DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT APPLICATION NO. 8227-3, Teton LLC

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 8227-3, Teton LLC, c/o Dr. Barry Kerkaert, PO Box 188, Pipestone MN 56164.

The Chief Engineer is recommending APPROVAL of Application No. 8227-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use, 4) it is in the public interest with the following qualifications:

1. The wells approved under Water Permit Nos. 8066-3 and 8227-3 will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner, under these Permits shall control withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

2. Permit Nos. 8066-3 and 8227-3 are subject to compliance with requirements of the Department's Water Pollution Control Permit issued pursuant to SDCL 34A-2-36 or 34A-2-112 for concentrated animal feeding operations.

3. Permit Nos. 8066-3 and 8227-3 are subject to compliance with all existing and applicable Water Management Board Rules including but not limited to:

   a) Chapter 74:54:01 Ground Water Quality Standards,
   b) Chapter 74:54:02 Ground Water Discharge Permit,
   c) Chapter 74:51:01 Surface Water Quality Standards,
   d) Chapter 74:51:02 Uses Assigned to Lakes,
   e) Chapter 74:51:03 Uses Assigned to Streams, and
   f) Chapter 74:52:01 through 74:52:11 Surface Water Discharge Provisions

4. The Permit holder shall report to the Chief Engineer annually the amount of water withdrawn from the Veblen aquifer.

5. Water Permit Nos. 8066-3 and 8227-3 authorize a total annual diversion of 46.03 acre feet of water.

6. Water Permit No. 8227-3 incorporates Water Permit No. 8066-3.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
July 27, 2016

REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 8227-3
TETON LLC
JULY 14, 2016

Water Permit Application No. 8227-3 proposes to appropriate water from the Veblen aquifer at a rate of 23.63 acre-feet annually, using the two existing wells that are authorized by Water Permit No. 8066-3. Water Permit No. 8066-3 appropriates 22.4 acre feet of water annually at a maximum diversion rate of 0.11 cubic feet of water per second (cfs) from two wells, 57 feet deep, located in the N½SW¼ Sec.16, T121N-R47W. This application proposes to increase the appropriation of water from the existing wells by 23.63 acre-feet annually. No increase in the diversion rate of 0.11 cfs is requested. This application, if approved and Water Permit No. 8066-3 will authorize a total of 46.03 acre-feet annually from the Veblen aquifer. This application is for commercial use at a swine production facility located in the NW¼ SW¼ Sec 16, T121N-R47W.

AQUIFER: Veblen aquifer (VEB)

GEOLOGY AND AQUIFER CHARCTERISTICS:
Historically, various glacial outwash deposits underlying portions of northeastern South Dakota have been considered the "Veblen aquifer" (Buhler, 2007). The Veblen aquifer is a group of buried basal outwash deposits underlying portions of Roberts, Grant and Deuel Counties, South Dakota and Big Stone, Swift and Lac Qui Parle Counties, Minnesota. In Grant County, the aquifer should generally be considered within the areal extent and interval of altitude defined by Hansen (1990). However, subsequent investigations suggest Hansen may have overestimated the areal extent of the aquifer (Barr Engineering, 2007). A map showing the three principle delineations of the Veblen aquifer is shown in Figure 1. Individual sand and gravel units of the Veblen aquifer are not continuous throughout the entire mapped extent; however, interconnection between the outwash deposits is likely in places (Buhler, 2007). The Veblen aquifer primarily consists of medium to coarse sand and fine gravel that is generally under confined conditions. The aquifer slopes to the east at about 13 feet per mile, and the direction of water movement in the aquifer is generally from west to east (Hansen, 1990). Hansen (1990) reported a range of aquifer depth of one to 210 feet below ground surface and an average aquifer thickness of 28 feet.

The South Dakota Water Well Completion Reports on file for the two existing wells which were completed on October 9, 2015, and December 9, 2015, respectively, identify coarse sand from 37-57 feet below grade. The static water level reported for the well completed October 9, 2015, was 43 feet below grade, and the static water level reported for the well completed December 9, 2015, was 35 feet below grade (Water Rights, 2016c). The reports identify unconfined conditions in the well completed in October, and confined conditions in the well completed in December. Both completion reports indicate the wells were test pumped for one hour at a rate of 60 gallons per minute.

