A search was made for all existing points of diversions (PODs), i.e. water rights near the Edwards property. In Figures 3 and 4 a blue circle is shown with a ½ mile radius centered on the proposed Edwards well location. The circle encompasses portions of sections 1 and 2, T14S, R35E and sections 35 and 36 T13S R35E. A search of the IDWR on-line database for PODs in these sections indicates that the only groundwater permit is in Section 36 T14S R35E. The results of the water right search are provided in Tables 1 through 3. It should be noted that there are no surface water rights in these sections. It should also be noted that the interactive map generator on the IDWR website shows none of these within a half mile radius of the Edwards proposed POD.

Nearby Wells

A search was performed of the IDWR drillers' log database for wells within ½ mile of the proposed well location. Seven representative well logs are provided in Attachment 1 to show the local hydrogeology. The average depth of the wells in sections 1 and 2, T14S, R35E and section 36 T13S R35E is 488 ft and the average depth to water is 224 ft.

Hydrogeology

The Malad Valley is surrounded by mountains made of old crystalline rock, which were up-lifted and formed a deep valley between them. During the ice ages, the entire Salt Lake Basin was filled with water forming a vast inland lake on several occasions. The water extended into the area of the subject property. During periods of high water fine sediment and sand were



deposited. During periods of low water the sediments were incised by surface streams, which also deposited coarse sands and gravels. Two of the most prominent lake levels were the Bonneville at about 5200 ft and the Provo at about 4800 ft above mean sea level. The elevation of the subject property is about 4770 ft, so it is expected that fine lake bed sediments from the Bonneville Lake Level exist in the shallow subsurface below the property. In this area the lake bed sediments were probably cut by the ancestral Malad River. This stream also may have deposited sands and gravels as reported on the well drillers logs.

The lithology in this area is a series of unconsolidated sands, gravels and clays. There is not a marker layer or geologic unit that can be correlated over distances between wells (~ ½ mile), at least, as described in the lithology on the well logs. The inability to correlate geologic layers is consistent with the area being situated in a cut and fill sequence of the Malad River. It is further complicated by waxing and waning cycles of Lake Bonneville. For the purposes of this investigation it is assumed that the aquifer thickness is 220 ft in this area. This is based on driller log for the Jeff Thomas Test Well and regional considerations of the hydrogeology. It should be noted that the aquifer is a sequence of permeable lens of sand and gravel stringers, which are primarily confined or semi-confined. Locally the aquifer may be unconfined.

Pumping Test

An irrigation well was completed to a depth of 489 feet on the Thomas Property, T14S, 35E, Section 24, on May 20, 2005. It is perforated from 280 ft to 481 feet in order to draw water from a deeper part of the aquifer. The geology beneath the Jeff Thomas property consists of interlayered sediment ranging from unconsolidated sands and gravel to brown sticky clay. With depth, the layers of sand are reported to be lithified into harder more competent sandstone intervals.

A four-day pumping test was conducted June 20-24, 2005 at a rate of 1,000 gpm. Water levels were monitored in nine surrounding wells, using electronic pressure transducers. The radial distance between the Thomas Well and the observation wells ranged from 528 feet to 3,168 feet. On the basis of the depth to water measurements, there appears to be at least three sub-units to the aquifer: 1) a shallow zone with depth to water between 7 and 10 feet, 2) a middle aquifer sub-unit with depth to water measurements between 73 and 76 feet and a deeper sub-unit with depth to water measuring between 97 and 104 feet.

Drawdown plots for the observation wells can be found in Attachment 2. The effects of pumping the new well could not be seen definitively in any of the observation wells. The pumping test was conducted when other nearby irrigation wells were pumping, which tended to make the aquifer data “noisy”. Nevertheless, if drawdown from pumping the Jeff Thomas well impacted the observation wells it was minimal and could not be defined.

Aquifer test analyses could only be performed on the pumped well because drawdown was not observed in any of the observation wells. Attachment 3 contains the aquifer test analyses performed using the AQTESOLV computer program for a leaky confined aquifer (Hantush, 1960). The first two plots are the drawdown and recovery curves. The transmissivity is 1392 ft²/day using the leaky confined aquifer solution. In the third plot, a match to the Theis solution for a confined aquifer is provided in Attachment 3. As can be noted, the match to the confined



This solution is not as good as the match to the leaky confined solution. Below the plots in Attachment 3 are listed the residual statistics for each match using the automatic curve matching option in AQTESOLV. The objective function that is minimized during automatic curve matching is the sum of the squared residuals. Automatic curve matching seeks to minimize the residual sum of squares, residual variance and standard deviation and obtain a residual mean close to zero. As can be seen by the residual statistics, the variance and the standard error are significantly less for the leaky confined match than for the confined solution. This indicates that in this area the aquifer is under leaky confined conditions. This was a significant test (i.e. 1000 gpm for 4 days with many observation wells) and it represents one of the best measures of aquifer properties for the Malad Valley.

Because the observation wells did not show measurable drawdown, a reasonable storativity value could not be calculated from the test itself. It was taken as 0.01, which is within the range of average values quoted by Freeze and Cherry (pg. 60) for confined aquifers.

Impact Assessment

Mr. and Mrs. Edwards wish to irrigate 285 acres and per IDWR estimates of usage this will require 0.02 cfs per acre or 2558 gpm (5.7 cfs). To estimate the long-term drawdown and impact to neighboring wells from pumping of the proposed Edwards well, the forward solution capability of the AQTESOLV program was employed. Boundaries in AQTESOLV were enabled to represent Malad Valley. As depicted in Figure 4-1 and listed in Table 4-1 the model is 25,000 ft wide and 40,000 ft long. Because the Malad Valley is bounded by mountains consisting of Paleozoic and Mesozoic sedimentary rock that do not provide much water compared to the unconsolidated valley fill, the northwest, northeast and southeast boundaries are set as impermeable or “no flow” boundaries. Water is allowed to enter the model domain only through the southwest boundary.

In the model domain the proposed POD well is located 12,890 ft east of the northwest boundary and 8,800 ft north of the northeast boundary. This represents the proximity of the proposed POD to the no flow boundaries, which will have the effect of increasing drawdown. An imaginary well is placed in the model ½ mile southwest of the proposed diversion to simulate drawdown impacts from the maximum proposed pumping.

Figure 4-2 shows the AQTESOLV[®] output plot of the forward calculation for the proposed well pumping at 2558 gpm or 5.7 cfs constantly for 6 months (April 15 to Oct 15). At the end of the time period the predicted drawdown is estimated to be 180 feet in the proposed POD. The calculated drawdown for a well ½ mile southwest of the POD and pumping from the same aquifer is predicted to be 0. Water supplying the well comes from leakage from overlying confining layers and aquifers.

It is my professional opinion that Mr. Evan’s water right application will not excessively impact his neighbors’ right to divert water. I believe that the calculated drawdown over estimates the actual drawdown to be expected for the following reasons: 1) Mr. and Mrs. Edwards will never pump continuously at the maximum rate for 180 days; 2) the Paleozoic/Mesozoic rocks of the mountains are not totally impermeable this is especially true of the area along the Malad River (toward Daniels reservoir) and to the south toward Malad. These are two areas of the model that



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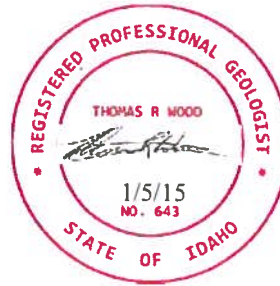
were simulated as no flow boundaries and in actuality will provide some water to the system, thus reducing drawdown; 3) several canals and the Malad River are within the domain of the model and no credit for recharge/leakage is taken in the model; and 4) the calculated impact used semi-confined aquifer conditions for the entire domain, while it is known that unconfined conditions exist over large parts of the area, which will have a greater storage coefficient. All of these factors will reduce the predicted drawdown.

Please do not hesitate to call me if you have any questions about this letter or the calculations presented.

Respectfully,

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

Thomas R. Wood, PhD, PG



cc

Lindsey and Justin Edwards 3825 N 3900 W Malad City Idaho 83252

References

- Hantush, M.S., Modification of the theory of leaky aquifers, Jour. of Geophysical Research, 65(11), 3713-3725, 1960.
- Freeze, R.A. and J.A. Cherry, 1979, Groundwater, ISBN 0-13-365312-9, Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632.

