

Saxton, Craig

From: Charles G. Brockway [charles.g.brockway@brockwayeng.com]
Sent: Wednesday, January 25, 2012 11:29 AM
To: Saxton, Craig; Keen, Shelley
Cc: Jim Speck; 'Connie Kemmerer'
Subject: 37-8752 diversion volume
Attachments: Tech memo - diversion volume 37-8752.pdf

Craig and Shelley,

Attached is an analysis of power records and calculation of diversion volume relative to crop water requirements in support of the licensing of 37-8752. This information is being provided pursuant to our telephone discussion a few weeks ago.

Please review this information and determine whether it will be sufficient to allow licensing of this water right. If not, please let Jim Speck and me know as soon as possible.

Thanks,
Chuck

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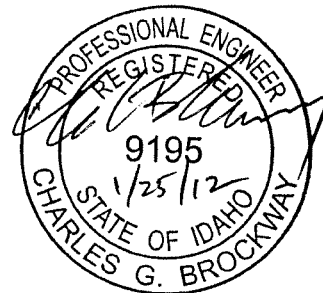
All information, calculations, maps, drawings, or other documents transmitted via e-mail are preliminary unless explicitly stated in the e-mail text or in the documents themselves.



BROCKWAY
ENGINEERING
P.L.L.C.

Technical Memorandum

DATE: January 25, 2012
TO: Craig Saxton, Shelley Keen
CC: Jim Speck
FROM: Charles G. Brockway, P. E.
SUBJECT: Flowers Bench water right licensing / 37-8752



Records of power consumption were obtained from Idaho Power for the years 2004-2011. At this time, these are the only records available. The methodology for estimating volumetric water withdrawal from these records is described in this memo. Data and calculations are shown on the attached spreadsheet, pump curve, and well drilling record.

1. A power consumption coefficient (PCC) for the irrigation well has not been determined by field measurements. Therefore, a PCC was estimated from known data regarding the pumping lift, discharge pressure, and pump performance curve using the following procedure:

At the time of the well drilling in 1992, the static water level was 25 feet below ground. The well delivered 400 gpm at 135 ft of drawdown which equates to a specific capacity of 2.96 gpm/ft. Assuming the same specific capacity applies at the irrigation flow rate of 130 gpm, the pumping lift would be 69 feet at that flow. This is a conservative assumption since specific capacity is generally not constant but would be higher at lower flow.

The curve for the installed Goulds 150L10 pump indicates a total head at 130 gpm of 205 feet. Subtracting the 69 ft pumping lift and 5 ft of column friction loss gives a pressure at the surface of 57 psi which is exactly as expected (pressure tanks are often set at a 60 psi shutoff point). From the pump curve, the pump efficiency at 130 gpm is 67%. At a lower pressure, e.g. 40 psi, the flow will be greater and in fact the field examiner measured 210 gpm under maximum-flow conditions but did not report a discharge pressure. However, for power analysis purposes the flow was conservatively assumed to be 130 gpm. Using $Q = 130$ gpm, total head = 205, and $e = 67\%$, the calculated PCC is 311.6 KWh/ac-ft.

2. The total power usage for the irrigation season was determined for each of the years 2004-2011. The period of irrigation is easy to discern in the power records – the base monthly usage is typically 400 to 500 kWh, and in each year there are 4 to 6 months of obviously elevated power usage.
3. The baseline monthly usage for each year was calculated as the average of the usage in the off-season months. The average baseline usage times the number of irrigation months was then subtracted from the total irrigation season power usage. The remainder was the annual power usage attributable to irrigation usage only.

4. Irrigation diversion volume was calculated as the power usage divided by the PCC. Diversion volumes range from a low of 17.8 ac-ft in 2006 to a high of 39.2 ac-ft in 2007, with an average of 29.2 ac-ft. Per-acre diversion volumes were calculated by dividing by the water right acreage of 14.5 acres. The results range from 1.23 to 2.71 ac-ft/acre with an average of 2.01 ac-ft/acre. The per-acre values would be slightly different if the irrigated acreage were assumed to be 15.5 acres, which is closer to the actual irrigation occurring.
5. Crop consumptive water requirement was determined from Allen & Robison (2009) for a crop of “Grass pasture – low management.” The nearest station is Hailey, but the Flowers Bench site is considerably higher in elevation and has a cooler and wetter climate than Hailey. The Galena station is the next station to the north, but this station is also not representative of crop water usage at Flowers Bench. To estimate Pdef at the site of interest, interpolation between the two stations was performed using elevation as an indicator. At the Galena station, Pdef for grass pasture (both low and high management) is listed as 95 mm. Compared to other crops at that station, that value appears to be anomalously low and probably should not be relied upon. Therefore, the value at Galena was taken to be the Pdef for irrigated turfgrass instead. The pertinent data is as follows:

<u>Station</u>	<u>Pdef</u>	<u>Elevation</u>
Hailey	500 mm	5350 ft
Galena	344 mm	7310 ft
Flowers Bench		5950 ft

Interpolating using elevation yields a Pdef of 452 mm or 1.48 ac-ft/acre at Flowers Bench.

