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WATER RESOURCES
WESTERN REGION

March 23, 2009

Idaho Department of Water Resources
Western Regional Office
2735 Airport Way
Boise, ID 83705-5082

Attention: John Westra

*Subject: Application for Permit # 63-32659 – Snake River Dairies LLC
Evaluation of the Effect of Diversion on Neighboring Wells*

Dear John,

On behalf of our client, Snake River Dairies LLC, enclosed is a Technical Memorandum that provides an evaluation of the effect of diversion under the pending application (as amended) on the local aquifer and on neighboring wells. The analysis makes the following conclusions:

- Based on data available from surrounding water level monitoring wells, water levels in the local aquifer are relatively stable. The proposed diversion is not expected to have a significant impact on the local aquifer.
- A Theis equation analysis estimates the potential impacts to neighboring wells for two conditions. The first condition is based on withdrawals under the existing licensed water right # 63-11054, which provides 92.4 acre-feet annually. Predicted aquifer drawdown under this condition is 3.5 feet at a distance of 1,500 feet after one year of continuous pumping.
- The second condition is under the proposed application and existing license together with diversion of 0.42 cfs on a continuous basis, which is volumetrically equivalent to pumping 1.0 cfs for 10 hours per day. Predicted aquifer drawdown under this condition is 11.5 feet at a distance of 1,500 feet after one year of continuous pumping. Therefore, the predicted aquifer drawdown resulting from the pending application only is the difference between the expanded and existing conditions, which is 8.0 feet at a distance of 1,500 feet after one year of pumping.

March 23, 2009

The memorandum further explains that the Theis equation analysis is a conservative approach and, in this case, likely over-estimates drawdown. Further, much of the anticipated additional water development is expected to source from the proposed new wells, which are further from the neighboring wells than the facility's existing wells.

Please contact me if you have any questions regarding this analysis.

Sincerely,



Scott N. King, P.E.
Supervising Engineer

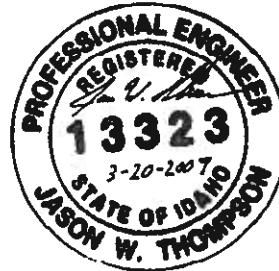
cc: Scott Campbell / Moffatt Thomas
Jerry Tlucek / Snake River Dairies LLC

File: 272.0100



TECHNICAL MEMORANDUM

DATE: March 20, 2009
TO: Christian Patrich, Ph.D., P.E., P.G.
FROM: Jason Thompson, P.E.
CC: FILE
RE: Snake River Dairies LLC – Response to IDWR RE Application for Permit #63-32659
JOB NO.: 272.0100



Existing System

The points of diversion for the new water right application (#63-32659) will be three existing wells and up to two new wells. The existing Well #1 is approximately 210 feet deep, with 6-inch casing. The existing Well #2 is approximately 202 feet deep with a 6-inch casing. The existing Well #3 is approximately 280 feet deep, with 6-inch casing. The proposed wells will be of similar construction with expected water-bearing zones from 175 to 350 feet below ground surface.

The proposed diversion is for 1.0 cfs (449 gpm) for stockwater and commercial uses.

Effect of Proposed Diversion on Local Aquifer

To evaluate the effect that the proposed diversion may have on the local aquifer, water levels from wells in the area of the dairy were examined to determine if local water level declines are occurring in the area. Seven wells within five miles of the dairy were identified from the Idaho Department of Water Resources (IDWR) online ground water level database. The location of these wells is shown on the attached Figure 1.

Prior to the water level analysis, any data points identified as having occurred during pumping were removed from the data set. This determination is made by the measuring agency at the time of the measurement. These points were removed because they were measurements impacted by pumping and not considered to be representative of the actual static water level.

The wells examined exhibited relatively stable water levels, particularly since 2000. There is also evidence of recharge of shallow aquifer zones from surface water sources during the irrigation season. There are numerous canals and laterals in the area. Hydrographs are included as Figure 2.

The proposed diversion is not expected to have a significant impact on the local aquifer.

Effect of Proposed Diversion on Neighboring Wells

To evaluate the effect that the proposed diversion may have on neighboring wells, wells near the dairy were identified from the IDWR online well construction database. This search identified four wells within ¼ mile of the dairy. Well construction data are summarized in the attached Table 1.