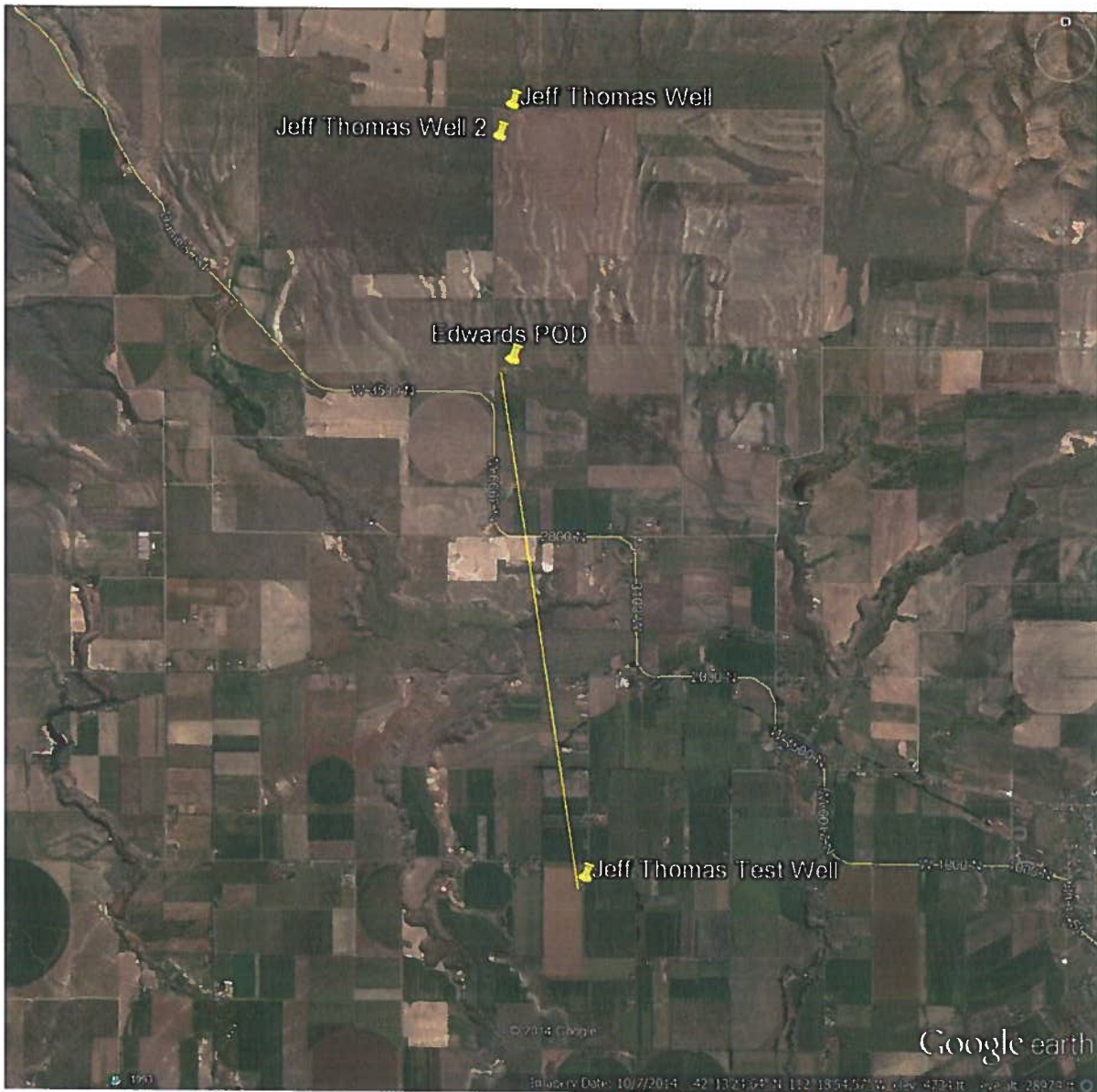


Figure 1. Map showing locations of the proposed Edwards well, the Jeff Thomas Irrigation/Test Well and a line 2.75 miles long.

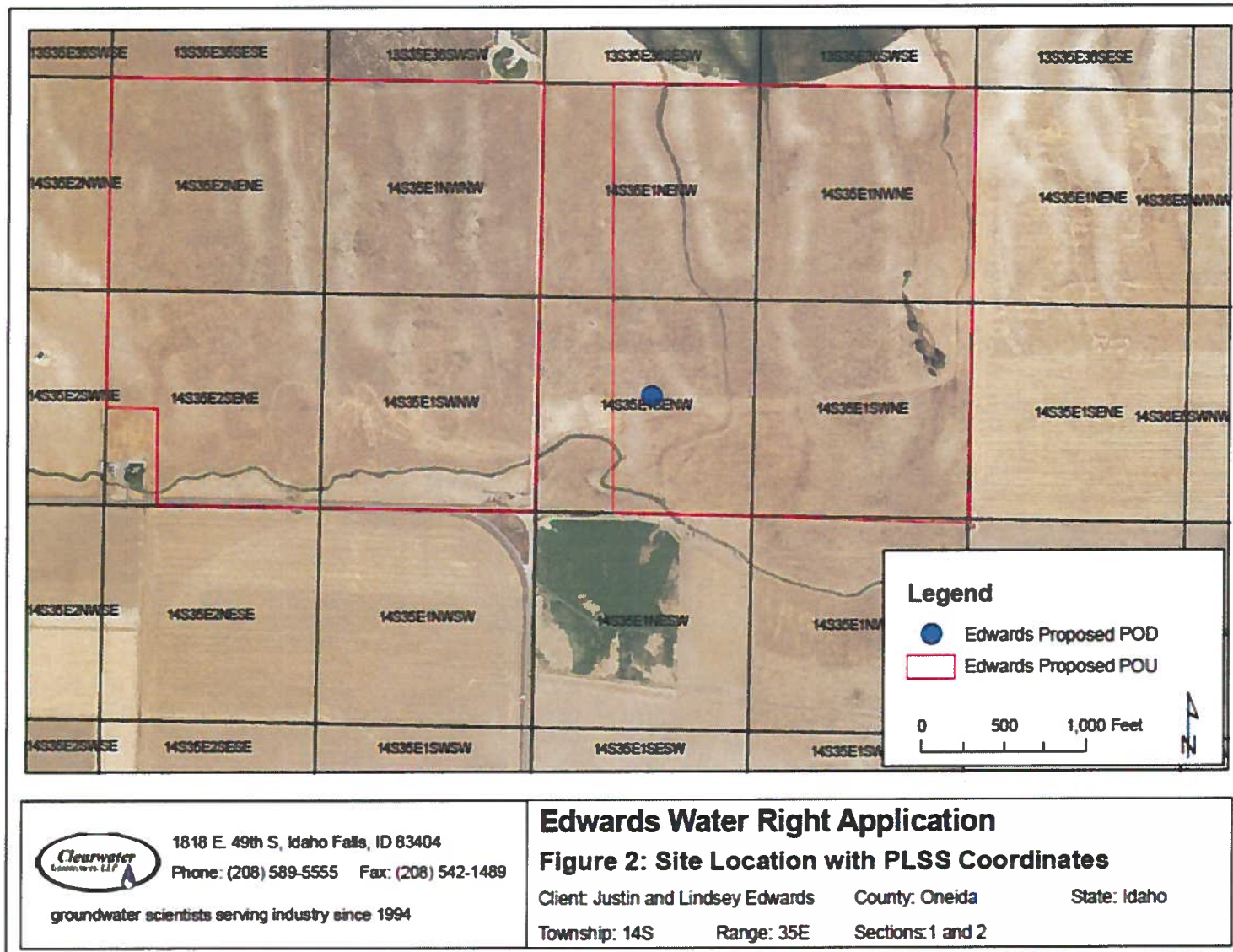


Figure 2. IDWR map area showing the township-range section coordinates and the proposed well location as a blue dot.

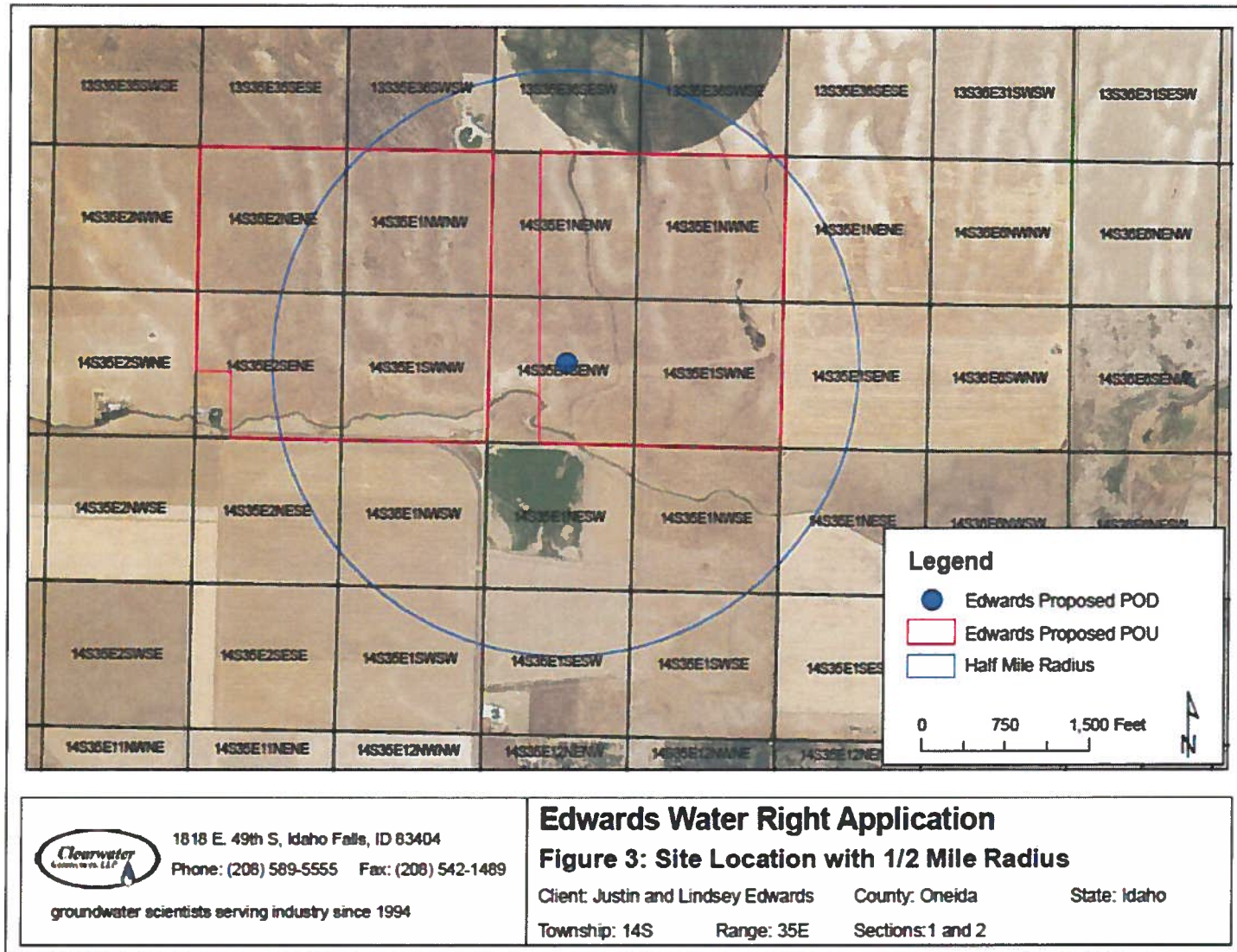


Figure 3. Edwards property with blue circle showing approximate 1/2 mile radius.

