HYDROLOGY HYDRAULICS WATER RIGHTS PROJECT MANAGEMENT STRUCTURAL DESIGN
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STREAM CHANNEL ALTERATIONS CIVIL ENGINEERING FLOOD PLAIN MODELING

Tanner Lane Ranch
Water Supply Bank Rental Application Report

Prepared by: Jason C. Helms, P.E.
Date: April 8, 2014

General Information

Tanner Lane Ranch is seeking water supply bank rental of ground water within Sections 27 and 34 of Township 2 South, Range 36 East as shown on the map in cluded with the application for rental. This report seeks to provide local hydrologic data in support of the rental of existing water rights 27-7071 and 27-7072. The location of the leased water rights in relation to the requested rental are shown on **Attachment #1**.

It is generally considered that diversion of tributary surface water rights from ground water sources cannot be approved due to inherent differences in the availability of the source supply. This specific location however, shows close hydraulic connection between the Blackfoot River and appears ideal to produce an appropriate reduction in reach gains to the Blackfoot River system through diversion of ground water from wells in close proximity. Both the leased water rights and the rental diversion location are directly tributary to the Eastern Snake River Plain Aquifer (ESPA).

Primary sources of information used in preparation of this report are previous studies referenced at the end of this report in addition to available ground water level information available from the United States Geological Survey (USGS) National Water Information System.

Local Observation Wells & Ground Water Level Trends

Mass ground water level measurements taken from a large number of wells over a period of just a few days have been repeated in this area multiple times. Evaluation of available water table monitoring data at a scale of 1:100,000 showing relative ground elevation in the location of the proposed rental is shown on **Attachment #2**.

Attachment #3 shows the historical water table trends in several local wells that include long-term measurements. According to the available monitoring data, the water

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table in this area appears relatively stable; particularly over the last 10 years, although all wells show a reduction in peak and minimum measured water table elevations of three to five feet over the period of record. Seasonal variation from the annual impacts of irrigation diversions in the local area is apparent with a minimum water table elevation occurring in the spring and a peak water table elevation as much as 20 feet higher as a result of the accumulated seepage of surface water diversions for irrigation. According to the data, the water table in this area averaged 12 feet higher in the fall than the spring of 2008 and has actually risen an average of one foot overall in the five years between the spring, 2008 and spring, 2013 mass measurements.

Surface Water-Ground Water Connectivity

Interpolation of the water depth data relative to the reported elevation of the observation well head approximates the water surface of the local regional water table. The three most recent mass measurements in this area were collected in April of 2008, October of 2008 and April of 2013. **Attachment #4** summarizes the three most recent mass water level measurements including the reported well head elevation, observation dates and depth to water.

Attachment #5 shows the calculated water table depth contours from the April, 2008 measurements relative to the USGS Digital Elevation Model (DEM). While the contours are only approximate, it is clear the ground water elevation significantly exceeds the elevation of the incised Blackfoot River channel along the southeast portion of the Tanner Lane Ranch property. This is confirmed throughout the area by the presence of a multitude of ponds which may have otherwise been considered to be filled from surface water sources. Evaluation of the combined data also reveals a significant water table mound at the mouth of the Blackfoot River canyon indicating ground water flowing even to the north along the east edge of the property although the data is sparse in this area.

Attachment #6 shows the calculated water table depth contours from the October, 2008 measurements relative to the USGS Digital Elevation Model (DEM). Once again, it is clear the ground water is draining to the Blackfoot River and the additional seepage from irrigation in the area is increasing the water table elevation even further. According to the interpolation of late season data it is actually somewhat surprising that the southeast property isn't flooded every fall and there must be

significant drainage to the Blackfoot River in this location as the river stage recedes keeping the lower portions of the property dry.

Attachment #7 shows the calculated water table depth contours from the most recent mass measurement during April, 2013 relative to the USGS Digital Elevation Model (DEM). The results are very similar to the April, 2008 measurement although the water table is raised slightly in some areas while others have decreased. Overall, the average recorded depth to water is approximately 1 foot higher than the measurement 5 years prior and may be the result of recent local precipitation or aggregate reduced water demand from the local aquifer in preceding years.

Conclusion

According to the results of the analysis, an area along the south east boundary of the property is apparent where the water table elevation continuously exceeds the ground surface indicating year-round drainage into the incised channel of the Blackfoot River. The presence of historical perennial ponds within Sections 5, 6, 7 and 8 of Township 3 south, Range 36 East confirm this condition extends much further to the southwest than can be determined from the data which is sparse in this area.

According to the nature of ground water flow, diversions from the proposed rental well will correspond primarily with local depletions to the Blackfoot River within a few miles of the property as the overall gradient to the river is decreased as a result of the water table drawdown from pumping. Existing wells in the area are capable of producing significant amounts of water (2,000-3,000 gpm) from the alluvial formation in this area so the effects of time lag between the well diversions and reduced gains to the river will be negligible. The rental of a portion of existing water rights 27-7071 and/or 27-7072 which are directly tributary to the Blackfoot Reservoir appears appropriate for the proposed use and authorization of the rental is unlikely to cause any injury to existing water rights with proper monitoring and reporting.