Three wells, all located in the NWSW Section 7, are currently used by Snake River Dairies. Driller's reports for two of these (Well A & Well B in Table 1) are available on IDWR's web site. The location shown by the Driller's Report for Well A may be incorrect and we believe this well is actually located in the NWSW (lot 3) of Section 7.

Of the remaining two wells within ¼ mile, one of the wells (C) has a total depth greater than Wells #1 and #2, but an open interval that overlaps with the dairy wells. Well D has a depth of 161 feet, which is less than all three dairy wells.

Due to the relatively stable water levels observed in the vicinity of the dairy and the apparent recharge from surface water sources, the proposed diversion is not expected to negatively impact nearby wells.

To quantify the effect that the proposed diversion may have on nearby wells, a Theis analysis using the non-equilibrium well equation was performed. The non-equilibrium well equation (Theis, 1935) is a commonly accepted method to estimate of the drawdown observed at various distances from a well.

There are assumptions inherent to the use of the Theis equation. These include: (1) the aquifer is homogeneous and isotropic, uniform in thickness and areal extent; (2) the aquifer receives no recharge; (3) the pumping well penetrates the full aquifer thickness; (4) water removed by discharge is removed instantaneously; (5) the pumping well is 100 percent efficient; (6) laminar flow exists throughout the aquifer; and (7) the water table or potentiometric surface has no slope. These assumptions are rarely completely satisfied under field conditions, but this method will often provide an indication of possible well interference.

The proposed diversion rate on the water right application (#63-32659) is 1.0 cfs (449 gpm) for the expanded dairy operation, including stockwater and commercial uses. This rate represents the anticipated maximum diversion rate of the expanded dairy, and is equal to the dairy's total future water demands assuming use over a 10 hour period each day. The Theis equation calculates drawdown effects using an annual average continuous pumping rate. The annual average pumping rate used in this analysis is 0.42 cfs (189 gpm), equal to the dairy's total future water demands assuming continuous use over a 24 hour period. A Theis analysis was also performed using the dairy's current water demands assuming continuous use, equal to 0.13 cfs (57 gpm).

The Theis equation requires an estimate of aquifer transmissivity and storativity. For this analysis, a transmissivity of 12,000 gpd/ft and a storativity of 0.001 were assumed. The

transmissivity value is an estimate obtained from the Treasure Valley Hydrologic Project (Petrich 2004).

Results of the Theis analysis using the dairy's current water demands are included as Table 2. Continuously pumping the well at 57 gpm for one month would result in a predicted drawdown of approximately 5 feet at a distance of 100 feet from the dairy and 2.1 feet at a distance of 1,500 feet from the dairy. Continuously pumping the well at 57 gpm for one year would result in a predicted drawdown of 6.4 feet at a distance of 100 feet and 3.5 feet at a distance of 1,500 feet.

Results of the Theis analysis using the expanded dairy's anticipated future water demands are included as Table 3. Continuously pumping the well at 189 gpm for one month would result in a predicted drawdown of nearly 16.8 feet at a distance of 100 feet from the dairy and approximately 7 feet at a distance of 1,500 feet from the dairy. Continuously pumping the well at 189 gpm for one year would result in a predicted drawdown of 21.3 feet at a distance of 100 feet and 11.5 feet at a distance of 1,500 feet.

Expansion of the dairy would increase the 24-hour continuous water demand from the current 57 gpm to 189 gpm. The Theis analysis indicates that this increase in well production over a one month period would result in a further drawdown of 11.7 feet at a distance of 100 feet from the dairy and a further drawdown of approximately 5 feet at a distance of 1,500 feet. The increase in well production over a period of one year would result in a further drawdown of 14.9 feet at a distance of 100 feet from the dairy and a further drawdown of approximately 8 feet at a distance of 1,500 feet.

It should be noted that the drawdown estimates assume the aquifer zones are in direct hydraulic connection with one another. If wells in the vicinity of the dairy tap aquifer(s) other than the zones utilized by the dairy wells, then interference drawdown will likely be reduced or eliminated.