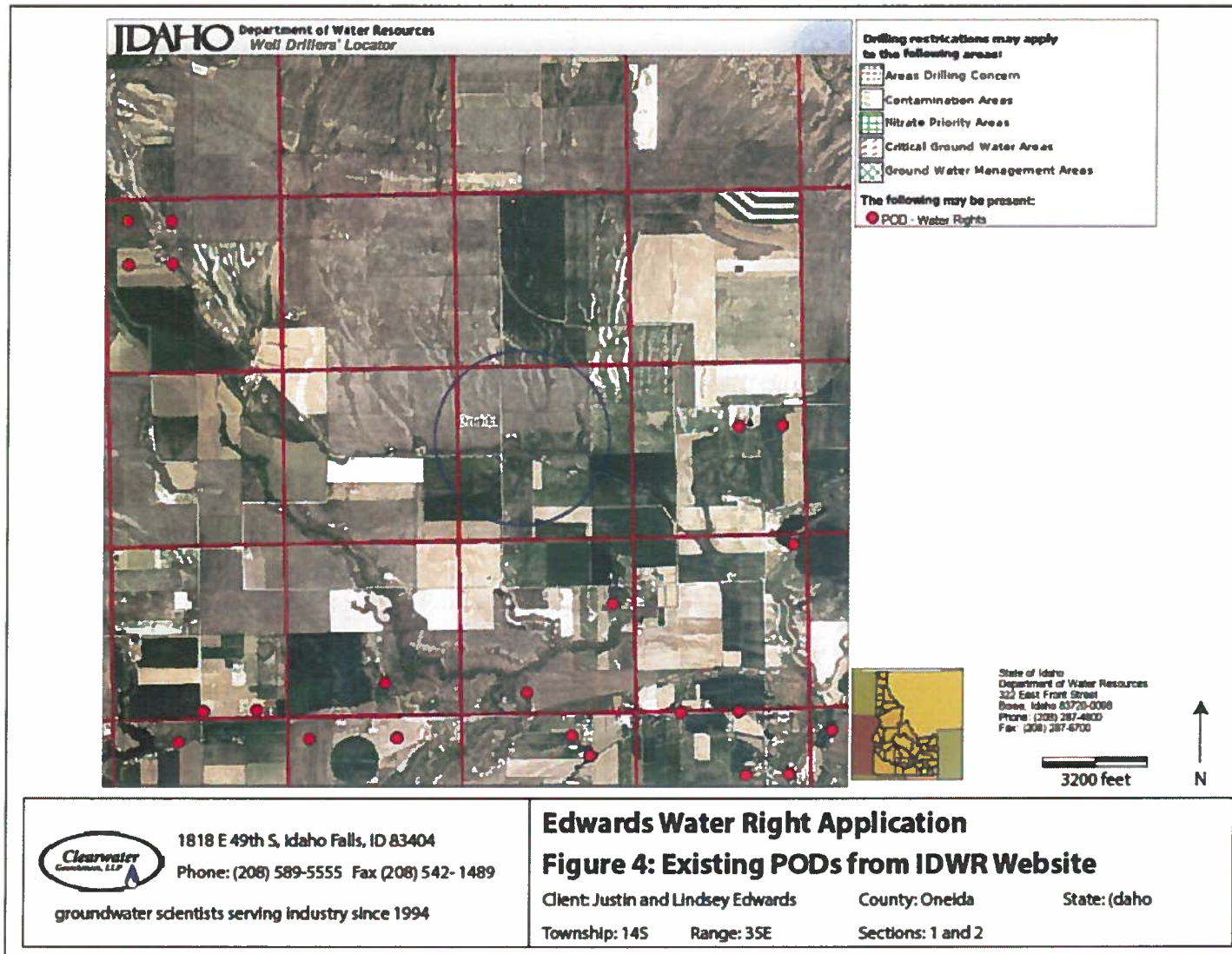


Figure 4. Existing PODs; from IDWR website and blue circle 1/2 mile diameter.

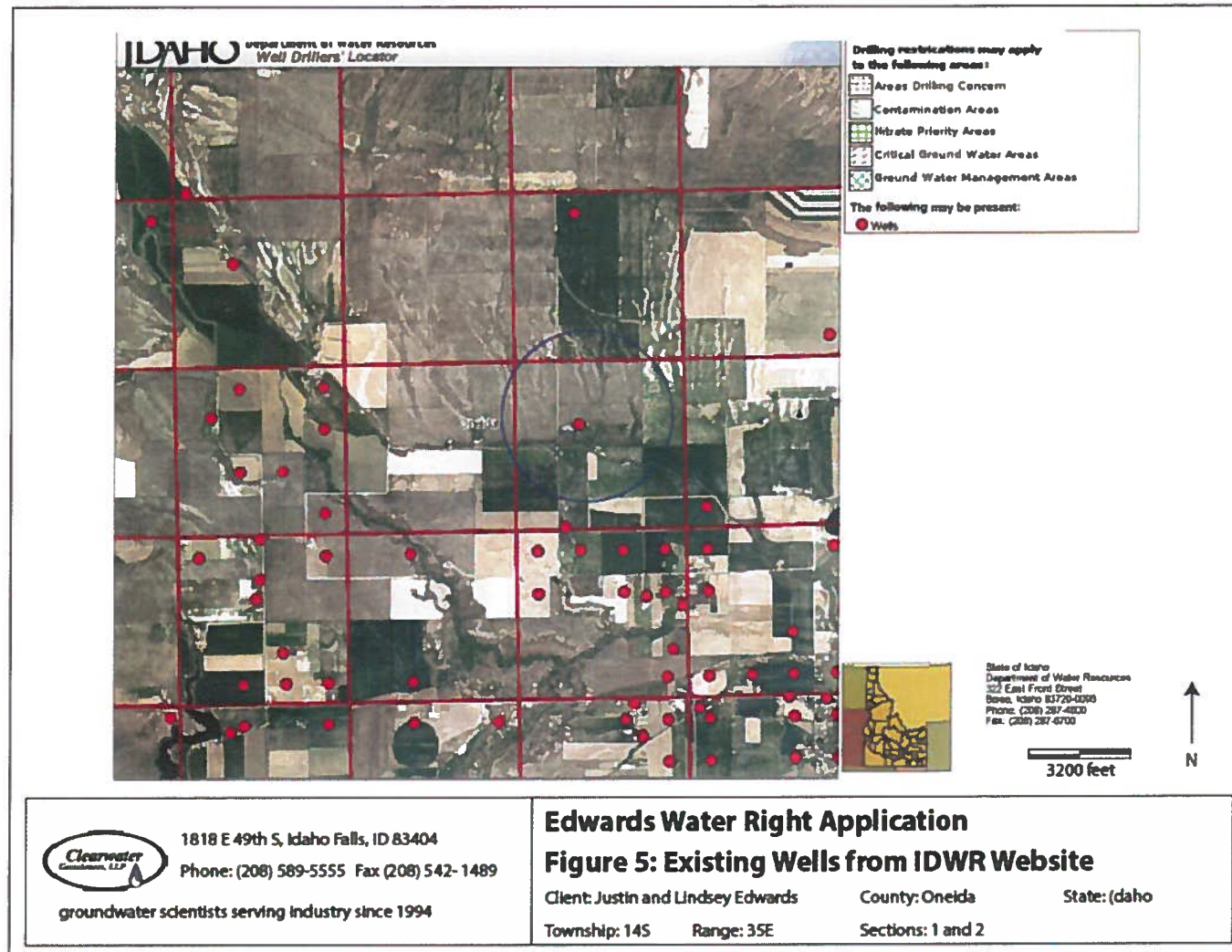


Figure 5. Existing wells; from IDWR website and blue circle ½ mile diameter. The one well within the ½ mile radius is the Edwards' domestic well.

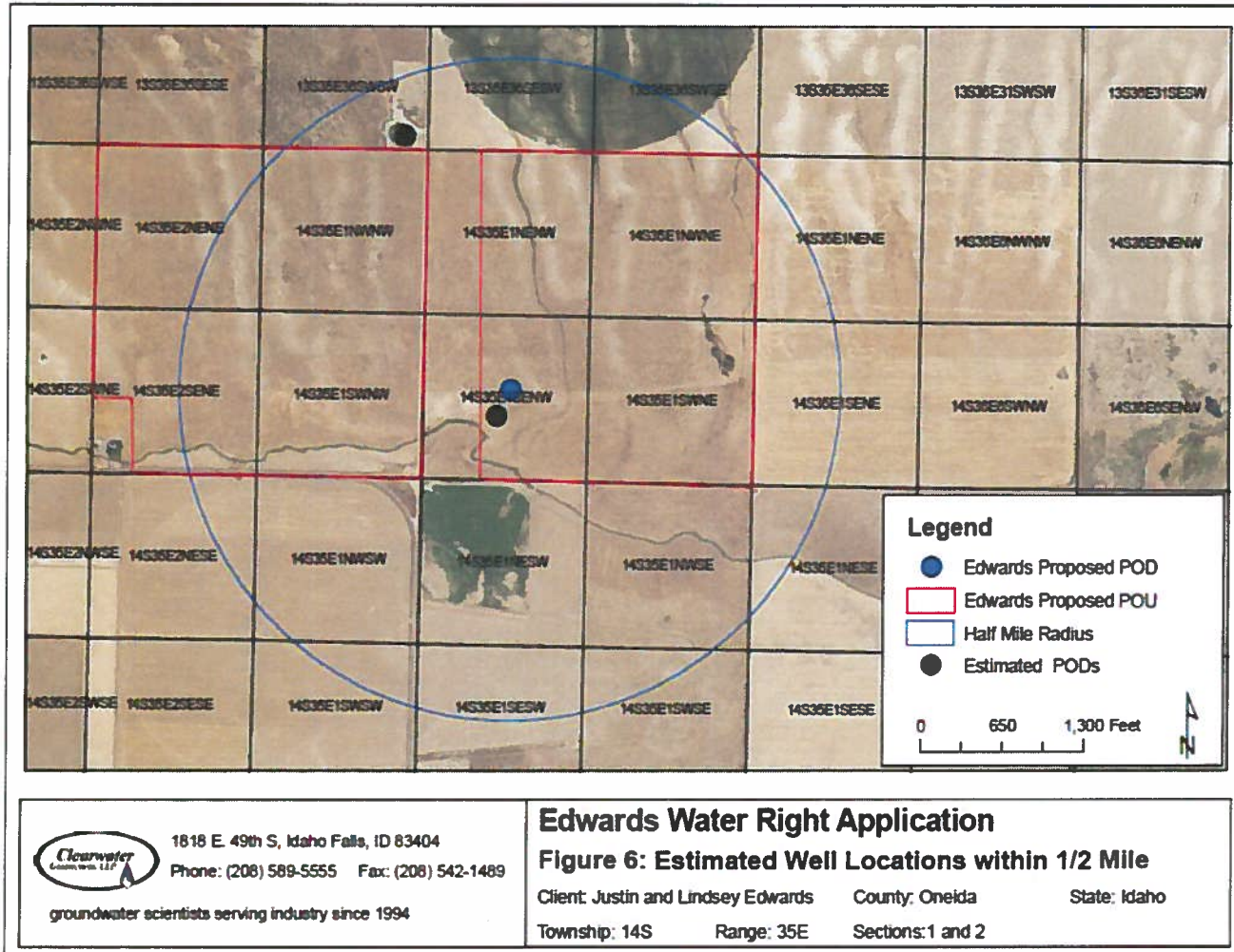


Figure 6. Estimated well locations within ½ mile of Edwards proposed location. Edwards POD is shown as a blue dot and the black dot near it in 14S 35E 1 SE NW is for the Edwards Water Right Application (this application). The black dot to the north in 13S 35E 36 SW SW is for the Jeff Thomas existing water right.