List of Attachments:

Attachment #1: Map: Existing Lease & Proposed Rental Well Locations

Attachment #2: Map: Ground Elevation & Local Observation Well Locations

Attachment #3: Charts: Local USGS Monitoring Well Water Level Data

Attachment #4: Table: Local USGS Monitoring Well Water Level Data

Attachment #5: Map: April, 2008 Calculated Water Table Elevation

Attachment #6: Map: October, 2008 Calculated Water Table Elevation

Attachment #7: Map: April, 2013 Calculated Water Table Elevation

References:

Garabedian, S.P., 1992, *Hydrology and digital simulation of the regional aquifer system, eastern Snake River Plain, Idaho*: U.S. Geological Survey Professional Paper 1408-F, 102 p., 10 pls. (Also available at http://pubs.usgs.gov/pp/1408f/.)

Whitehead, R.L., 1992, *Geohydrologic framework of the Snake River Plain regional aquifer system, Idaho and eastern Oregon*. U.S. Geological Survey Professional Paper 1408-B, 32 p., 6 pls.

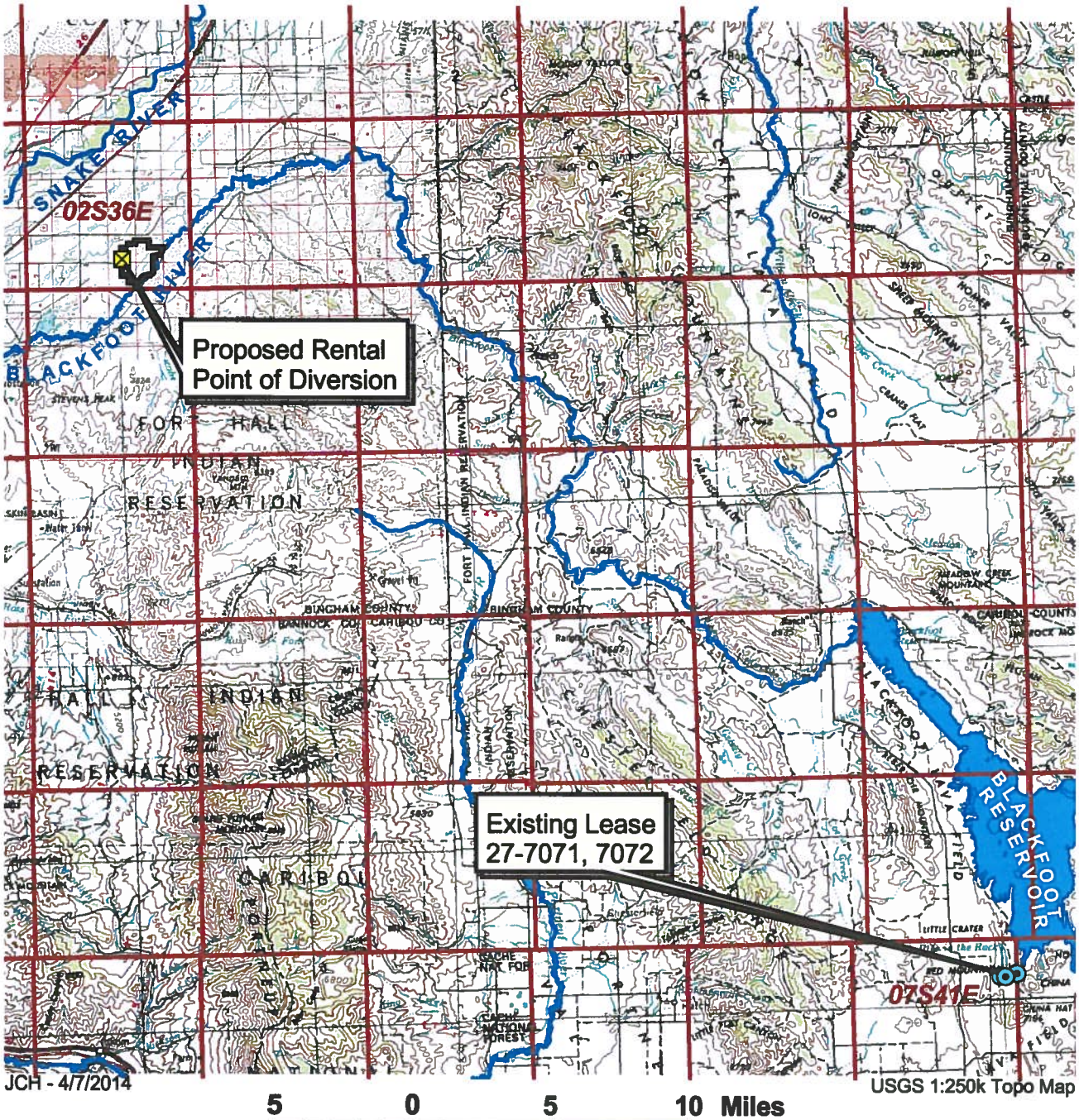
Lindholm, G.F., 1996, *Summary of the Snake River Plain Regional Aquifer-System Analysis in Idaho and Eastern Oregon.* U.S. Geological Survey Professional Paper 1408-A, 68 p., 1 pls.

U.S. Geological Survey, 2013c, *National Water Information System—Web interface*, USGS water data for Idaho: U.S. Geological Survey database, accessed April, 2014, at http://waterdata.usgs.gov/id/nwis/nwis.

Desborough, George A.; Raymond, W. H.; Marvin, R. F.; Kellogg, K. S., 1992 *Pleistocene sediments and basalts along the Snake River in the area between Blackfoot and Eagle Rock, southeastern Snake River Plain, southeastern Idaho.* USGS Open-File Report: 89-436

Kjelstrom, L. C., 1988, *Estimates of gains and losses for reservoirs on the Snake River from Blackfoot to Milner, Idaho, for selected periods, 1912 to 1983.* USGS Water-Resources Investigations Report: 87-4063

Dion, N. P., 1974, *An Estimate of Leakage From Blackfoot Reservoir to Bear River Basin, Southeastern Idaho.* Water Information Bulletin No. 34.