It should also be noted that the drawdown estimates assume no annual recharge and use a low (i.e., conservative) estimate of storativity. A higher storativity value would result in less calculated drawdown, and may be more appropriate for these aquifer zones and for long-term (i.e., days or months) drawdown estimates.

References

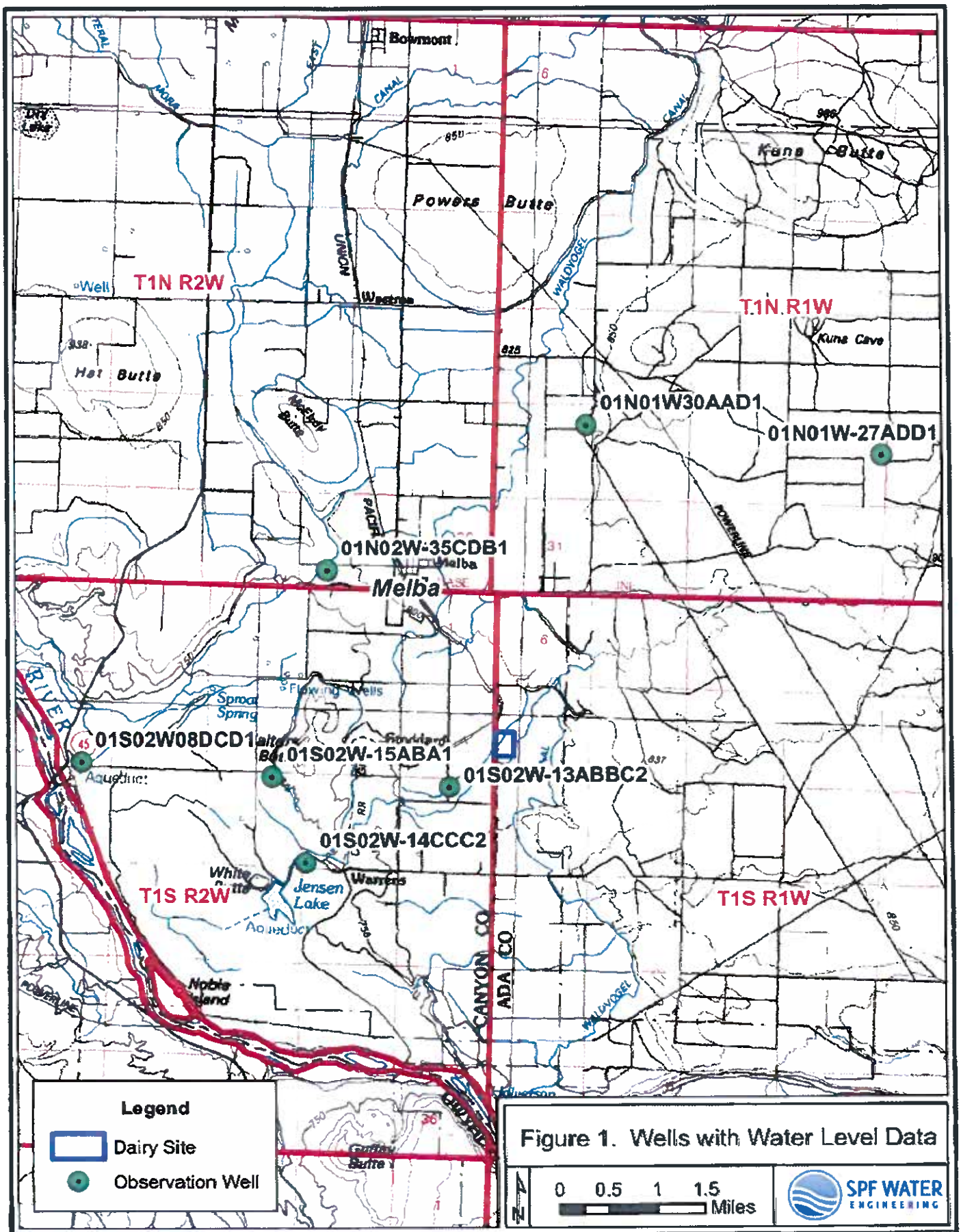
Petrich, C. 2004. Simulation of ground water flow in the lower Boise River basin. Idaho Water Resources Research Institute, IWRI-2004-02.