Table 1 IDWR Search results for point of diversions in T14S, R35E, Section 1

Type	Basin	Sequence	Suffix	Application Number	Status	Priority Date	Div. Rate (cfs)	Source	Water Use	Owner
Water Application	15	7393		79716	Active	11/26/2014	5.7	Ground Water	Irrigation	Edwards, Justin, Edwards, Lindsey

Table 2 IDWR Search results for point of diversions in T14S, R35E, Section 2

Type	Basin	Sequence	Suffix	Application Number	Status	Priority Date	Div. Rate (cfs)	Source	Water Use	Owner
Water Permit	15	7215			Active	10/12/2001	4	Ground Water	Irrigation	Thomas, Thomas G

Table 3 IDWR Search results for point of diversions in T13S, R35E, Section 36

Type	Basin	Sequence	Suffix	Application Number	Status	Priority Date	Div. Rate (cfs)	Source	Water Use	Owner
Water Right	15	7193			Active	12/1/2000	8.8	Ground Water	Irrigation	Thomas, Jeffery J



Table 4 IDWR Search results for wells in T14S, R35E, Section 1

Contact	Use	TWP	RNG	Tract	Well Address	Gallons Per Minute	Static Water Level	Total Depth	Casing Depth	CSG Dia.	Construction Date
Justin Edwards	Domestic	14S	35E	1	346 N 200 W	20	101	160	180	6"	3/2/2012
Harold Casey Jr	Domestic	14S	35E	1	39 Bush Ave	15-20	228	281	271	6"	7/18/2010

Table 5 IDWR Search results for wells in T14S, R35E, Section 2

Contact	Use	TWP	RNG	Tract	Well Address	Gallons Per Minute	Static Water Level	Total Depth	Casing Depth	CSG Dia.	Construction Date
Richard and Diane Aiden	Domestic	14S	35E	2	RDA Farms	25	256	345	345	6"	3/18/2014

Table 6 IDWR Search results for wells in T13S, R36E, Section 36

Contact	Use	TWP	RNG	Tract	Well Address	Gallons Per Minute	Static Water Level	Total Depth	Casing Depth	CSG Dia.	Construction Date
Jeffery J Thomas	Domestic	13S	35E	36	270 W 2000 N		65	470	420	16"	9/3/2001
Jeffery J Thomas	Irrigation	13S	35E	36	270 W 2000 N		275	523	264	20"	12/9/2002
Jeffery J Thomas	Irrigation	13S	35E	36	270 W 2000 N		110	450	450	16"	12/20/2002
Jeffery J Thomas	Irrigation	13S	35E	36	270 W 2000 N		520	1145	open hole		8/16/2010



Attachment 1

REPRESENTATIVE WELL LOGS



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Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

15

1. WELL TAG NO. D0062501
Drilling Permit No. 55001-01-000000
Water right or injection well #

2. OWNER: Justin Edwards
Name
Address 3416 N 200W
City Malden State ID Zip 83252

3. WELL LOCATION:
Twp. 14 North ☐ or South ☒ Rge. 35 East ☒ or West ☐
Sec. 1 11 14 14 14 14
Gov't Lot _____ County Oneida
Lat. 42° 14' 32.3" (Deg. and Deciml minutes)
Long. 112° 19' 22.3" (Deg. and Deciml minutes)
Address of Well Site 4215 N 3900 W City Malden

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

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other

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

7. SEALING PROCEDURES:
Seal material From (ft) To (ft) Quantity (lb or ft³) Placement method/procedure
Cement 0 38 2 bags one bag

8. CASING/LINER:
Diameter (nominal) From (ft) To (ft) Gauge/Schedule Material Casing Liner Threaded Welded
6 0 160 .250 Steel ☒ ☐ ☐ ☒

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 180

9. PERFORATIONS/SCREENS:
Perforations ☒ Y ☐ N Method Touch
Manufactured screen ☐ Y ☐ N Type
Method of installation

From (ft) To (ft) Slot size Number Diameter (nominal) Material Gauge or Schedule
160 180 1/4 to 3/8 30 6" Steel .250

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

10. FILTER PACK:
Filter Material From (ft) To (ft) Quantity (lb or ft³) Placement method

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☐ N Artesian Pressure (PSIG) _____
Describe control device _____

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) 105 Static water level (ft) 101
Water temp. (°F) 56 Bottom hole temp. (°F) _____
Describe access port well cap

Well test:
Drawdown (feet) Discharge of flow (gpm) Test duration (minutes)
_____ 38 _____
Test method:
Pump ☐ Bailer ☐ Air ☒ Flowing Artesian ☐

Water quality test or comments: Good

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water	
				Y	N
10	0	35	Brn clay		X
10	35	38	Brn clay gravel		X
6	38	70	Brn clay		X
6	70	85	Gravel Brn clay		X
6	85	95	Brn clay		X
6	95	105	Brn clay gravel		X
6	105	115	Brn clay gravel sand	X	
6	115	130	Gravel	X	
6	130	140	Gravel Brn clay	X	
6	140	170	Gravel	X	
6	170	175	Gravel Brn clay	X	
6	175	180	Brn clay gravel		X

RECEIVED
MAY 22 2012
Department of Water Resources
Eastern Region

Completed Depth (Measurable): 180
Date Started: 3-27-12 Date Completed: 3-28-12

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

Company Name Northwest Well Drilling Co. No. 543

*Principal Driller Miles Franchsen Date 4-15-12

*Driller Miles Franchsen Date 4-1-12

*Operator II _____ Date _____

Operator I _____ Date _____

*Signature of Principal Driller and rig operator are required

Figure 1-1 Well log for Justin Edwards



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Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

RECEIVED

Location Corrected by IDWR To:
T14S R35E Sec. 1 SWSESW
By: mciscell 2013-09-11

1. WELL TAG NO. D D0058503
Drilling Permit No. _____
Water right or injection well # _____

2. OWNER: Harold Casey Jr.
Name _____
Address 39 Bush Lane
City Malad State ID Zip 83252

3. WELL LOCATION:
Twp 14 North ☐ or South ☒ Rge 35 East ☒ West ☐
Sec. 1 1/4 1/4 1/4 1/4

Gov't Lot _____ County Oseida
Lat N 42° 13' 74" (Deg and Decimal minutes)
Long W 112° 19' 22" (Deg and Decimal minutes)
Address of Well Site 3062 N 3900th
City Malad

Lot _____ Blk _____ Sub. Name _____

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

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other _____

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

7. SEALING PROCEDURES:
Seal material From (ft) To (ft) Quantity (ba or ft) Placement method/procedure
Benrich O 30 27 Bags One-time

8. CASING/LINER:
Diameter (nominal) From (ft) To (ft) Gauge/Schedule Material Casing Liner Threaded Welded
6" 4" 27 290 5 Steel

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 221'

9. PERFORATIONS/SCREENS:
Perforations ☒ Y ☐ N Method Machine
Manufactured screen ☐ Y ☒ N Type _____
Method of installation _____

From (ft)	To (ft)	Slot size	Number(s)	Diameter (nominal)	Material	Gauge or Schedule
211	221	1/4"	160			

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

10. FILTER PACK:
Filter Material From (ft) To (ft) Quantity (ba or ft) Placement method

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) _____
Describe control device _____

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 39 Static water level (ft) 228'
Water temp (°F) _____ Bottom hole temp. (°F) _____
Describe access port Top

Well test: _____ Test method: _____
Discharge or yield (gpm) _____ Test duration (minutes) _____
Pump _____ Bafer _____ Air _____ Flowing Artesian _____
APR 15-2000 PM 5 HRs

Water quality test or comments: _____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water
10 1/2	8	36	Brown sticky clay	Y
	35	39	Brown clay 2' sand	Y
8"	39	66	Sticky gray clay	Y
	66	68	Black clay	Y
	68	100	tan clay	Y
	100	118	Brown sand	Y
	118	140	some gravel	Y
	140	172	Sticky brown clay	Y
	172	198	conglomerate gravel	Y
	198	209	Sticky brown clay	Y
	209	220	gravel some brown clay & w/ dtes	Y
	220	236	Sticky gray clay	Y
	236	249	Brown clay 2' sand	Y
	249	261	gravel	Y
	261	273	Sticky clay	Y
	273	285	gravel	Y
	285	297	Sticky clay	Y
	297	300	gravel	Y
	300	306	Sticky clay	Y

Completed Depth (Measurable): 228'
Date Started: 6-25-10 Date Completed: 7-16-10

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 Marvick Drilling Co No. 5533
Principal Driller Sam J. Jansen Date 7-16-10

*Driller _____ Date _____
*Operator II _____ Date _____
Operator I _____ Date _____

*Signature of Principal Driller and rig operator are required.