- Rental Well (Twp. 2S, Rng. 36E, Section 27)
- 27-7071, 27-7072 Authorized Points of Diversion
- Tanner Lane Ranch Property
- Township & Range

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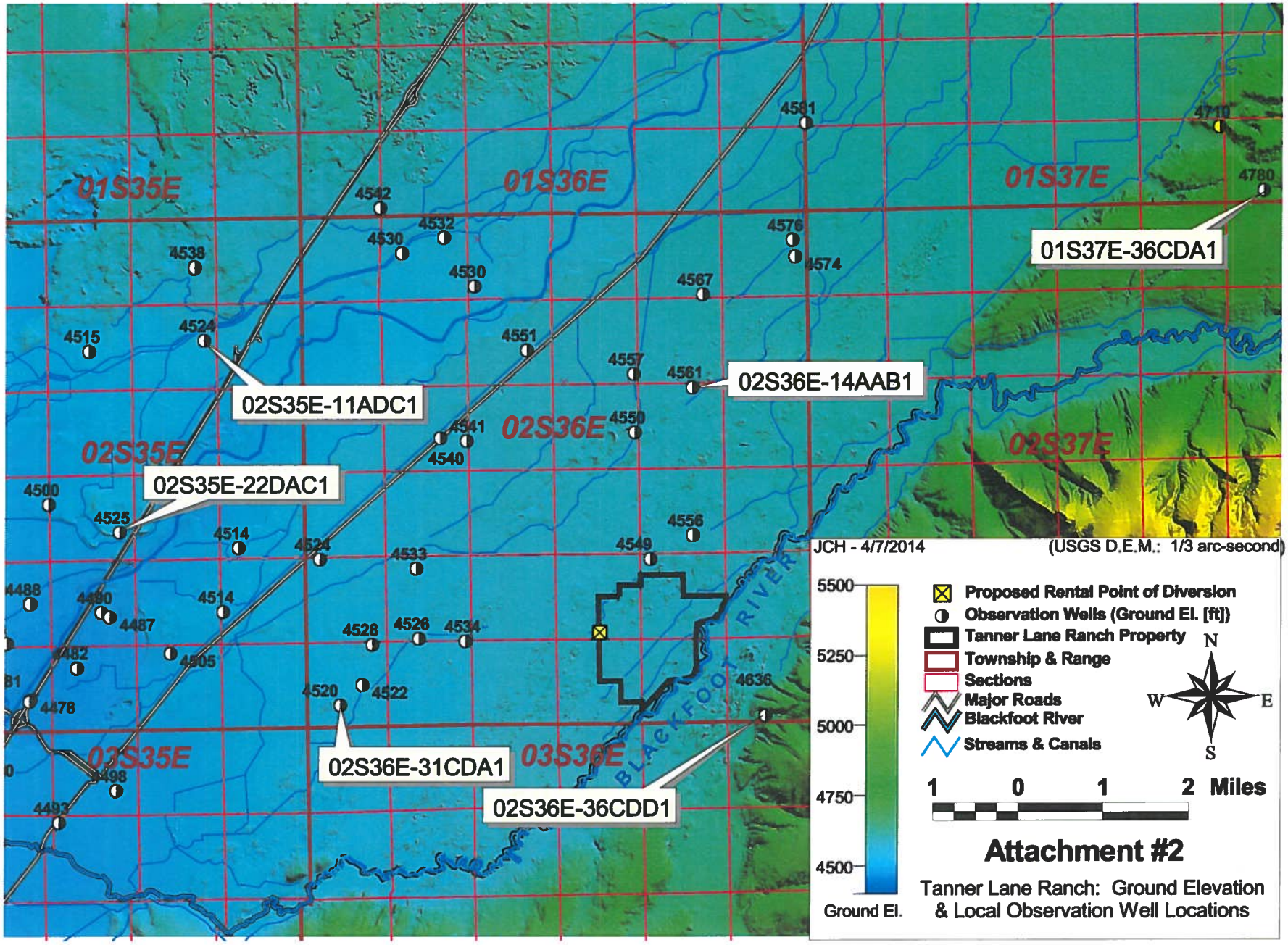
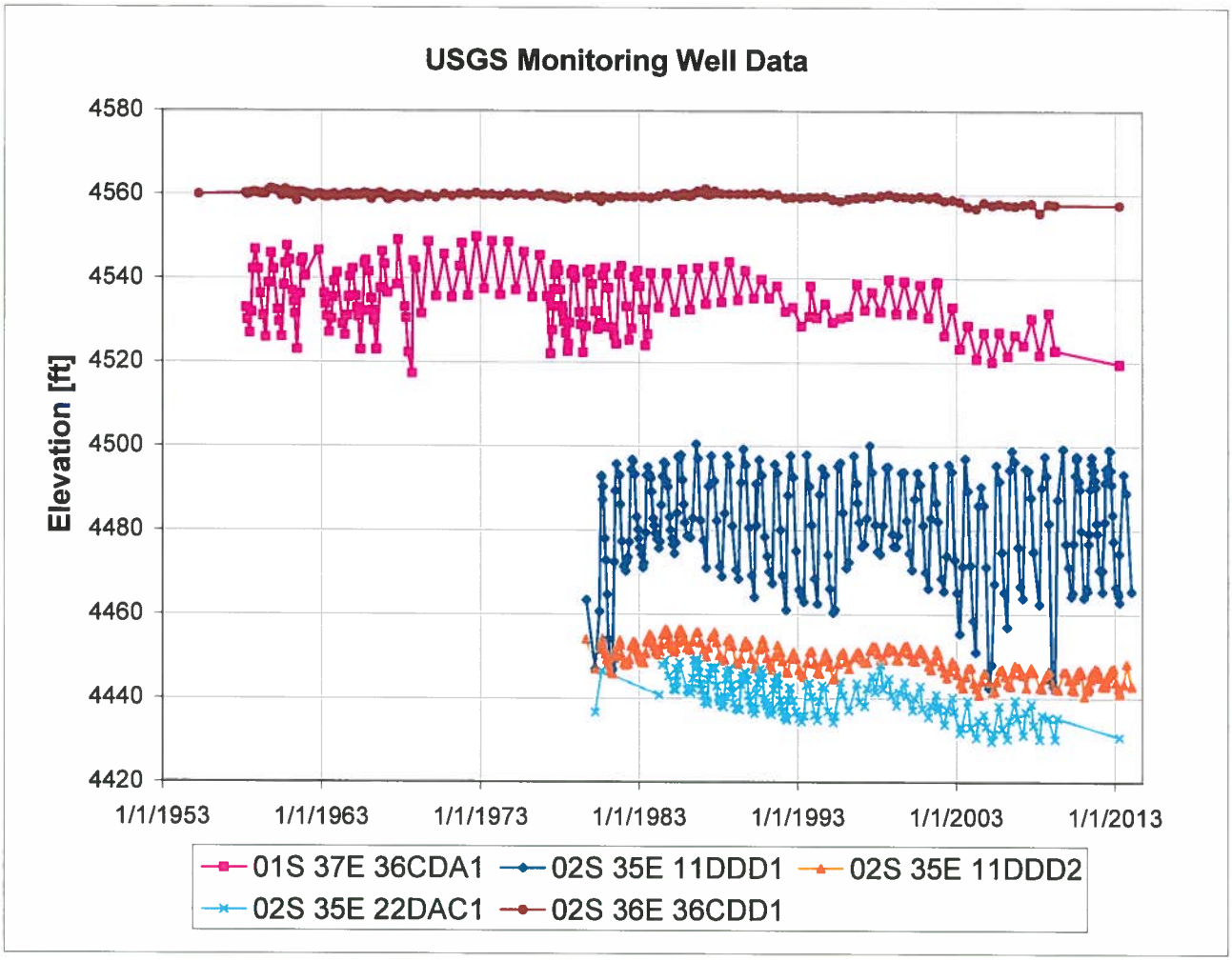
Attachment #1