Theis, C.V. 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage. Transactions, American Geophysical Union, 16: 519-524

Table 1. Information for Wells within 1/4 mile of the Snake River Dairy

Well ID	Contact	Use	TWP	RNG	SEC	Tract	Well Address	Gallons Per Minute	Static Water Level	Total Depth	Casing Depth	Open Interval (ft)	CSG. DIA.	Construction Date	Permit Number	Tag Number
A	TLUCEK, JERRY	Stockwater	01S	01W	7	NESW*			130	225	183	183-225	6	12/31/1966	802893	
B	TLUCEK, JERRY L	Commercial	01S	01W	7	NWSW			135	280	178	178-280	6	10/31/1983	722024	
C	MC GRIFF, ROBERT	Domestic- Single Residence	01S	02W	12	SESE	1/2 MILE S OF BUTTE ON RT HAND SIDE N OF GLENDALE RD	75	115	248	168	168-248	6	7/6/2006	841171	D0046827
D	BELZER, BOB	Domestic- Single Residence	01S	02W	12	SESE	INTERSECTION	10	112	161	161	154-161	8	6/21/1994	727819	

*Well A may actually be located in NWSW (lot 3) Section 7.



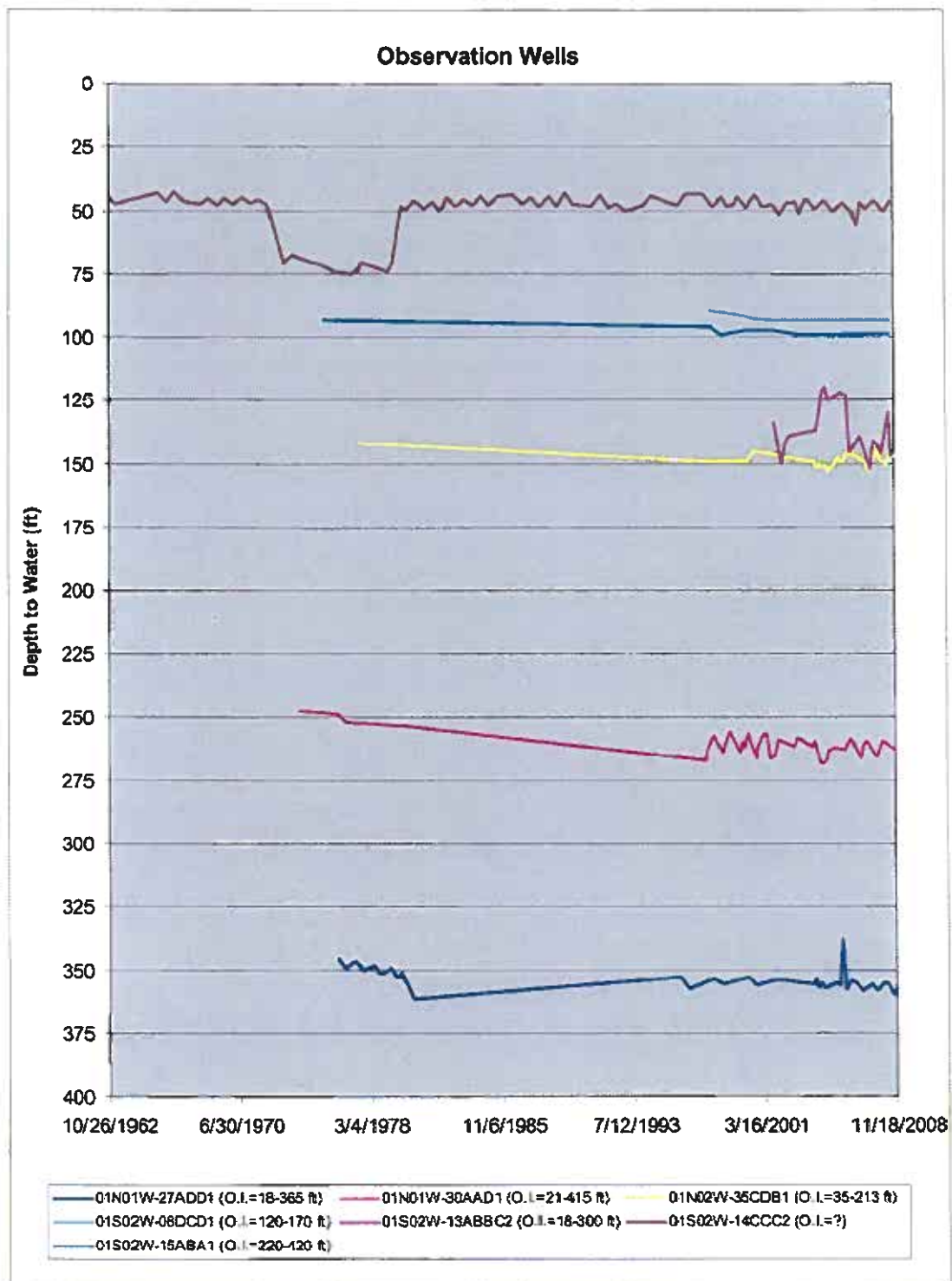