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Ground Water Development and Exploration

Figure 1-2 Well log for Harold Casey

Form 238-7
6/07
DMD

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 0065315
Drilling Permit No _____
Water right or injection well # _____

2. OWNER: Richard & Dora Aiken
Name RDA Farms
Address 4 N Main ST
City Malad State ID Zip 83252

3. WELL LOCATION:
Twp 14 North ☐ or South ☒ Rge. 35 East ☒ or West ☐
Sec 2 1/4 SW 1/4 NE 1/4
Gov't Lot _____ County Oneida
Lat. 42 ° 14 ' 240 (Deg and Decimal minutes)
Long 112 ° 20 ' 001 (Deg and Decimal minutes)
Address of Well Site 4145 W 35th N City Malad
Lot _____ Blk _____ Sub Name _____

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

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other _____

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

7. SEALING PROCEDURES:
Seal material Cement From (ft) 0 To (ft) 40 Quantity (lbs or ft³) 18 bags Placement method/procedure Overbore

8. CASING/LINER:
Diameter (nominal) 6 From (ft) 0 To (ft) 345 Gauge/Schedule 250 Material Steel
Casing Liner Threaded Welded
☒ ☐ ☐ ☒
Was drive shoe used? ☒ N Shoe Depth(s) 345

9. PERFORATIONS/SCREENS:
Perforations ☒ Y ☐ N Method torch
Manufactured screen ☐ Y ☐ N Type _____
Method of installation _____

From (ft)	To (ft)	Slot size	Number	Diameter (nominal)	Material	Gauge or Schedule
<u>335</u>	<u>345</u>	<u>1/4"</u>	<u>7</u>	<u>6</u>	<u>Steel</u>	<u>.250</u>
<u>295</u>	<u>300</u>	<u>1/4"</u>	<u>360</u>	<u>6</u>	<u>Steel</u>	<u>.250</u>

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

10. FILTER PACK:
Filter Material _____ From (ft) _____ To (ft) _____ Quantity (lbs or ft³) _____ Placement method _____

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☐ N Artesian Pressure (PSIG) _____
Describe control device _____

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 270 Static water level (ft) 256
Water temp. (°F) 58 Bottom hole temp. (°F) _____
Describe access port well cap
Well test:
Drawdown (feet) _____ Discharge or yield (gpm) 25 Test duration (minutes) _____
Test method: Pump ☐ Bailer ☐ Air ☒ Flowing artesian ☐
Water quality test or comments: good

13. LITHOLOGIC LOG and/or repairs or abandonment:
Bore Dia. (in) From (ft) To (ft) Remarks, lithology or description of repairs or abandonment, water temp. Water Y N

<u>10</u>	<u>0</u>	<u>1</u>	<u>Top Soil</u>	<u>X</u>	<u>X</u>
<u>10</u>	<u>1</u>	<u>410</u>	<u>Bm Clay little gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>40</u>	<u>80</u>	<u>Bm clay little gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>80</u>	<u>105</u>	<u>Bm clay</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>105</u>	<u>133</u>	<u>Bm clay gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>133</u>	<u>145</u>	<u>Broken Rock</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>145</u>	<u>240</u>	<u>Bm clay little gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>240</u>	<u>255</u>	<u>Gravel Bm clay</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>255</u>	<u>260</u>	<u>Bm clay Gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>260</u>	<u>270</u>	<u>Gravel Bm clay</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>270</u>	<u>285</u>	<u>Gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>285</u>	<u>315</u>	<u>Bm clay little gravel</u>	<u>X</u>	<u>X</u>
<u>6</u>	<u>315</u>	<u>345</u>	<u>Bm shale</u>	<u>X</u>	<u>X</u>

Completed Depth (Measurable): 345
Date Started: 3-17-14 Date Completed: 3-18-14

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 Michael J. Williams No 543
Principal Driller Michael J. Williams Date 4-6-14
Driller Malcolm J. Jordan Date 3-30-14
Operator II _____ Date _____
Operator I _____ Date _____
* Signature of Principal Driller and rig operator are required



Clearwater Geosciences, LLP
Ground Water Development and Exploration

Figure 1-3 Well log for Richard and Diane Aiden

Form 238-7
1/97

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

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

1. WELL TAG NO. D 601487B
DRILLING PERMIT NO. 768481
Other IDWR No. 15-02192

2. OWNER:
Name Jeffery J Thomas
Address 2703 W 20th N
City Malad State ID Zip 83242

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

h
w
Twp 13 North or South SE
Rge 25 East or West
Sec 36 1/4 NE 1/4 SW 1/4
Gov't Lot _____
County Oneida
Lat _____ Long _____
Address of Well Site _____
City _____
(One of four faces of map - (Diagonals to find or locate))

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	Barrels or Pails	Other	
Bentonite	0 60	50		OverBore

Was drive shoe used? ☒ N Shoe Depth(s) 400'
Was drive shoe seal tested? ☐ Y ☐ N How?

8. CASING LINER:

Diameter	From To	Gauge	Material	Casing	Liner	Welded	Threaded
16"	0 470	3/16"	Steel	☒	☐	☐	☐

Length of Headpipe _____ Length of Tailpipe _____

9. PERFORATIONS/SCREENS

From To	Slot Size	Number	Diameter	Material	Casing	Liner
120 460	1/2"	2000	16"	Steel	☒	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
65 ~~66~~ ft. below ground Artesian pressure _____ lb
Depth flow encountered _____ ft Describe access port or control devices _____

11. WELL TESTS:
☐ Pump ☐ Baller ☐ Air
Yield gal/min _____ Drawdown _____ Pumping Level _____ Time _____
Water Temp cold Bottom hole temp. cold
Water Quality test or comments good
Depth first Water Encounter 240

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

Bore Dip	From	To	Remarks: Lithology, Water Quality & Temperature	T	H
20"	0	10	Brown clay		X
20"	10	20	Gravel & Clay		X
20"	20	40	gravel & Cobbles		X
20"	40	45	Brown clay		X
20"	45	50	Broken Limestone		X
20"	50	140	Limestone		X
20"	140	240	Broken Limestone		X
20"	240	280	Broken limestone good		X
16"	280	285	Shell		X
16"	285	297	Gravel		X
16"	297	302	Clay		X
16"	302	340	Gravel		X
16"	340	420	Clay little Gravel		X
16"	420	460	Clay (Brown)		X
16"	460	480	Shale little Gravel		X
16"	480	520	Clay & Shell		X
16"	520	530	Shell & Clay		X
16"	530	620	Shale Broken		X
16"	620		Shell & Clay		X

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Eastern Region

Completed Depth 470' (Measurable)
Date Started 4-10-01 Completed 9-3-01

13. DRILLER'S CERTIFICATION
We certify that all minimum well construction standards were complied with at the time the rig was removed.
Company Name Mountain West Well Drilling Firm No. 543
Firm Official Michael Franden Date 10-2-01
and
Driller or Operator _____ Date _____
(Sign once if Firm Official & Operator)

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Figure 1-4 Well log for Jeffery J Thomas Domestic Well



Clearwater Geosciences, LLP
Ground Water Development and Exploration

Form 230
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 0021997
DRILLING PERMIT NO. 772937
Water Right or Injection Well No. _____

2. OWNER:
Name Jeff Thomas
Address 2705 W. 2000 N.
City Malad State ID Zip 83252

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 13 North ☐ or South ☒
Rge. 35 East ☒ or West ☐
Sec. 36 1/4 NE 1/4 NW 1/4
Gov't Lot _____ County Blaine
Lat: _____ Long: _____
Address of Well Site 5 mi. W. from Farm
City Malad
Bldg. _____ Sub-Name St. Johns
Bench _____

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 Benckite From 264 To 264 Weight / Volume 90 Bag Seal Placement Method Overbore
Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 264'
Was drive shoe seal tested? ☒ Y ☐ N How? Pressure

8. CASING/LINER:
Diameter From To Gauge Material Casing Liner Varied Threaded
20" 0 264 316 Steel ☒ ☐ ☒ ☐
Length of Headpipe _____ Length of Tailpipe _____
Packer ☐ Y ☐ N Type NA

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method _____
Screen Type & Method of Installation
From To Slot Size Number Diameter Material Casing Liner
NA ☐ ☐
☐ ☐

10. FILTER PACK
Filter Material From To Weight / Volume Placement Method
NA ☐ ☐

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
275 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 _____
Water Temp. _____ Bottom hole temp. _____
Water Quality test or comments: _____

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

Start	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
24	0	19	Dirt		X
	19	62	Red Clay: Rock		X
	62	230	Brown Clay: Rock		X
	230	240	Black lava		X
	240	258	Grey lava		X
	258	264	Red Clay		X
20	264	320	Grey Rock		X
	320	330	Fractured Rock	X	
	330	412	Grey Rock		X
	412	431	Fractured Rock	X	
	431	445	Grey Rock		X
	445	457	Fractured Rock	X	
	457	466	Grey Rock		X
	466	472	Fractured Rock	X	
	472	510	Grey Rock		X
	510	523	Fractured Rock	X	

Completed Depth 523 (Measurable)
Date: Started 1-14-02 Completed 12/9/02

14. DRILLER'S CERTIFICATION
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. 303
Principal Driller [Signature] Date 12/26/02
and Driller or Operator II [Signature] Date _____
Operator I [Signature] Date 1-29-03
Principal Driller and Rig Operator Required.
Operator I must have signature of Driller/Operator II.

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Figure 1-5 Well log for Jeffery J Thomas Irrigation Well



Clearwater Geosciences, LLP
Ground Water Development and Exploration

Form 238
8/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 2024644
DRILLING PERMIT NO. 779950
Water Right or Injection Well No. 16

2. OWNER:
Name Jeff J. Thomas
Address 2705 East 2020 North
City Malad State ID Zip 83252

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp 13 North ☐ or South ☒
Rge 35 East ☒ or West ☐
Sec. 36 1/4 NE 1/4 NW 1/4
Gov't Lot _____
County Blaine State ID
Lat: _____ Long: _____
Address of Well Site Rural Area City Malad
LL _____ 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 Benctonite From 0 To 20' Weight / Volume 22 bags Seal Placement Method Overbore
Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 20' - 28' - 430'
Was drive shoe seal tested? ☒ Y ☐ N How? Pressure

8. CASING/LINER:
Diameter From To Gauge Material Casing Line Welded Threaded
20" 18" 20' 250 Steel ☒ ☐ ☒ ☐
18" 14" 28' 250 Steel ☒ ☐ ☒ ☐
14" 800' 450' 250 Steel ☒ ☐ ☒ ☐
Length of Headpipe _____ Length of Tailpipe _____
Packer ☒ Y ☐ N Type NA

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method _____
Screen Type & Method of Installation
From To Slot Size Number Diameter Material Casing Liner
NA

10. FILTER PACK
Filter Material From To Weight / Volume Placement Method
NA

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

Office Use Only
Well ID No. _____
Inspected by _____
Twp _____ Rge _____ Sec _____
1/4 _____ 1/4 _____ 1/4 _____
Lat. _____ Long. _____
☐ Pump ☐ Baller ☐ Air ☐ Flowing Artesian

12. WELL TESTS:

Yield gal/min.	Drawdown	Pumping Level	Time

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

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water	Y	N
20"	0	20'	Gravel, Play & Boulders			
20"	20'	36'	Gravel Cemented w/ Brown Clay			
	36'	74'	Clay			
	74'	106'	Clay, small Bits of Gravel			
	106'	160'	Sandstone w/ clay streamers			
	160'	240'	Gravel			
	240'	260'	Sandy Pebbles			
	260'	280'	Gravel Boulders			
	280'	295'	Gravel Conglomerates			
	295'	328'	Clay			
	328'	332'	Gravel Cemented			
	332'	368'	Clay			
	368'	372'	Gravel Cemented			
	372'	418'	Clay			
	418'	438'	Cemented Gravel			
	438'	440'	Clay			
	440'	450'	Clay			
10"	450'	910'	Clay mixed w/ Layer of Gravel, Stream of Pebbles - Phys. d. @ 450' - water level was lower than upper zone			
			WATER LEVEL OF TEST WELL 383'			

Completed Depth _____ (Measurable)
Date: Started 7-10-02 Completed 12-20-02

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 Vollmer Well Drilling Firm No. 353
Principal Driller Paul H. Vollmer Date 12/26/02
and Paul H. Vollmer
Driller or Operator II Paul H. Vollmer Date 12/26/02
Operator I _____ Date _____
Principal Driller and Rig Operator Required
Operator I must have signature of Driller/Operator II.