The water diverted was sufficient to meet the Pdef with a reasonable irrigation efficiency (less than 80%) in five of the eight years examined. In these years, the implied irrigation efficiency (Pdef divided by diversion volume) ranged from 55% to 72%, which is reasonable for a residential solid-set system. In the other three years, the crop was likely shorted (diversion volume was close to or less than Pdef, implied efficiency >80%), but water application was still more than adequate to sustain active vegetative growth. Water diverted in these years ranged from 1.23 to 1.72 ac-ft/acre, which is more than merely a nominal amount.

Flowers Bench Subdivision

Power Record Analysis - Irrigation Well

CGB 1/12/12

Derived PCC = 311.6 KWH/ac-ft Pasture Pdef 1.48 afa
 Acres (water right) 14.5 acres
 Acres (actual irrigation) 15.5 acres

Yearly Summary

Year	KWH total irrig season	No. months	KWH avg base mnthly	Net irrig KWH	Ac-ft	Ac-ft/ac on 14.5 ac	Implied efficiency
2004	13312	6	410	10852	34.8	2.40	0.62
2005	8887	5	452	6626	21.3	1.47	insuf
2006	8421	5	575	5544	17.8	1.23	insuf
2007	14478	5	451	12224	39.2	2.71	0.55
2008	11872	4	575	9571	30.7	2.12	0.70
2009	12778	5	380	10877	34.9	2.41	0.61
2010	11143	4	467	9276	29.8	2.05	0.72
2011	9240	4	364	7786	25.0	1.72	insuf

	Ac-ft	Ac-ft/acre (14.5 ac)	Ac-ft/acre (15.5 ac)
Mean	29.2	2.01	1.88
Max	39.2	2.71	2.53
Min	17.8	1.23	1.15

Monthly Readings

Read Date	SA Type	Days	Read Code	\$Amount	KWH	Demand
12/13/2011	EC-LG	33	R	60.37	537	3.00 KW
10/11/2011	EC-LG	29	R	41.07	308	2.00 KW
12/10/2011	EC-LG	30	R	164.18	1769	12.00 KW
12/9/2011	EC-LG	32	R	228.78	2834	12.00 KW
11/8/2011	EC-LG	29	R	220.98	2419	12.00 KW
7/13/2011	EC-LG	30	R	212.83	2218	12.00 KW
6/13/2011	EC-LG	32	R	27.59	141	10.00 KW
12/5/2011	EC-LG	29		31.95	198	3.00 KW
4/13/2011	EC-LG	30		32.55	205	2.00 KW
3/14/2011	EC-LG	32		33.75	219	2.00 KW
10/2/2011	EC-LG	28	L	70.86	650	2.00 KW
1/13/2011	EC-LG	30	L	70.86	650	2.00 KW
12/14/2010	EC-LG	32	L	70.86	650	2.00 KW
12/11/2010	EC-LG	30		53.13	444	12.00 KW
10/13/2010	EC-LG	30	R	199.04	2308	13.00 KW
9/13/2010	EC-LG	32	R	246.88	3160	13.00 KW
12/8/2010	EC-LG	29	R	245.19	2884	11.00 KW
7/14/2010	EC-LG	30	R	241.19	2791	12.00 KW
6/14/2010	EC-LG	32		28.44	160	12.00 KW