Figure 2. Hydrographs for wells within 5 miles of the dairy.

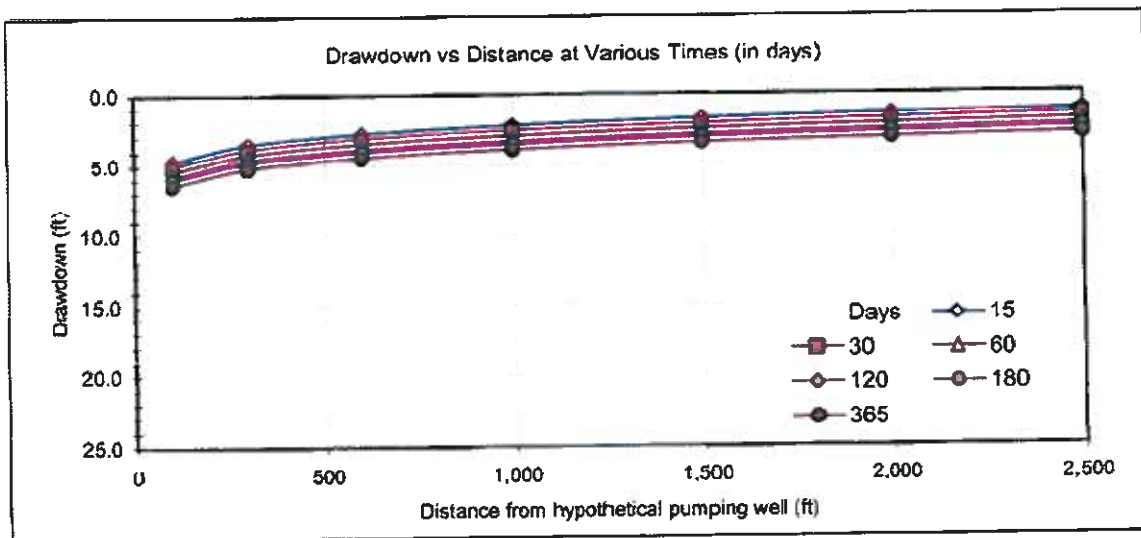
Table 2. Theis Worksheet

Project: Snake River Dairies
 Project Number: 272.0100

Assumed Parameter Values

Q=	57	(gpm)
T=	12,000	(gpd/ft)
S=	0.001	(dimensionless)

Time (days)	Time (minutes)	Radius (ft)						
		100	300	600	1,000	1,500	2,000	2,500
0.01	14	0.78	0.05	0.00	0.00	0.00	0.00	0.00
0.1	144	1.96	0.83	0.27	0.04	0.00	0.00	0.00
0.2	288	2.33	1.17	0.52	0.18	0.03	0.00	0.00
0.4	576	2.71	1.53	0.83	0.39	0.15	0.04	0.01
0.8	1152	3.08	1.90	1.17	0.68	0.35	0.18	0.07
1.0	1440	3.21	2.02	1.28	0.78	0.43	0.24	0.12
2.0	2880	3.68	2.39	1.65	1.12	0.73	0.48	0.31
7.0	10080	4.26	3.07	2.32	1.77	1.34	1.05	0.83
15.0	21600	4.68	3.48	2.73	2.18	1.74	1.44	1.21
30.0	43200	5.06	3.86	3.11	2.55	2.11	1.81	1.57
60.0	86400	5.43	4.24	3.48	2.93	2.49	2.18	1.94
120.0	172800	5.81	4.61	3.86	3.30	2.86	2.55	2.31
180.0	259200	6.03	4.84	4.08	3.52	3.08	2.77	2.53
365.0	525600	6.42	5.22	4.47	3.91	3.47	3.16	2.91