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Figure 1-6 Well log for Jeffery J Thomas Irrigation Well



Office Use Only

Well ID No. _____

Inspected by _____

Twp _____ Rge _____ Sec _____

_____ 1/4 _____ 1/4 _____ 1/4

Lat: : : Long: : :

12. WELL TESTS:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min.	Drawdown	Pumping Level	Time

Water Temp. Cold Bottom hole temp. Cold

Water Quality test or comments: Good

Depth first Water Encounter

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

[illegible]

Completed Depth 1145 (Measurable)
Date Started 4-14-09 Completed 8-16-10

14. DRILLER'S CERTIFICATION

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

Company Name Mt. West Well Drilling Firm No. 5413

Principal Driller Michael Thompson Date 8-16-10

Driller or Operator II _____ Date _____

Operator: _____ Date: _____

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

FORWARD WHITE COPY TO WATER RESOURCES

Figure 1-7 Well log for Jeffery J Thomas Irrigation Well

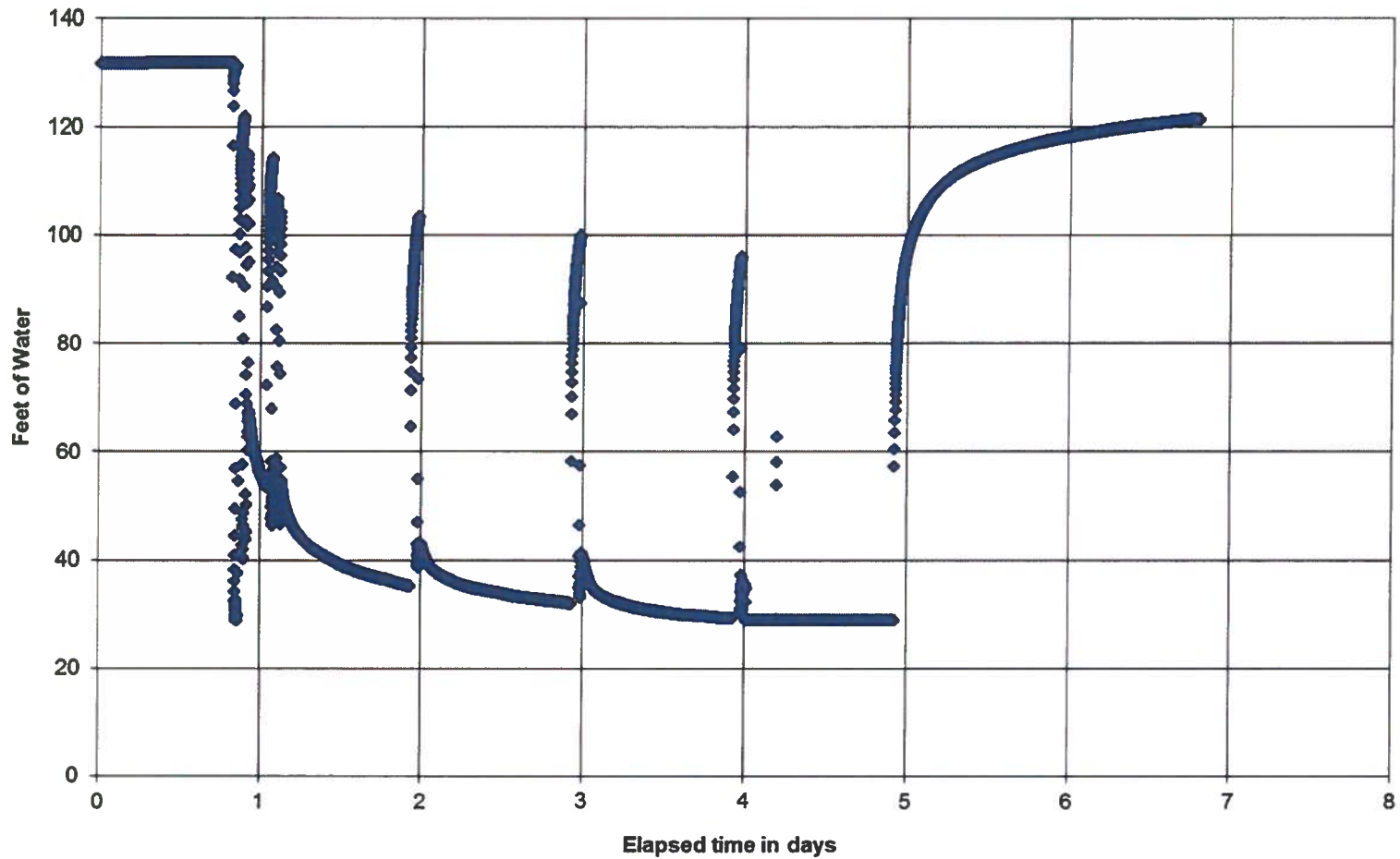


Attachment 2

Water Level Data During Pumping of Jeff Thomas Water Well