5/13/2010	EC-LG	29		38.23	289	2.00 KW
4/14/2010	EC-LG	30	R	34.13	242	4.00 KW
3/15/2010	EC-LG	32		69.62	650	2.00 KW
11/2/2010	EC-LG	28	L	69.62	650	2.00 KW
1/14/2010	EC-LG	30	L	69.62	650	2.00 KW
12/15/2009	EC-LG	32		65.63	604	2.00 KW
11/13/2009	EC-LG	30		24.92	136	5.00 KW
10/14/2009	EC-LG	30	R	183.84	1963	12.00 KW
9/14/2009	EC-LG	32	R	206.87	2209	12.00 KW
8/13/2009	EC-LG	29		256.22	3050	12.00 KW
7/15/2009	EC-LG	30	E	246.39	2850	13.00 KW
6/15/2009	EC-LG	32		215.84	2706	12.00 KW
5/14/2009	EC-LG	29		41.83	373	10.00 KW
4/15/2009	EC-LG	30		42.67	384	2.00 KW
3/16/2009	EC-LG	32		44.51	410	2.00 KW
12/2/2009	EC-LG	29		40.92	371	2.00 KW
1/14/2009	EC-LG	30		41.48	384	2.00 KW
12/15/2008	EC-LG	32		43.41	410	3.00 KW
11/13/2008	EC-LG	30	R	39.69	360	3.00 KW
10/14/2008	EC-LG	32	R	179.98	2490	12.00 KW
12/9/2008	EC-LG	30	R	225.57	3395	12.00 KW
8/13/2008	EC-LG	29	R	223.65	3137	12.00 KW
7/15/2008	EC-LG	32	R	212.19	2850	12.00 KW
6/13/2008	EC-LG	30		50.43	508	11.00 KW
5/14/2008	EC-LG	29	V	61.72	725	4.00 KW
4/15/2008	EC-LG	32	V	56.64	650	2.00 KW
3/14/2008	EC-LG	30		55.16	650	3.00 KW
2/13/2008	EC-LG	29		53.86	650	2.00 KW
1/15/2008	EC-LG	32	E	53.86	650	2.00 KW
12/14/2007	EC-LG	30		53.86	650	2.00 KW
11/14/2007	EC-LG	30	V	34.5	348	3.00 KW
10/15/2007	EC-LG	32		110.23	1529	13.00 KW
9/13/2007	EC-LG	30	R	199.45	3648	15.00 KW
8/14/2007	EC-SG	29	R	234.88	3035	13.00 KW
7/16/2007	EC-SG	32	R	218.05	2816	13.00 KW
6/14/2007	EC-SG	30	S	241.54	3450	6.00 KW
5/15/2007	EC-SG	29	R	13.74	155	2.00 KW
4/16/2007	EC-SG	32		69.74	1052	6.00 KW
3/15/2007	EC-SG	30		13.74	155	2.00 KW
2/13/2007	EC-SG	28		13.12	145	2.00 KW
1/16/2007	EC-SG	33	L	44.64	650	2.00 KW
12/14/2006	EC-SG	30		44.64	650	0.00 KW
11/14/2006	EC-SG	32	E	44.64	650	2.00 KW
10/13/2006	EC-SG	30	R	125.55	1946	12.00 KW
9/13/2006	EC-SG	30	E	110.09	1600	12.00 KW
8/14/2006	EC-SG	31	R	124.21	1733	12.00 KW
7/14/2006	EC-SG	30	R	117.49	1638	12.00 KW

6/14/2006	EC-SG	30	R	110.23	1504	13.00 KW
5/15/2006	EC-SG	31	R	56.04	728	5.00 KW
4/14/2006	EC-SG	30		39.54	500	2.00 KW
3/15/2006	EC-SG	30	E	39.54	500	2.00 KW
2/13/2006	EC-SG	31	E	39.54	500	2.00 KW
1/13/2006	EC-SG	31	E	39.54	500	2.00 KW
12/13/2005	EC-SG	32	R	47.71	613	2.00 KW
11/11/2005	EC-SG	29	R	21.44	250	2.00 KW
10/13/2005	EC-SG	30	R	140.78	1899	14.00 KW
9/13/2005	EC-SG	32	R	139.83	1786	14.00 KW
12/8/2005	EC-SG	29	R	110.93	1366	14.00 KW
7/14/2005	EC-SG	30	E	202.28	2500	13.00 KW
6/14/2005	EC-SG	32	R	99.87	1336	13.00 KW
5/13/2005	EC-SG	29	R	21.05	264	14.00 KW
4/14/2005	EC-SG	17		39.25	539	2.00 KW
3/28/2005	EC-SG	27	S	40.29	550	1.00 KW
1/3/2005	EC-SG	32		43.66	600	1.00 KW
1/28/2005	EC-SG	30		26.84	350	1.00 KW
12/29/2004	EC-SG	30	E	30.2	400	2.00 KW
11/29/2004	EC-SG	32	R	34.91	470	2.00 KW
10/28/2004	EC-SG	30	R	81.39	1161	12.00 KW
9/28/2004	EC-SG	32		223.29	3229	13.00 KW
8/27/2004	EC-SG	29		193.03	2561	13.00 KW
7/29/2004	EC-SG	30		187.57	2500	13.00 KW
6/29/2004	EC-SG	32		174.59	2343	12.00 KW
5/28/2004	EC-SG	29		106.41	1518	12.00 KW
4/29/2004	EC-SG	29	R	18.18	229	1.00 KW
3/31/2004	EC-SG	30	R	28.31	377	1.00 KW
1/3/2004	EC-SG	32	R	41.79	574	2.00 KW