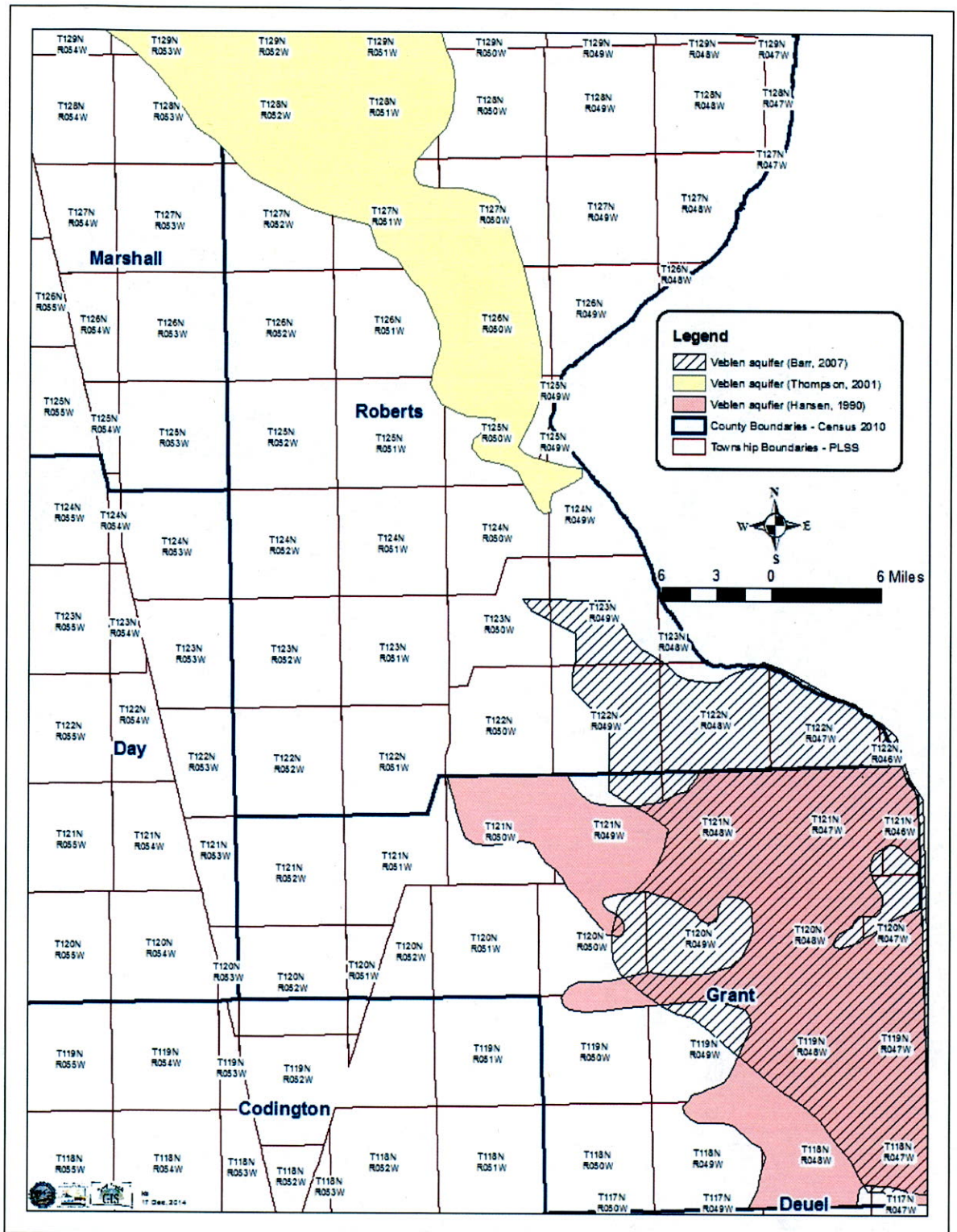

Figure 1. The areal extent of the Veblen aquifer in Grant and Roberts Counties, South Dakota (modified from Barr, 2007: Thompson, 2001; Hansen, 1990; and Buhler, 2014).

A completion report for a well constructed less than one mile east of the well sites proposed by this application identifies sand, (i.e. Veblen aquifer) from 90-180 feet below grade (Water Rights, 2016c). The report indicated the aquifer was under confined conditions with a static water level of 75 feet below grade on January 24, 2007. The well was reportedly test pumped at 550 gallons per minute and had a specific capacity of 29.57 gallons per minute per foot of drawdown. Analysis of an aquifer pumping test at the well yielded an estimated transmissivity of 96,600 gal/day/ft and a storativity value of 0.00047 (Barr, 2007).

SOUTH DAKOTA CODIFIED LAW (SDCL) 46-2A-9

Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued only if there is reasonable probability that there is unappropriated water available for the applicant's proposed use, that the proposed diversion can be developed without unlawful impairment of existing rights and that the proposed use is a beneficial use and in the public interest. This report will address the availability of unappropriated water and existing rights from the aquifer.

WATER AVAILABILITY:

This application proposes to appropriate water from the Veblen aquifer at a rate of 23.63 acre-feet annually. The probability of unappropriated water available from an aquifer can be evaluated by considering SDCL 46-6-3.1 which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and a water distribution system has applied for a permit, the Board need not consider the recharge/withdrawal issue. Here, a water distribution system is not involved and the aquifer is not older or lower than the Greenhorn Formation, therefore the withdrawal/recharge issue must be considered.

Hydrologic Budget:

Withdrawals:

Discharge from the Veblen aquifer potentially occurs through outflow to local lakes and rivers, and well withdrawals for commercial, municipal, institutional, industrial, irrigation and domestic use (Hansen, 1990; Water Rights, 2016b). There are currently 48 water rights/permits appropriating water from the Veblen aquifer.