Drawdown vs Distance at Various Times (in days)
 $Q = 57 \text{ gpm}$

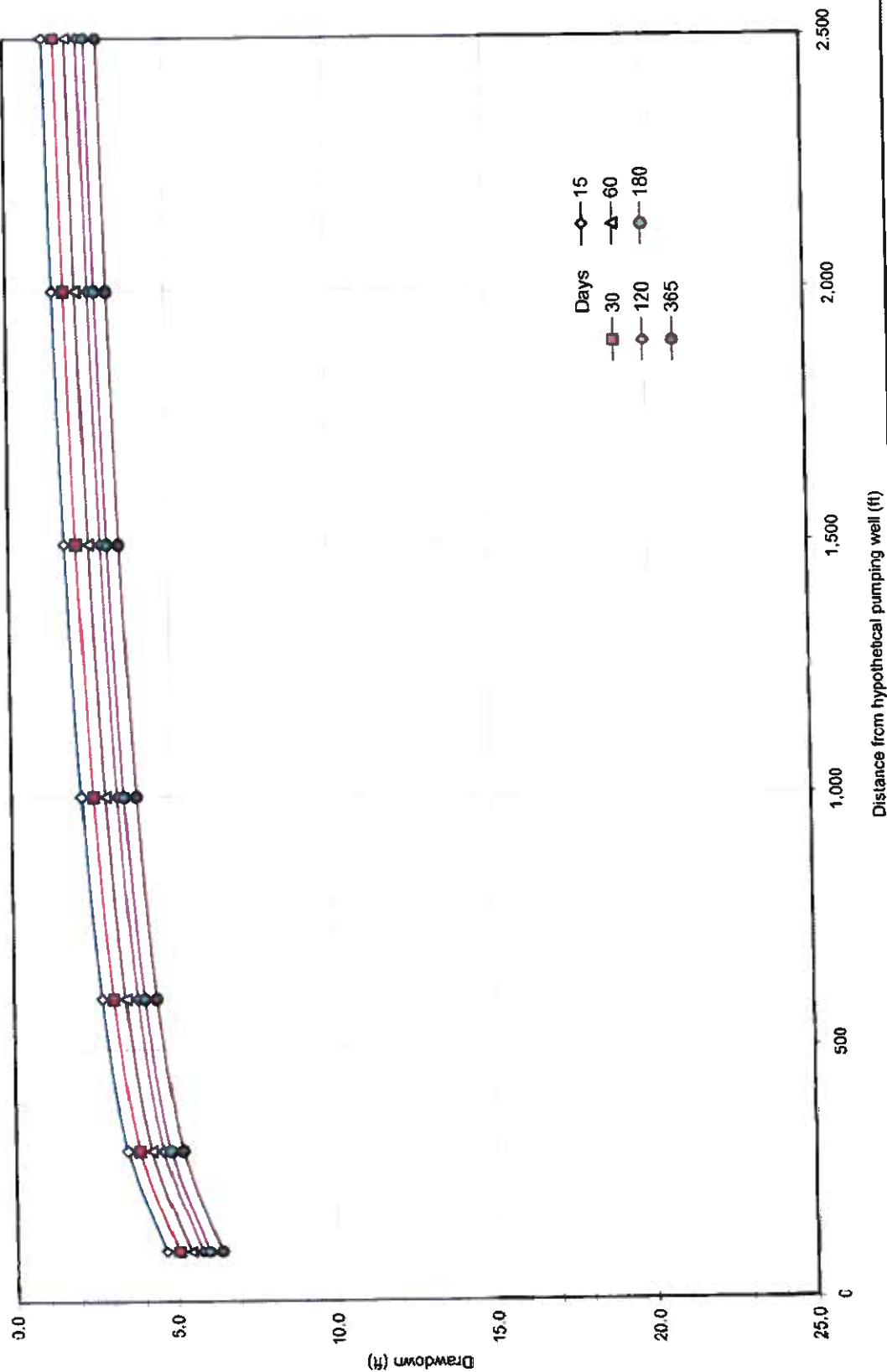


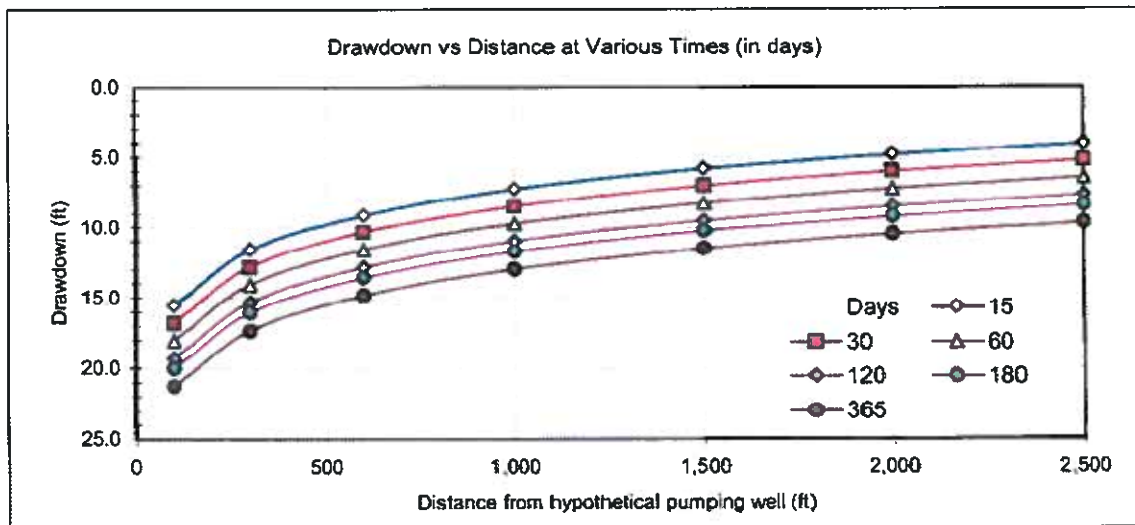
Table 3. Theis Worksheet

Project: Snake River Dairies
 Project Number: 272.0100

Assumed Parameter Values

Q=	189	(gpm)
T=	12,000	(gpd/ft)
S=	0.001	(dimensionless)

Time (days)	Time (minutes)	Radius (ft)						
		100	300	600	1,000	1,500	2,000	2,500
0.01	14	2.58	0.18	0.00	0.00	0.00	0.00	0.00
0.1	144	6.50	2.75	0.89	0.14	0.01	0.00	0.00
0.2	288	7.73	3.88	1.73	0.58	0.11	0.01	0.00
0.4	576	8.98	5.07	2.75	1.30	0.49	0.14	0.04
0.8	1152	10.23	6.29	3.88	2.25	1.16	0.58	0.25
1.0	1440	10.63	6.68	4.26	2.58	1.43	0.78	0.41
2.0	2880	11.88	7.92	5.48	3.70	2.40	1.58	1.04
7.0	10080	14.14	10.18	7.68	5.87	4.45	3.48	2.76
15.0	21600	15.51	11.55	9.05	7.22	5.78	4.77	4.01
30.0	43200	16.76	12.80	10.30	8.46	7.01	5.99	5.20
60.0	86400	18.02	14.05	11.55	9.71	8.25	7.22	6.43
120.0	172800	19.27	15.30	12.80	10.96	9.50	8.46	7.66
180.0	259200	20.00	16.03	13.53	11.69	10.23	9.19	8.39
365.0	525600	21.27	17.31	14.81	12.96	11.50	10.46	9.66



Drawdown vs Distance at Various Times (in days)
 $Q = 189 \text{ gpm}$