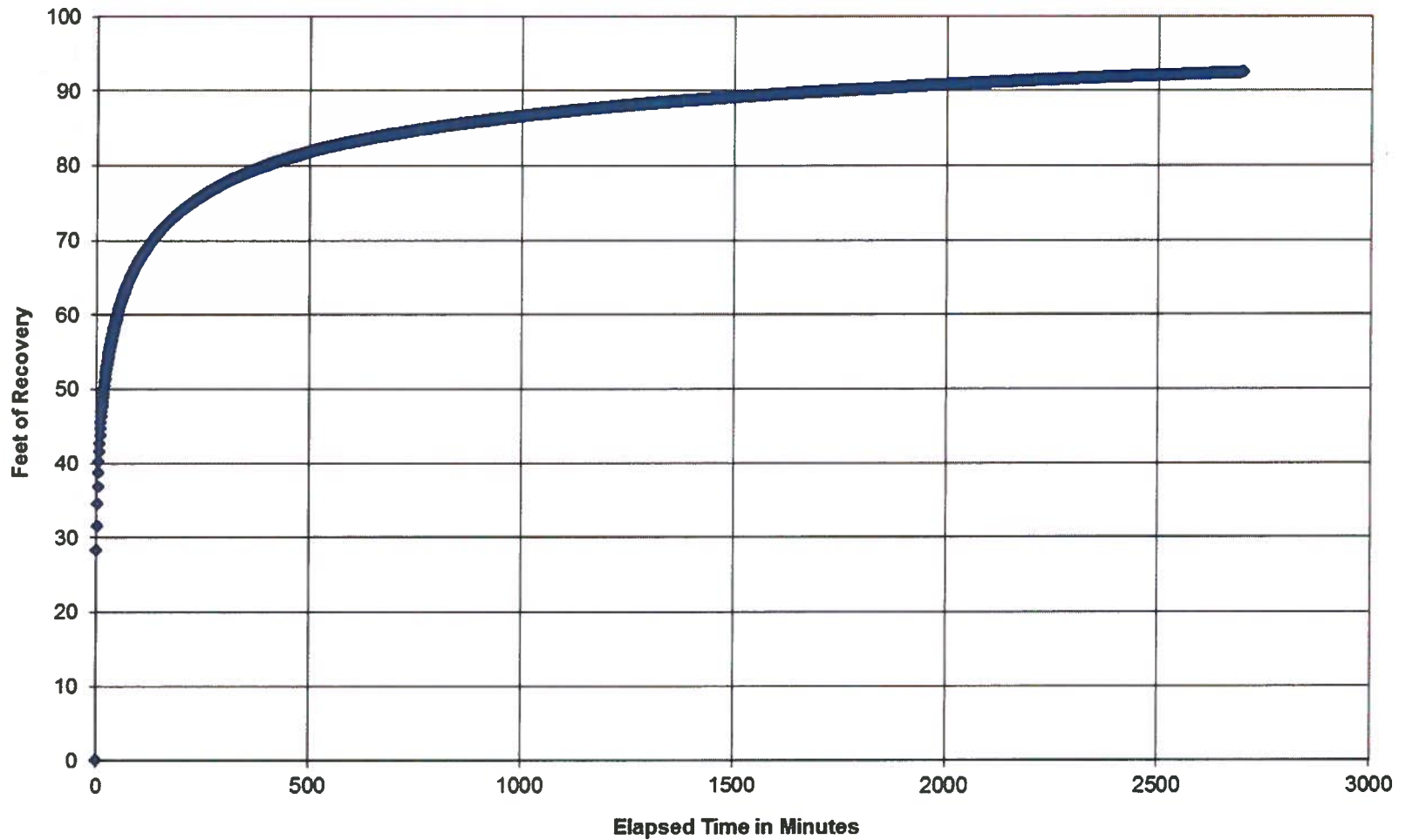


**Jeff Thomas 2005 Irrigation Well Response to Pumping at 1000 gpm,
June 18 through June 25, 2005**





Recovery Test Jeff Thomas Well 1000 gpm





Attachment 3

AQTESOLV PLOTS

Jeff Thomas Water Well



Clearwater Geosciences, LLP
Ground Water Development and Exploration

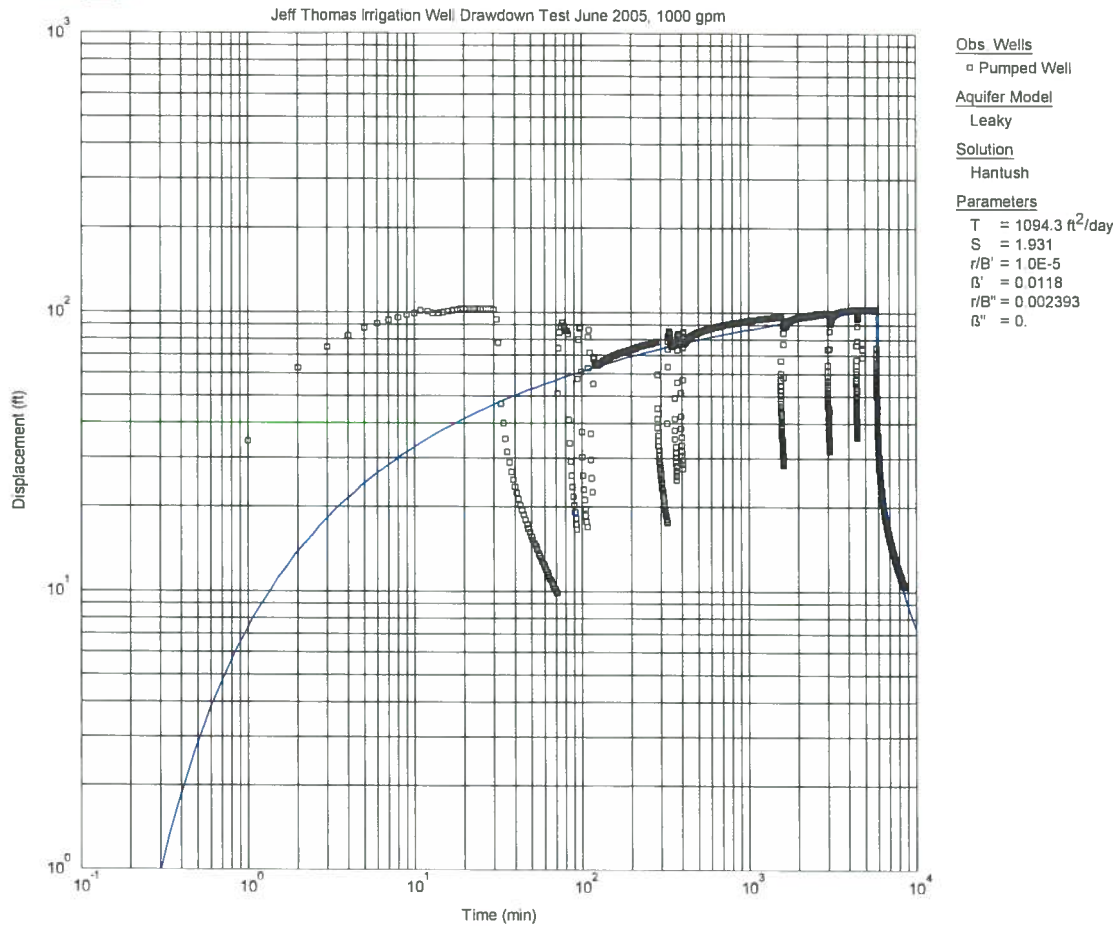


Figure 3-1 leaky confined match to drawdown data.

Residual statistics:

Mean = -0.008229

Var. = 134.9

S.E. = 11.61

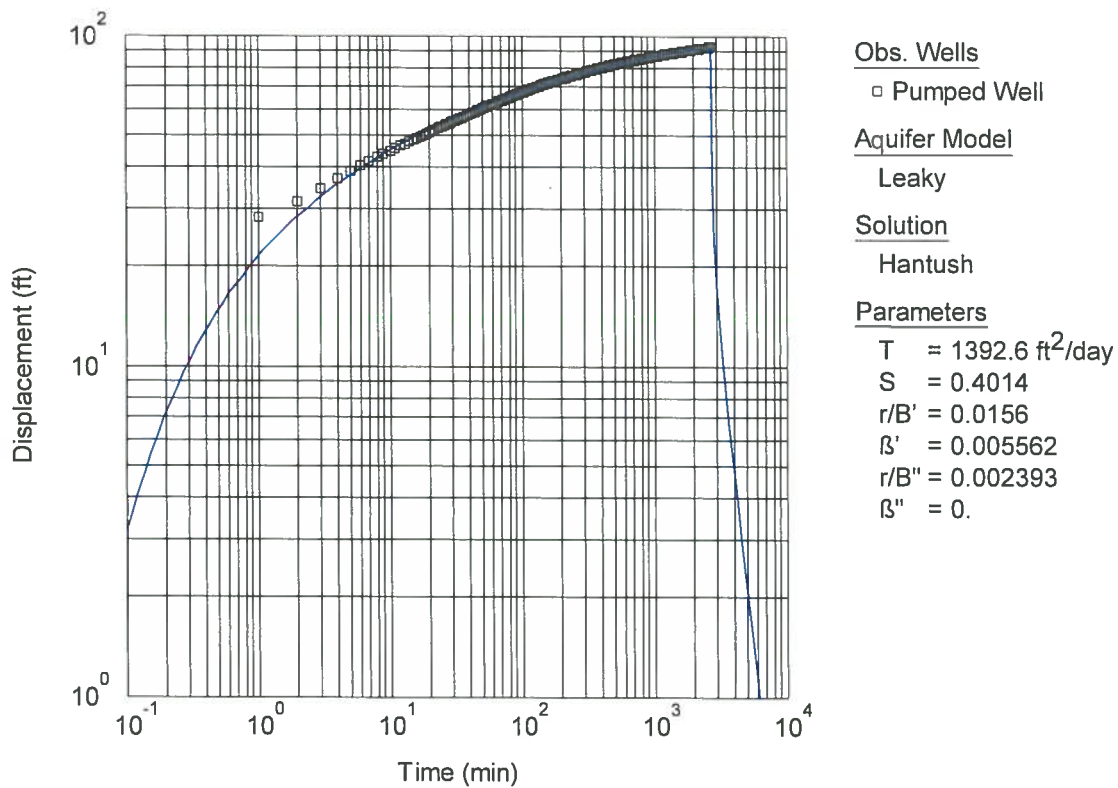


Figure 3-2 leaky confined match to recovery data.

Residual statistics:
Mean = -0.0001279
Var. = 0.08975
S.E. = 0.2996

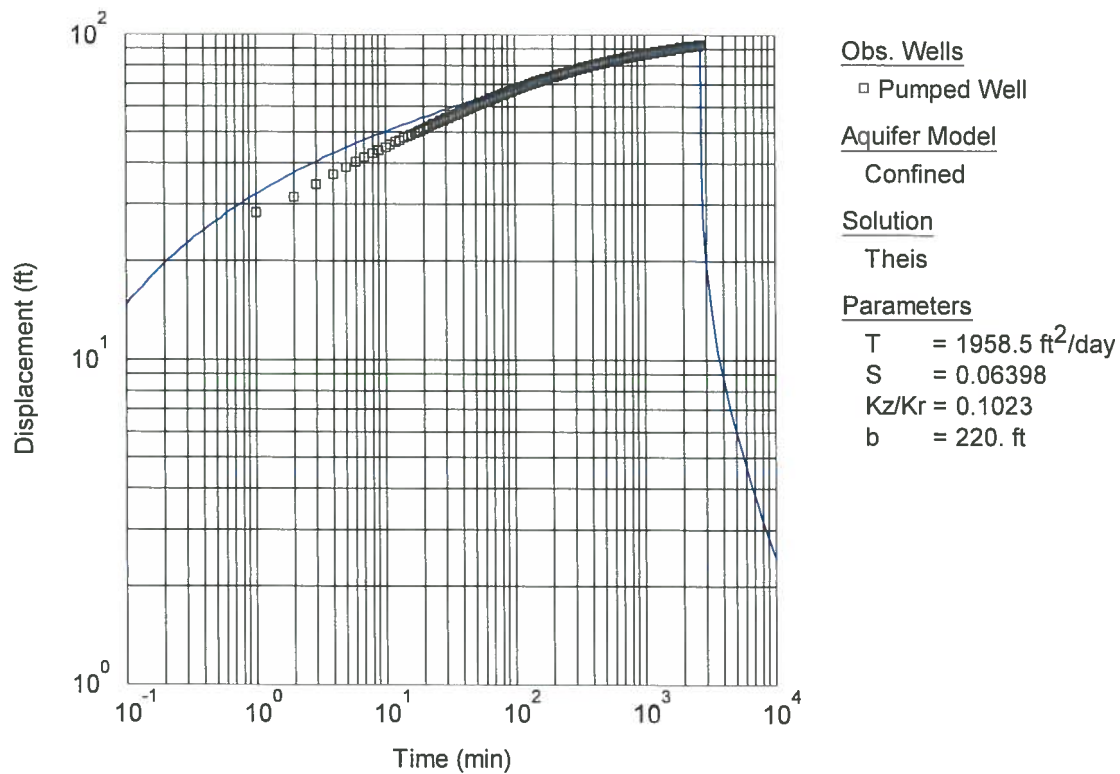


Figure 3-3 Theis confined match to recovery data.

Residual statistics:
Mean = -0.0005663
Var. = 1.046
S.E. = 1.023



Attachment 4

AQUIFER IMPACT ANALYSIS



Table 4-1. Locations for various boundary corners and wells used in the AQESOLV simulation.

Location	x	y
North Corner	0	40,000
East Corner	25,000	40,000
West Corner	0	0
South Corner	25,000	-
Edwards POD	12,890	31,200
Well 0.5 mile South	12,890	28,560