Thompson's interpretation of the geohydrologic data for Roberts County resulted in the Veblen aquifer terminating to the south in T124N (Thompson, 2001) (see Figure 1). The study area for the Barr Engineering investigation did not extend far enough north to corroborate or contradict Thompson, but did suggest a constriction in the outwash near the northern limit of their study area (Barr, 2007). The southern terminus of Thompson's outwash and the constriction at the northern edge of Barr's outwash, both appear to be associated with a northwest-southeast trending bedrock high identified by Tomhave and Schulz, (2004). This constriction and/or discontinuity in the outwash allows the Veblen aquifer south of T124N to be treated separately from the outwash deposits north of T124N for water management purposes. The 39 water rights permits appropriating water from the Veblen aquifer south of T124N are shown in Table 1.

Table 1. Water Rights/Permits appropriating water from the Veblen aquifer (Water Rights, 2016b).

PERMIT NO	NAME	PRIORITY DATE	STATUS	USE	CFS	ACRES
548-3	CITY OF MILBANK	01/01/1924	LC	MUN	2.1	
2006-3	TOWN OF CORONA	08/16/1973	LC	MUN	0.245	0
5469-3	MICHAEL JOHNSON	04/29/1976	LC	IRR	2	230
2759-3	LIEBE IRRIGATION	06/09/1976	LC	IRR	2.23	198
2808-3	KATHLEEN A TRAPP	06/29/1976	LC	IRR	2	140
2994-3	ANTHONY G FOLK	09/09/1976	LC	IRR	1.39	97
3234A-3	MICHAEL D JOHNSON	11/08/1976	LC	IRR	2	116
3234B-3	JOEL ADLER	11/08/1976	LC	IRR	0	120
3412A-3	DANA JOHNSON	12/10/1976	LC	IRR	0.64	72
3627-3	JAMES/TERESA GRORUD	02/07/1977	LC	IRR	1.94	136
3723-3	ROCKY MEADOWS INC	02/14/1977	LC	IRR	1.11	164
3954-3	ROGER MC CULLOUGH	05/05/1977	LC	IRR	2.11	176
4084A-3	RICHARD WILL	06/20/1977	LC	IRR	1	254
4050-3	CITY OF BIG STONE CITY	07/05/1977	LC	MUN	3.3	0
4502-3	ROCKY GARDENS	03/10/1980	LC	IRR	0.17	40
4735-3	MICHAEL D JOHNSON	04/02/1981	LC	IRR	1	74
4844-3	RICHARD PILLATZKI	12/28/1981	LC	IRR	2	167
4856-3	MICHAEL D JOHNSON	01/08/1982	LC	IRR	1	70
5525-3	MIELITZ BROS	03/07/1991	LC	IRR	1.78	140
5918-3	VICTORY FARMS	03/19/1996	LC	COM/LCO	0.33	0
6161-3	LOU'S GREENHOUSE	12/28/1999	LC	COM	0.04	0
6171-3	COLD SPRING GRANITE CO	01/18/2000	LC	IND	0.111	0
6230-3	RIVERVIEW LLP	09/20/2000	LC	COM/LCO	0.39	0
6358-3	MICHAEL & NANCY JOHNSON	08/06/2002	LC	COM/LCO	0.11	0
6636-3	WESTERN CONSOLIDATED COOP	07/06/2005	LC	COM	0.022	0
6947-3	JOEL ADLER	01/10/2008	PE	IRR	1.71	0
7216-3	MIELITZ BROS	10/06/2010	PE	IRR	2.28	160
7394-3	RODNEY FENHAUS	08/08/2012	PE	IRR	3.33	235
7439-3	MIELITZ BROS	09/19/2012	PE	IRR	1.14	80
7446-3	DALE TUCHSCHERER	09/25/2012	PE	IRR	1.78	64
7498-3	DALE TUCHSCHERER	10/31/2012	PE	IRR	1.78	116
8078-3	RUSTY DIMBERG	11/05/2012	PE	IRR	0.89	43
7649-3	POET BIOREFINING	01/09/2013	PE	IND	3.34	0
7931-3	GCC READY MIX	12/02/2013	PE	COM	0.11	0
8015-3	VICTORY FARMS LLC	05/13/2014	PE	COM	0.33	0
8066-3	TETON LLC	10/08/2014	PE	COM/LCO	0.11	0

Water permits/rights appropriating water for non-irrigation purposes authorize a maximum diversion rate of 10.538 cfs. Assuming these non-irrigation appropriations will divert water at the maximum authorized rate 60% of the time their annual withdrawal from the southern portion of the Veblen aquifer is expected to be less than 4,580 ac-ft/yr. Irrigation use reported from the southern portion of the Veblen aquifer is shown in Table 2.