Tanner Lane Ranch: Existing Lease & Proposed Rental Locations



Attachment #2

Tanner Lane Ranch: Ground Elevation & Local Observation Well Locations



Attachment #3

Local Historical Monitoring Well Data

JCH - 4/7/2014

Observation Well	Ground Elevation	Date	Observed Depth	Elevation	Date	Observed Depth	Elevation	Change from 4/2008	Date	Depth	Elevation	Change from 4/2008
01S 36E 32CCC2	4542	4/3/2008	59.88	4482.12	10/23/2008	56.85	4485.15	3.0	4/10/2013	59.02	4482.98	0.9
01S 37E 30CCD1	4581	4/2/2008	46.16	4534.84	10/23/2008	25.24	4555.76	20.9	4/10/2013	45.57	4535.43	0.6
01S 37E 35AAA1	4710	4/2/2008	197.64	4512.36	10/23/2008	190.53	4519.47	7.1	4/9/2013	196.61	4513.39	1.0
01S 37E 36CDA1	4780	4/2/2008	258.16	4521.84	10/23/2008	248.14	4531.86	10.0	4/9/2013	260.35	4519.65	-2.2
02S 35E 02DAB1	4538	4/2/2008	91.38	4446.62	10/23/2008	88.86	4449.14	2.5	4/15/2013	91.59	4446.41	-0.2
02S 35E 09BCC1	4499	4/2/2008	73.47	4425.53	10/29/2008	71.83	4427.17	1.6	4/9/2013	73.33	4425.67	0.1
02S 35E 10CAA1	4515	4/2/2008	83.27	4431.73								
02S 35E 11ADC1	4524	4/2/2008	79.84	4444.16	10/28/2008	76.43	4447.57	3.4	4/9/2013	79.52	4444.48	0.3
02S 35E 11DDD1	4518.38	4/2/2008	55.93	4462.45	11/4/2008	36.55	4481.83	19.4	4/10/2013	55.45	4462.93	0.5
02S 35E 11DDD2	4518.38	4/2/2008	75.76	4442.62	11/4/2008	71.78	4446.60	4.0	4/10/2013	76.85	4441.53	-1.1
02S 35E 11DDD3	4518.38	4/2/2008	76.39	4441.99	11/4/2008	71.28	4447.10	5.1	4/11/2013	76.4	4441.98	0.0
02S 35E 11DDD4	4518.38	4/2/2008	76.76	4441.62	11/4/2008	71.66	4446.72	5.1	4/11/2013	76.8	4441.58	0.0
02S 35E 20DCB1	4490	4/1/2008	72.60	4417.40	10/29/2008	70.09	4419.91	2.5	4/9/2013	72.61	4417.39	0.0
02S 35E 21ADA1	4500	4/2/2008	83.28	4416.72	10/29/2008	79.56	4420.44	3.7	4/9/2013	82.93	4417.07	0.3
02S 35E 22DAC1	4525	4/1/2008	94.73	4430.27	10/29/2008	89.65	4435.35	5.1	4/9/2013	94.22	4430.78	0.5
02S 35E 24CCD1	4514	4/3/2008	43.08	4470.92	10/23/2008	25.84	4488.16	17.2	4/11/2013	42.26	4471.74	0.8
02S 35E 25CBCC1	4513.5	4/3/2008	63.11	4450.39	10/23/2008	43.46	4470.04	19.6	4/11/2013	62.05	4451.45	1.1
02S 35E 27DBA1	4490	4/3/2008	46.42	4443.58	10/24/2008	25.57	4464.43	20.9	4/11/2013	44.7	4445.3	1.7
02S 35E 27DBDA1	4487.44	4/3/2008	46.21	4441.23	10/24/2008	24.93	4462.51	21.3	4/11/2013	44.49	4442.95	1.7
02S 35E 28CDD1	4483	4/10/2008	58.19	4424.81	10/29/2008	43.62	4439.38	14.6	4/9/2013	54.01	4428.99	4.2
02S 35E 28DBAA1	4487.59	4/1/2008	62.71	4424.88	10/28/2008	53.85	4433.74	8.9	4/9/2013	61.62	4425.97	1.1
02S 35E 30DCD1	4474.12	4/3/2008	54.65	4419.47	10/23/2008	50.72	4423.40	3.9	4/10/2013	54.28	4419.84	0.4
02S 35E 31DDC2	4462	4/3/2008	43.08	4418.92	10/23/2008	35.16	4426.84	7.9	4/10/2013	41.73	4420.27	1.4
02S 35E 32ACC1	4476.9	4/3/2008	52.57	4424.33	10/23/2008	41.30	4435.60	11.3	4/10/2013	50.49	4426.41	2.1
02S 35E 32BAA1	4481.3	4/10/2008	57.32	4423.98	10/29/2008	48.12	4433.18	9.2	4/9/2013	55.67	4425.63	1.6
02S 35E 32CCCD1	4469.69	4/3/2008	46.45	4423.24	10/23/2008	36.51	4433.18	9.9	4/10/2013	45.05	4424.64	1.4
02S 35E 32CDAC1	4471	4/3/2008	47.56	4423.44	10/23/2008	35.32	4435.68	12.2	4/10/2013	44.37	4426.63	3.2
02S 35E 32DDCB1	4475.09	4/3/2008	47.45	4427.64	10/23/2008	33.85	4441.24	13.6	4/10/2013	44.18	4430.91	3.3
02S 35E 33BCBD1	4481.27	4/1/2008	54.97	4426.30	10/29/2008	42.88	4438.39	12.1	4/9/2013	52.58	4428.69	2.4
02S 35E 33BCBD2	4481	4/1/2008	55.15	4425.85	10/29/2008	44.22	4436.78	10.9	4/9/2013	52.58	4428.42	2.6
02S 35E 33CABC3	4482.01	4/1/2008	54.46	4427.55	10/29/2008	42.28	4439.73	12.2	4/9/2013	54.29	4427.72	0.2
02S 35E 33DABC1 M	4478.26	4/4/2008	16.60	4461.66	10/24/2008	6.15	4472.11	10.5	4/11/2013	12.98	4465.28	3.6
02S 35E 33DACB1 M	4477.88	4/4/2008	16.03	4461.85	10/24/2008	5.90	4471.98	10.1	4/11/2013	7.71	4470.17	8.3