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

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

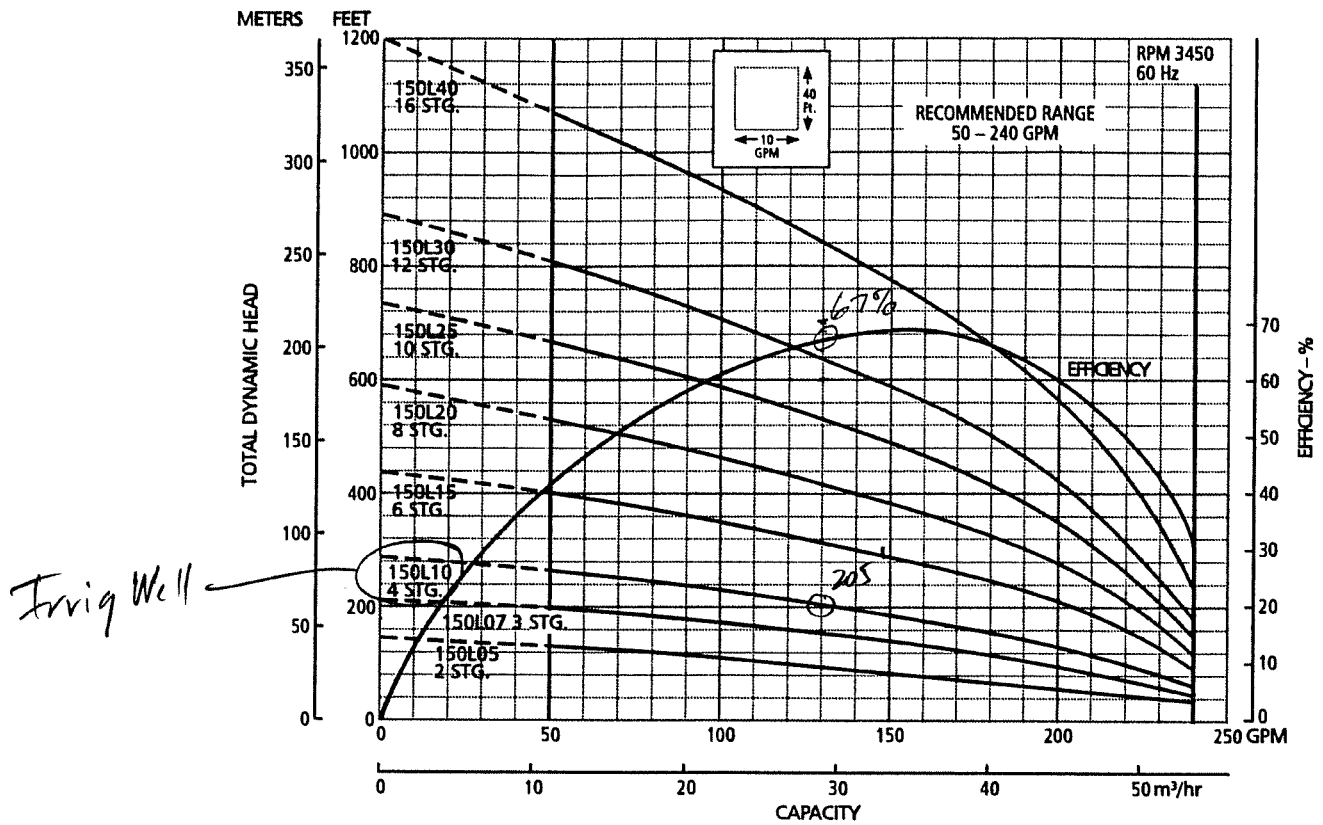
Irrigation Well.

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SW/SW
T4N R17E S01

Goulds

Model 150L



Model 200L

Curve Reference SU 00