Table 2. Irrigation use reported from the southern portion of the Veblen aquifer (Water Rights, 1980-2016)

YEAR	NUMBER OF PERMITS/RIGHTS REPORTING	APPROPRIATION (AC-FT/YR)	REPORTED PUMPING (AC-FT/YR)
1979	28	13199	950.19
1980	28	13199	1087.08
1981	32	14837	1484.36
1982	23	10682.6	1111.75
1983	24	10422.6	1611.8
1984	28	12014.6	1718.0
1985	29	12905.8	903.1
1986	32	14495.8	726.70
1987	35	14015.8	1582.8
1988	34	12874.8	2670.3
1989	34	14974.8	1994.1
1990	31	14915.2	1550.60
1991	24	12051	195.80
1992	25	10739.0	748.80
1993	25	11209.0	220.10
1994	21	8913.0	677.83
1995	21	8913.0	537.08
1996	21	8913.0	869.36
1997	21	8913.0	794.0
1998	21	8913.0	945.2
1999	21	8913.0	899.14
2000	21	8913.0	1150.55
2001	20	8505.0	1365.09
2002	20	8505.0	1123.39
2003	20	8505.0	1456.83
2004	20	8505.0	1406.48
2005	19	8425.0	1370.83
2006	19	8425.0	1668.51
2007	18	8017.0	1404.83
2008	23	10186.0	1470.68
2009	20	8005.0	1067.84
2010	20	8005.0	1100.69
2011	21	8094.0	334.63
2012	22	8325.0	1265.45
2013	27	9387.0	1384.59
2014	24	7718	780.77
2015	23	6862	729.44
Max	*35*	*14974.8*	*2670.3*
Min	*18*	*6862*	*195.8*
Average	*24.2*	*10010.4*	*1144.8*

In addition to the appropriative rights from the Veblen aquifer, there are a number of water well completion reports on file with the SD DENR-Water Rights Program for domestic wells that appear to be completed into the Veblen aquifer (Water Rights, 2016c). The annual withdrawal due to domestic wells is not expected to be significant to the hydrologic budget of the Veblen aquifer.

Recharge:

Recharge to the Veblen aquifer in Grant County occurs through direct infiltration of precipitation where the aquifer is at land surface and possibly through leakage from the till (Hansen, 1990).

Hedges and others (1985) estimated the recharge rate for the Veblen aquifer as 0.24 inches per year (in/yr) for the confined portions of the aquifer and 5.2 in/yr for the unconfined portions. Assuming average annual withdrawals from the aquifer will equal the average proposed by this application plus the average of existing users (5,725 ac-ft/yr + 22.4 ac-ft/yr= 5,747.4 ac-ft/yr), an average annual recharge rate of only 0.26 inches per year would be necessary to balance withdrawals, assuming the areal extent of the southern portion of the Veblen aquifer to be 265,000 acres. An annual recharge rate of 0.26 inches per year is within the range estimates for average annual recharge presented by Hedges and others, (1985) and in fact is on the conservative side. Therefore, there is a reasonable probability that unappropriated water is available in light of SDCL 46-6-3.1.

Observation well data:
Administrative Rule of South Dakota Section 74:02:05:07 requires that the Water Management Board shall rely upon the record of observation well measurements in addition to other data to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated average annual recharge of the aquifer.

The DENR-Water Rights Program monitors 34 observation wells completed into the Veblen aquifer, with 16 of these observation wells located in the southern portion of the aquifer. A map with the location of the observation wells and hydrographs for the wells are included in Appendix A.

The observation well data documents cyclic conditions of water levels, recharging during wet years and declining during dry years. Some of the hydrographs also show the effects of nearby pumping on the aquifer. Observation well data indicates that, at the current level of development, temporal well withdrawal is masked by climatic conditions, indicating that recharge to and natural discharge from the aquifer greatly exceeds well withdrawal. Therefore, unappropriated water is available from this area of the Veblen aquifer to support this proposed appropriation of 23.63ac-ft/yr.

EXISTING WATER RIGHTS:
As previously noted, there are 39 water rights/permits appropriating water from the portion of the Veblen aquifer that Permit No. 8066-3 and Application No. 8227-3 proposes to appropriate water from (see Table 1). Water rights/permits in the vicinity of the wells that are to be used to supply this proposed permit are shown in Figure 2 and identified in Table 1 (Water Rights, 2016b). There are a number of water well completion reports on file in the vicinity of the wells this application proposes to use that appear be completed into the Veblen aquifer (Water Rights, 2016c). Although the Veblen aquifer is generally under confined conditions, drawdown from pumping high capacity wells measured in nearby observation wells is not significant (see observation well hydrographs in Appendix A). For example, observation well GT-77H (Figure A17.), located within approximately 2,000 feet of two irrigation wells, documents only eight to ten feet fluctuation during the irrigation season which is minimal relative to the effects of climatic conditions to the water levels (Water Rights, 2014a).