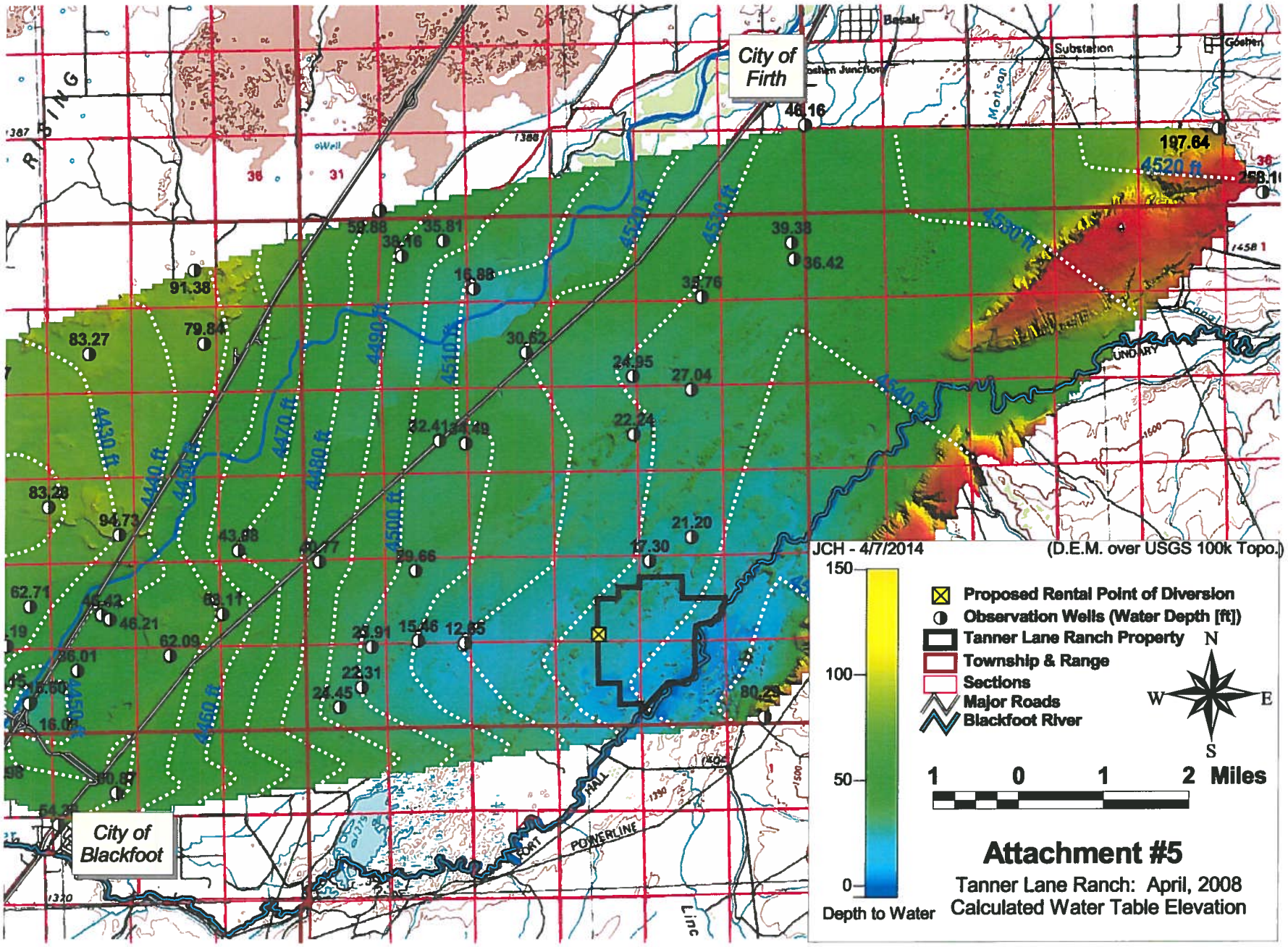
Attachment #4

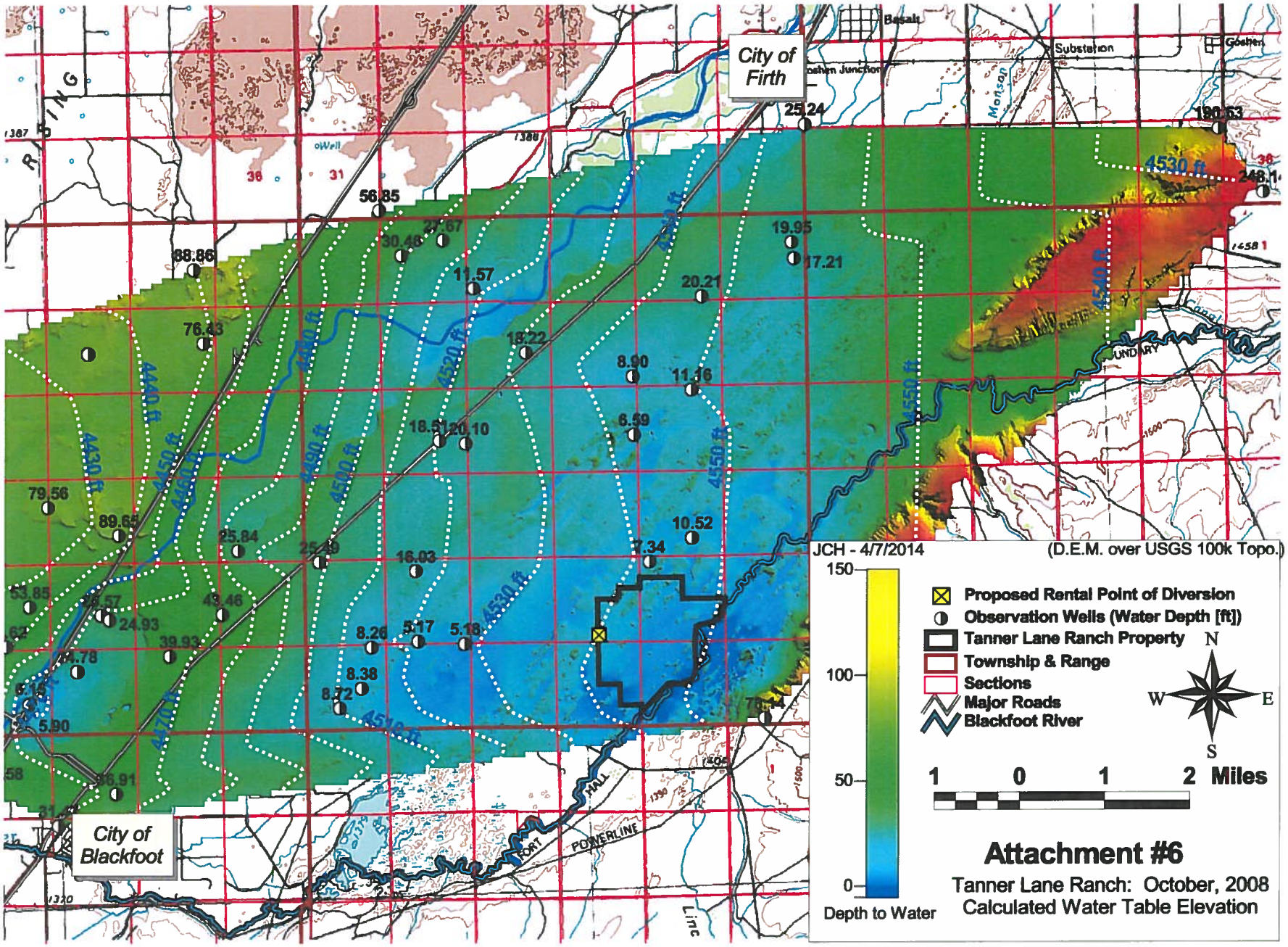
Tanner Lane Ranch Area: Recent Observation Well Mass Measurements