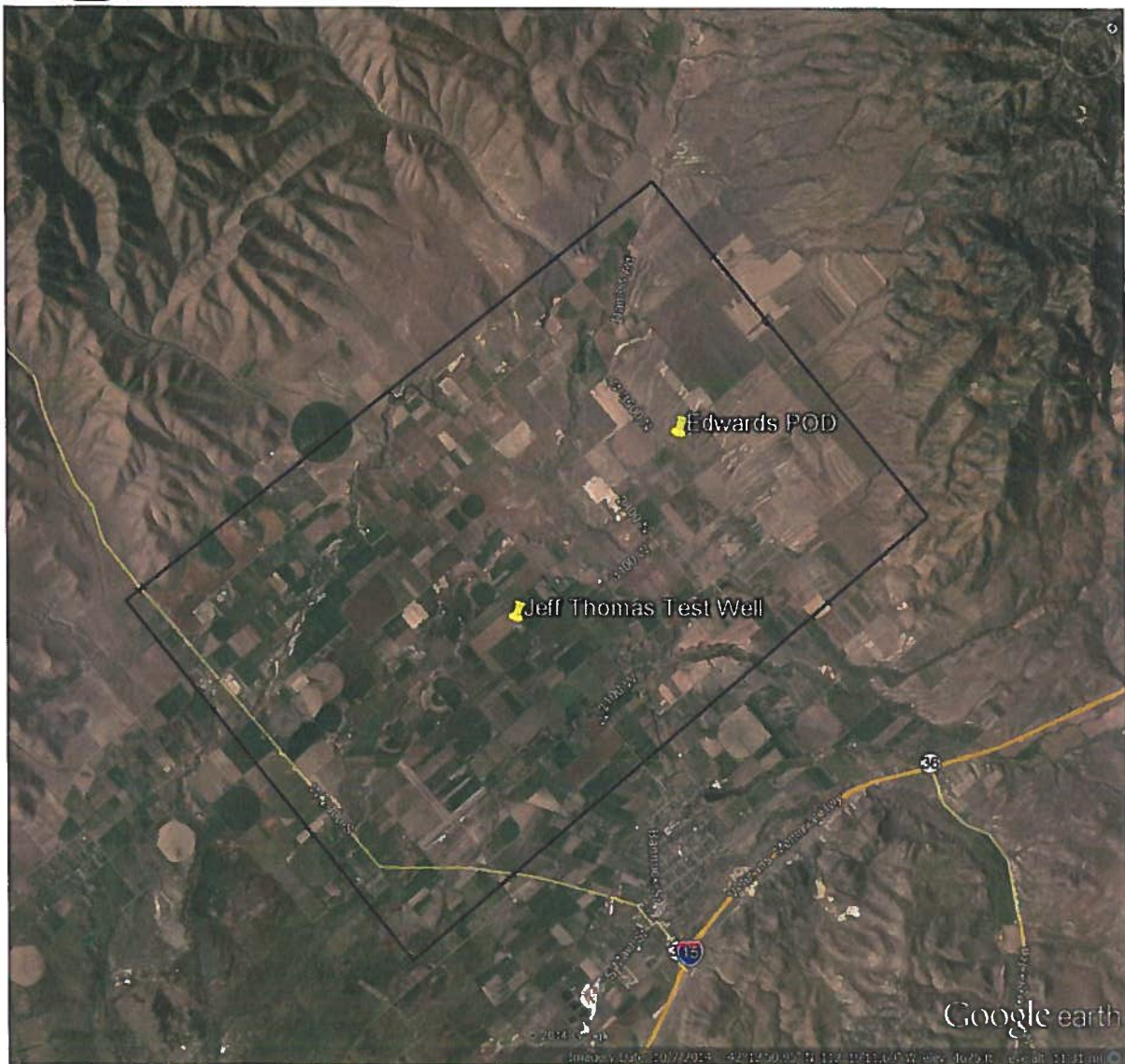


Figure 4-1 Outline of the boundaries used in the AQTESOLV forward solution calculation.

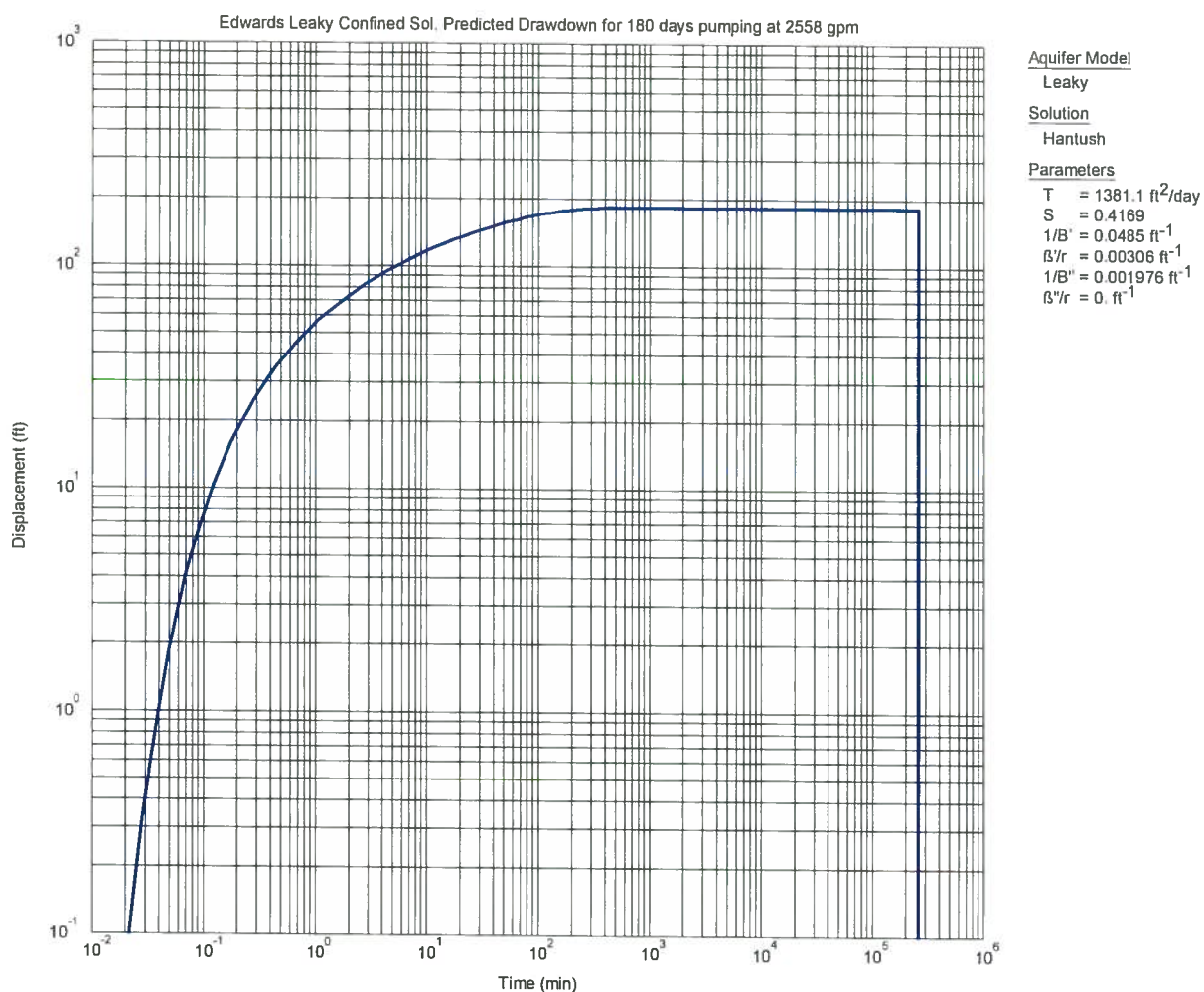


Figure 4-2. Leaky confined predictive plot of drawdown at 2598 gpm or 5.7 cfs for the full period of use 180 days. The black line is for the water level in the proposed Edwards Well pumping and the blue line is the water level predicted in a well ½ mile southwest of the proposed Edwards Well.

Key to line colors

- Blue Imaginary well ½ mile southwest of the proposed POD
- Black Proposed POD for Edwards

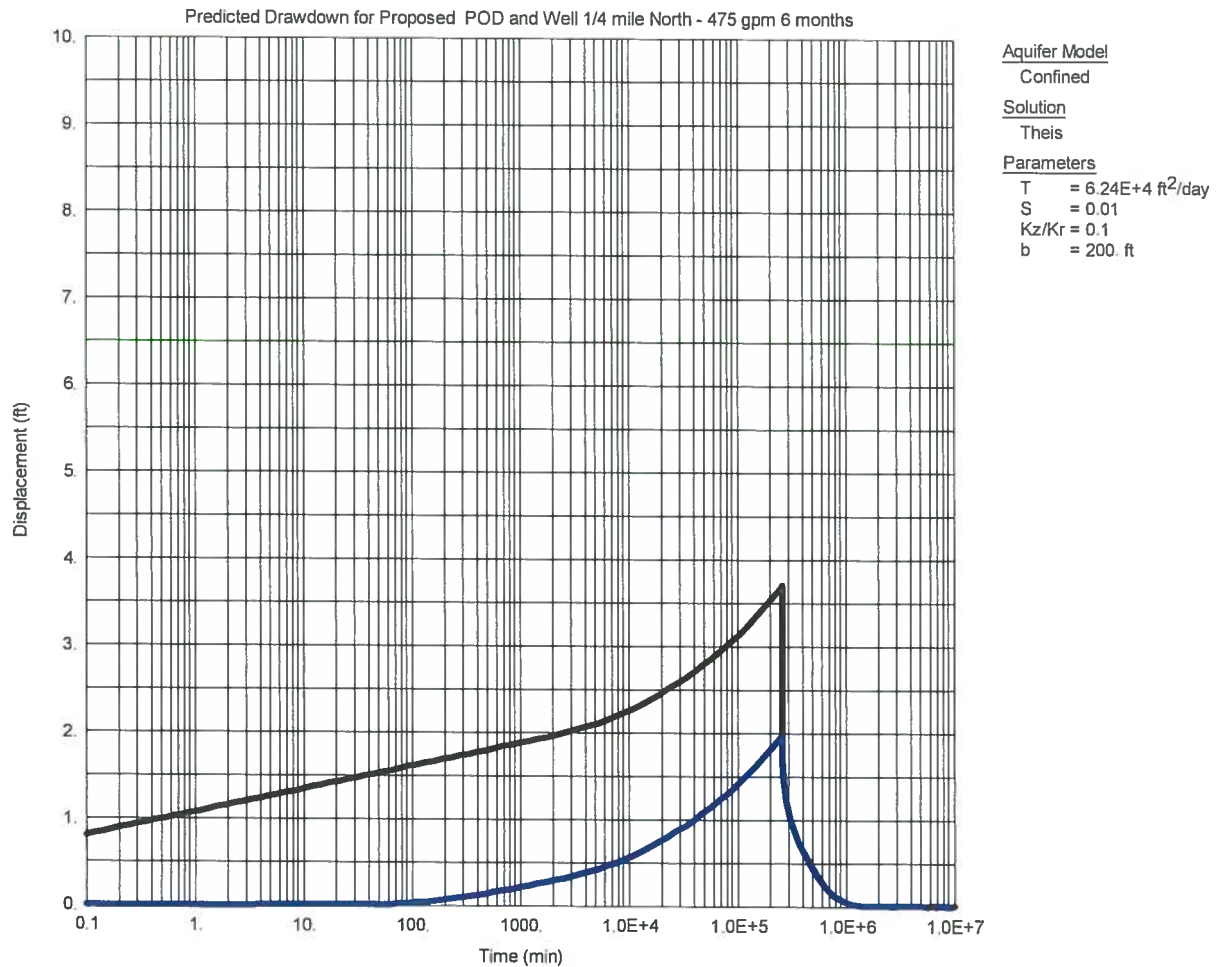


Figure 4-4 Predictive plot of drawdown at **475 gpm or 1 cfs for 180 days**. The red line is for the water level in the proposed Edwards Well pumping and the blue line is the water level predicted in a well 1/4 mile north of the proposed Edwards Well.

Key to line colors

- Blue Imaginary well 1/4 mile north of the proposed POD
Black Proposed POD for Edwards