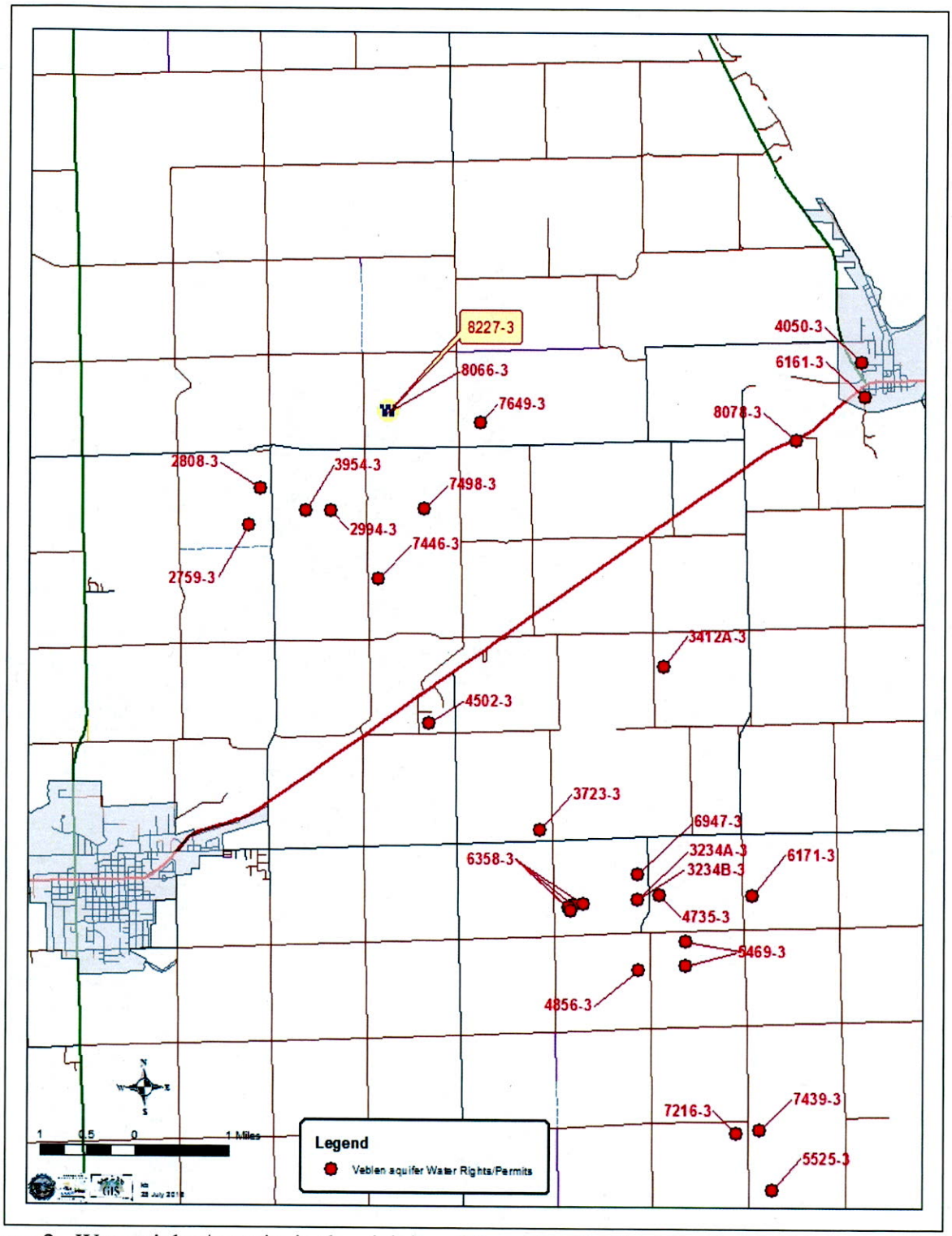

Figure 2. Water rights/permits in the vicinity of the wells Application No. 8227-3 proposes to use as a water source.

Drawdown for the two wells that are to be used to supply this application was estimated to be less than one-half foot, 2000 feet from the wells, at a rate of 0.11 cfs, based on aquifer

characteristics determined for the Veblen aquifer (Buhler, 2014). The additional 23.63 ac-ft/yr this application proposes to withdraw water from the wells completed to supply Water Permit No. 8066-3 is the equivalent to an increase of the average diversion rate from the wells of 0.0326 cfs (14.63 gallons per minute). The increased drawdown that will result from this increased diversion is not expected to be significant considering the characteristics of the Veblen aquifer. Based on the observation well data well interference is not expected to be significant to existing users.

Considering that SDCL 46-6-6.1 does not protect artesian head pressure as a means of delivery and the Water Management Board has consistently recognized that to place water to maximum beneficial use a certain amount of drawdown may occur, a nearby adequate well defined by ARSD 74:02:20(7), which states that the pump intake must be set 20 feet below the top of the aquifer or, if the aquifer is less than 20 feet thick, as near to the bottom of the aquifer as is practical, is not expected to be adversely or unlawfully impaired. Therefore, there is a reasonable probability that any well interference from the proposed appropriation will not cause a significant impact and will also not adversely or unlawfully impair existing users.

CONCLUSIONS:

1. Water Permit Application No.8227-3 proposes to increase the diversion rate from two existing wells completed into the Veblen aquifer by 23.63 acre-feet annually.
2. This application does not propose to increase the instantaneous diversion rate authorized for two existing wells (0.11 cfs).
3. Approval of Application No. 8227-3 will result in an increase of the average diversion rate of 0.0326 cfs (14.63 gallons per minute) over one year of operation.
4. If Permit No. 8227-3 is approved, the total diversion rate from the two existing wells will be 46.03 ac-ft/yr, or an average of 0.06358 cfs (28.54 gpm).
5. The Veblen aquifer in Grant County is a viable aquifer.
6. There is a reasonable probability that unappropriated water is available from the Veblen aquifer for this appropriation.
7. The appropriation proposed by this application will not adversely impact existing rights.