Observation Well	Ground Elevation	Date	Observed Depth	Elevation	Date	Observed Depth	Elevation	Change from 4/2008	Date	Depth	Elevation	Change from 4/2008
02S 35E 34BDBA1	4481.93	4/4/2008	36.01	4445.92	10/24/2008	14.78	4467.15	21.2	4/11/2013	28.1	4453.83	7.9
02S 35E 35BAA1	4505	4/3/2008	62.09	4442.91	10/24/2008	39.93	4465.07	22.2	4/11/2013	60.67	4444.33	1.4
02S 36E 01AAC1	4576	4/2/2008	39.38	4536.62	10/23/2008	19.95	4556.05	19.4	4/11/2013	39.07	4536.93	0.3
02S 36E 01DAA2	4574	4/2/2008	36.42	4537.58	10/23/2008	17.21	4556.79	19.2	4/11/2013	36.14	4537.86	0.3
02S 36E 02DDC1	4567	4/2/2008	35.76	4531.24	10/23/2008	20.21	4546.79	15.6	4/11/2013	36.49	4530.51	-0.7
02S 36E 04CCB1	4530	4/3/2008	16.88	4513.12	10/28/2008	11.57	4518.43	5.3	4/11/2013	13.9	4516.1	3.0
02S 36E 05ACA1	4532	4/3/2008	35.81	4496.19	10/23/2008	27.67	4504.33	8.1	4/11/2013	32.38	4499.62	3.4
02S 36E 05BDC1	4530	4/3/2008	38.16	4491.84	10/23/2008	30.46	4499.54	7.7	4/11/2013	34.79	4495.21	3.4
02S 36E 09DAB1	4551	4/3/2008	30.62	4520.38	10/23/2008	18.22	4532.78	12.4	4/11/2013	30.98	4520.02	-0.4
02S 36E 10CCC1	4549	4/2/2008	26.39	4522.61								
02S 36E 11CCC1	4557	4/2/2008	24.95	4532.05	10/23/2008	8.90	4548.10	16.1	4/11/2013	24.45	4532.55	0.5
02S 36E 14AAB1	4561	4/2/2008	27.04	4533.96	10/23/2008	11.16	4549.84	15.9	4/11/2013	26.74	4534.26	0.3
02S 36E 15DAA1	4550	4/3/2008	22.24	4527.76	10/23/2008	6.59	4543.41	15.6	4/11/2013	21.62	4528.38	0.6
02S 36E 16CBB1	4541	4/2/2008	34.49	4506.51	10/23/2008	20.10	4520.90	14.4	4/11/2013	35.46	4505.54	-1.0
02S 36E 17DBD1	4540	4/2/2008	32.41	4507.59	10/23/2008	18.51	4521.49	13.9	4/11/2013	30.62	4509.38	1.8
02S 36E 23ADC1	4556	4/3/2008	21.20	4534.80	10/23/2008	10.52	4545.48	10.7	4/11/2013	20.7	4535.3	0.5
02S 36E 26BBA1	4549	4/3/2008	17.30	4531.70	10/23/2008	7.34	4541.66	10.0	4/11/2013	16.39	4532.61	0.9
02S 36E 29BAC1	4533	4/3/2008	29.66	4503.34	10/23/2008	16.03	4516.97	13.6	4/11/2013	29.06	4503.94	0.6
02S 36E 29DCC1	4526	4/3/2008	15.46	4510.54	10/23/2008	5.17	4520.83	10.3	4/11/2013	14.95	4511.05	0.5
02S 36E 30BBA1	4524	4/3/2008	40.77	4483.23	10/23/2008	25.49	4498.51	15.3	4/11/2013	40.01	4483.99	0.8
02S 36E 31AAA1	4528	4/3/2008	23.91	4504.09	10/23/2008	8.26	4519.74	15.6	4/11/2013	23.18	4504.82	0.7
02S 36E 31CDA1	4520	4/3/2008	24.45	4495.55	10/23/2008	8.72	4511.28	15.7	4/11/2013	23.81	4496.19	0.6
02S 36E 31DCA1	4522	4/3/2008	22.31	4499.69	10/23/2008	8.38	4513.62	13.9	4/11/2013	20.64	4501.36	1.7
02S 36E 32AAA1	4534	4/3/2008	12.65	4521.35	10/23/2008	5.18	4528.82	7.5	4/11/2013	12.33	4521.67	0.3
02S 36E 36CDD1	4636	4/3/2008	80.29	4555.71	10/23/2008	78.14	4557.86	2.1	4/11/2013	78.41	4557.59	1.9
03S 35E 03DAC1	4498	4/4/2008	60.87	4437.13	10/24/2008	36.91	4461.09	24.0	4/11/2013	59.72	4438.28	1.1
03S 35E 04CAD1	4490	4/4/2008	57.98	4432.02	10/24/2008	39.58	4450.42	18.4	4/11/2013	55.35	4434.65	2.6
03S 35E 10BBB1	4493	4/4/2008	54.38	4438.62	10/24/2008	31.47	4461.53	22.9	4/11/2013	52.95	4440.05	1.4