Ken Buhler
SD DENR-Water Rights

REFERENCES:

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Hansen, D.S. 1990, Water Resources of Codington and Grant Counties, South Dakota: U.S. Geological Survey Water-supply Paper 2254, 263 p.

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Water Rights. 2016b. Water Right/Permit Files, SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

Water Rights. 2016c. Water Well Completion Reports, SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

APPENDIX A

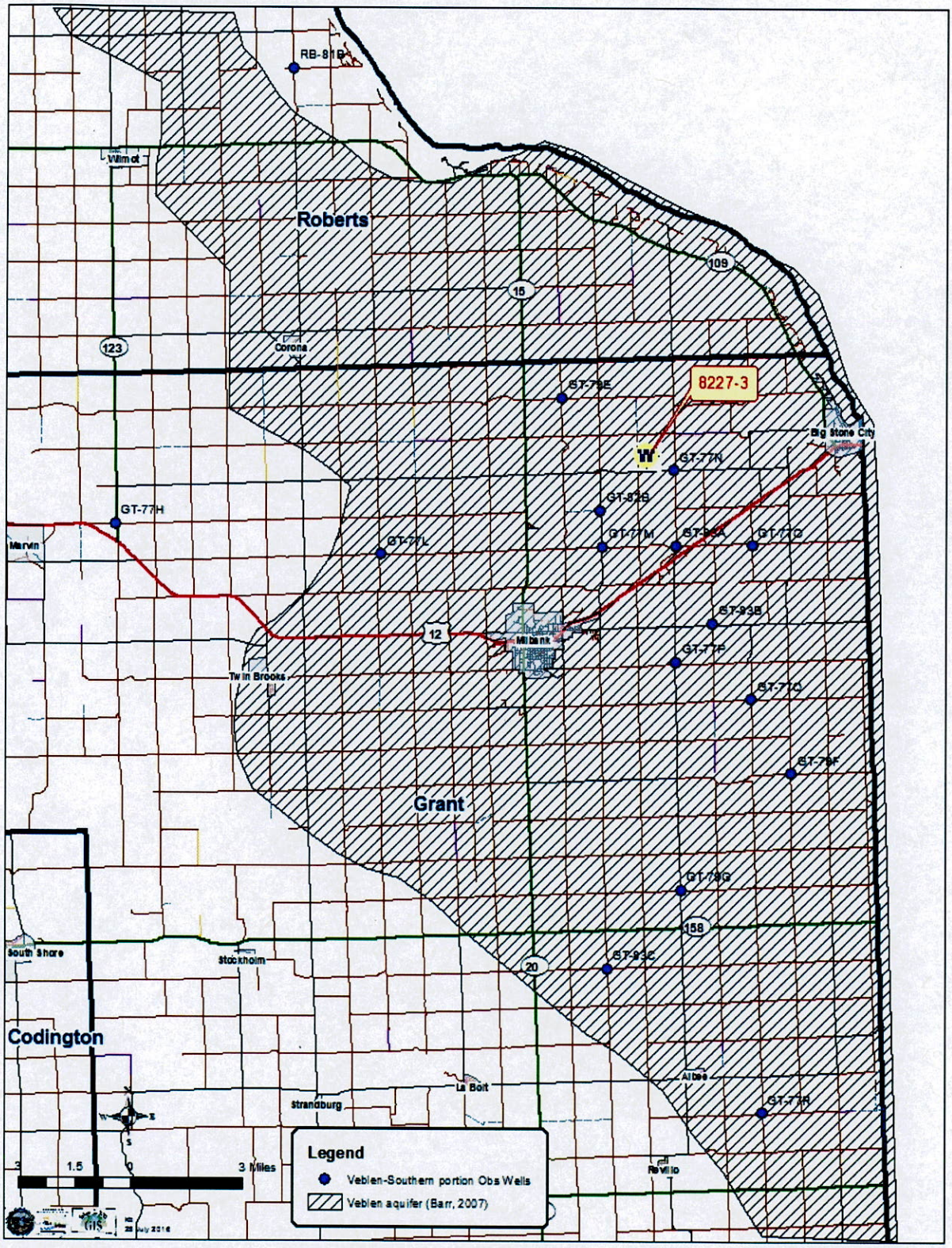

Figure A1. Map showing the location of DENR-Water Rights' observation wells completed into this portion of the Veblen aquifer and the location of the well site to be used by Water Permit No. 8227-3, if approved.

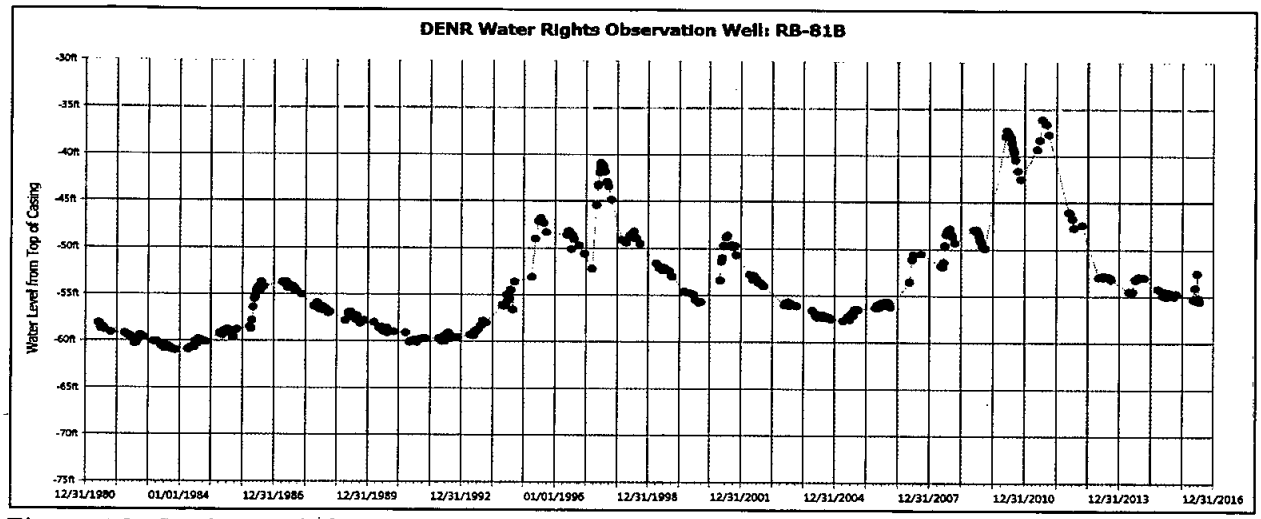

Figure A2. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

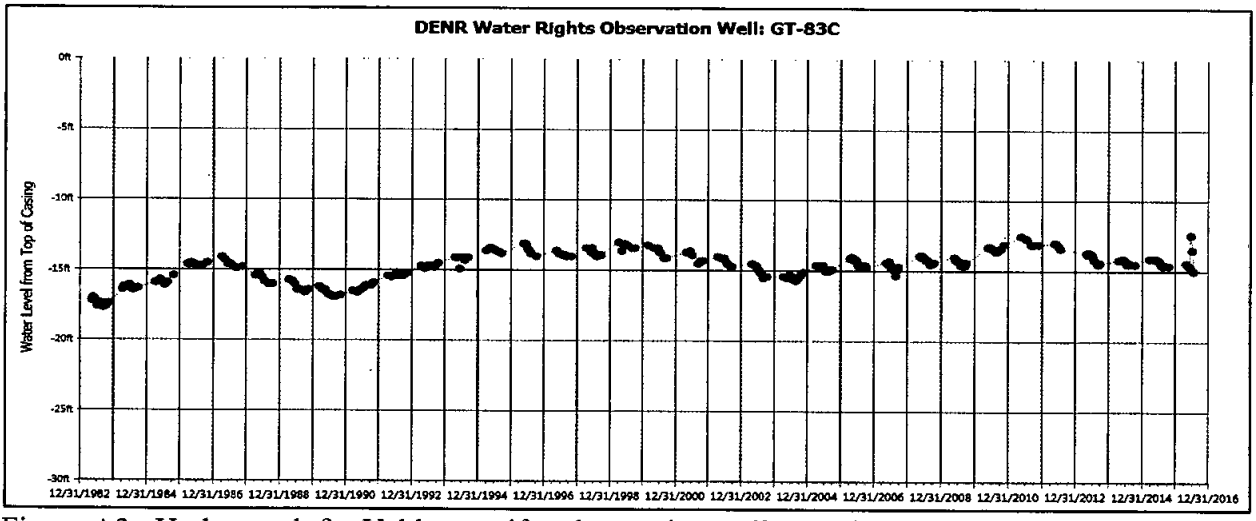

Figure A3. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

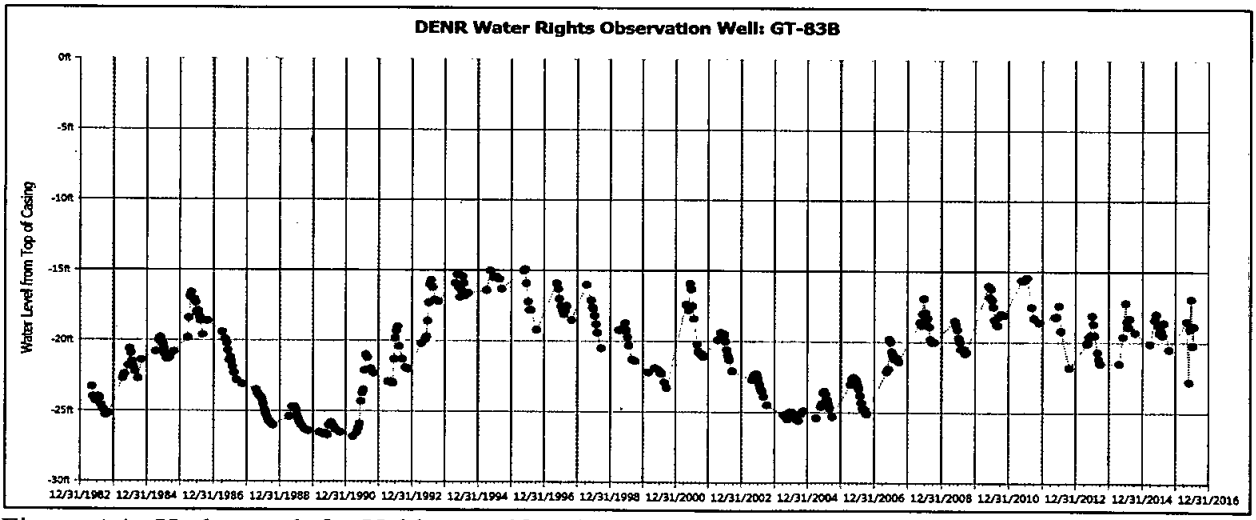