Attachment #4

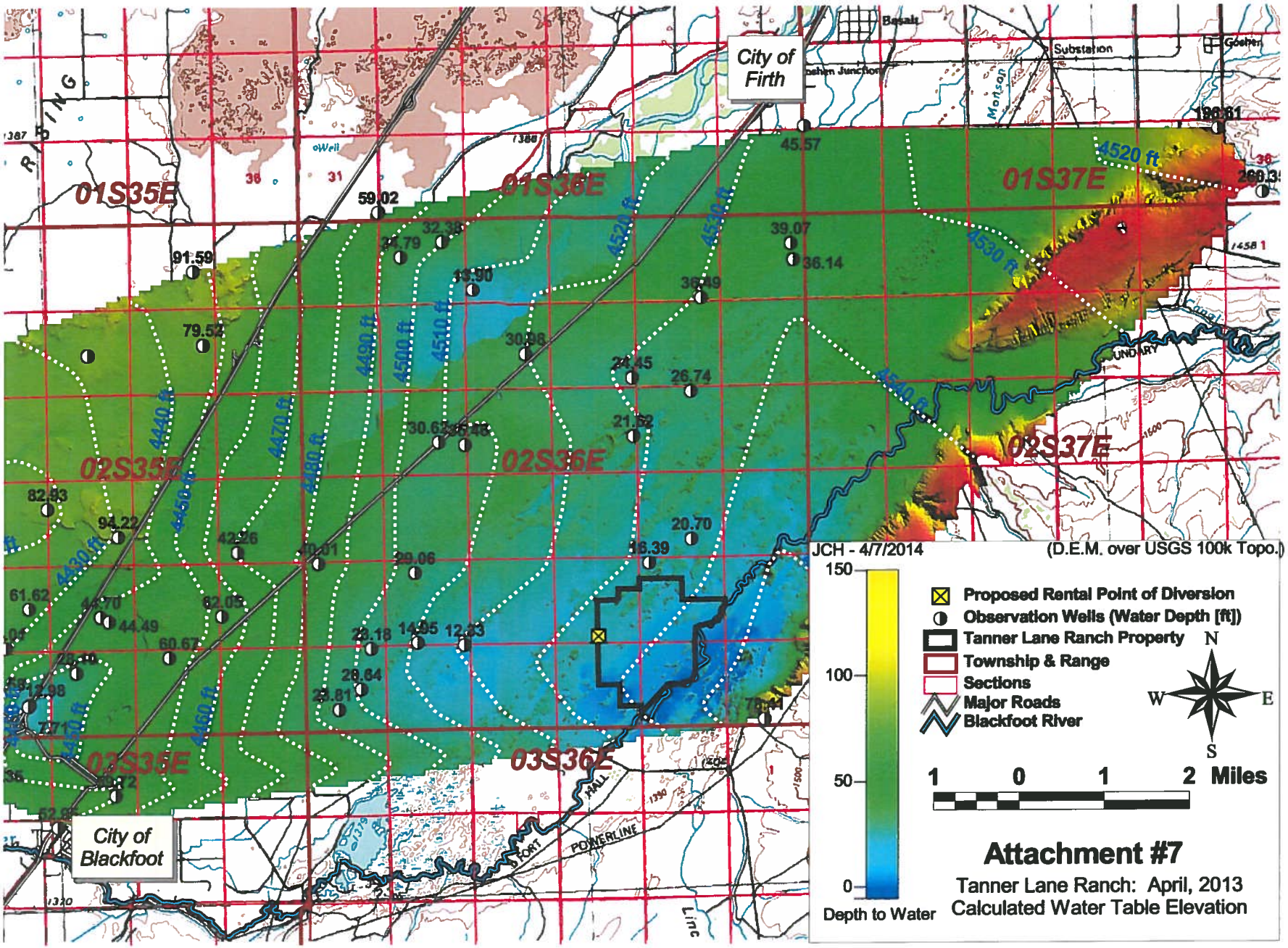
Tanner Lane Ranch Area: Recent Observation Well Mass Measurements


City of Firth
City of Blackfoot
JCH - 4/7/2014
(D.E.M. over USGS 100k Topo.)
150
100
50
0
Depth to Water
Proposed Rental Point of Diversion
Observation Wells (Water Depth [ft])
Tanner Lane Ranch Property
Township & Range
Sections
Major Roads
Blackfoot River
N
W
E
S
1 0 1 2 Miles
Attachment #5
Tanner Lane Ranch: April, 2008
Calculated Water Table Elevation



Attachment #6

Tanner Lane Ranch: October, 2008
Calculated Water Table Elevation


City of Firth
City of Blackfoot
01S35E
01S36E
01S37E
02S35E
02S36E
02S37E
03S35E
03S36E
4520 ft.
4530 ft.
4540 ft.
4500 ft.
4510 ft.
4490 ft.
4480 ft.
4470 ft.
4460 ft.
4450 ft.
4440 ft.
4430 ft.
JCH - 4/7/2014
(D.E.M. over USGS 100k Topo.)
150
100
50
0
Depth to Water
Proposed Rental Point of Diversion
Observation Wells (Water Depth [ft])
Tanner Lane Ranch Property
Township & Range
Sections
Major Roads
Blackfoot River
N
W
E
S
1 0 1 2 Miles
Attachment #7
Tanner Lane Ranch: April, 2013
Calculated Water Table Elevation