Figure A4. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

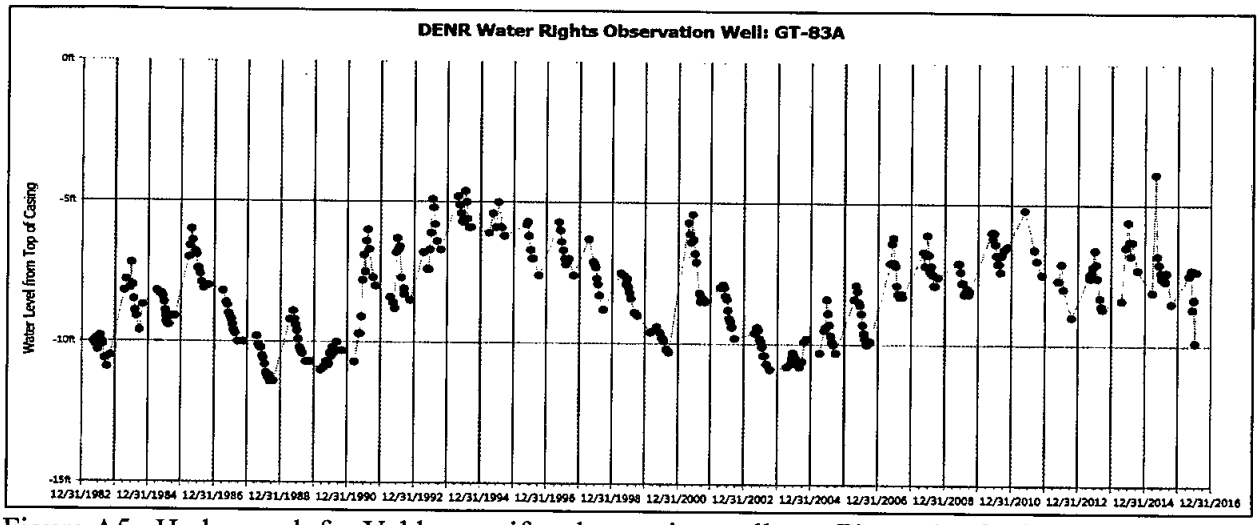

Figure A5. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

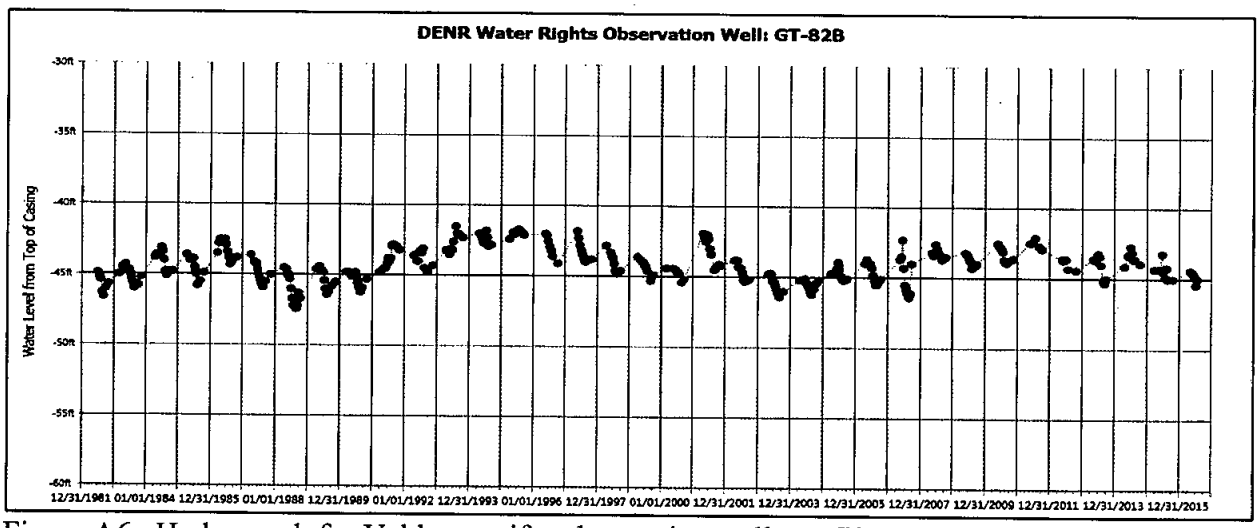

Figure A6. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

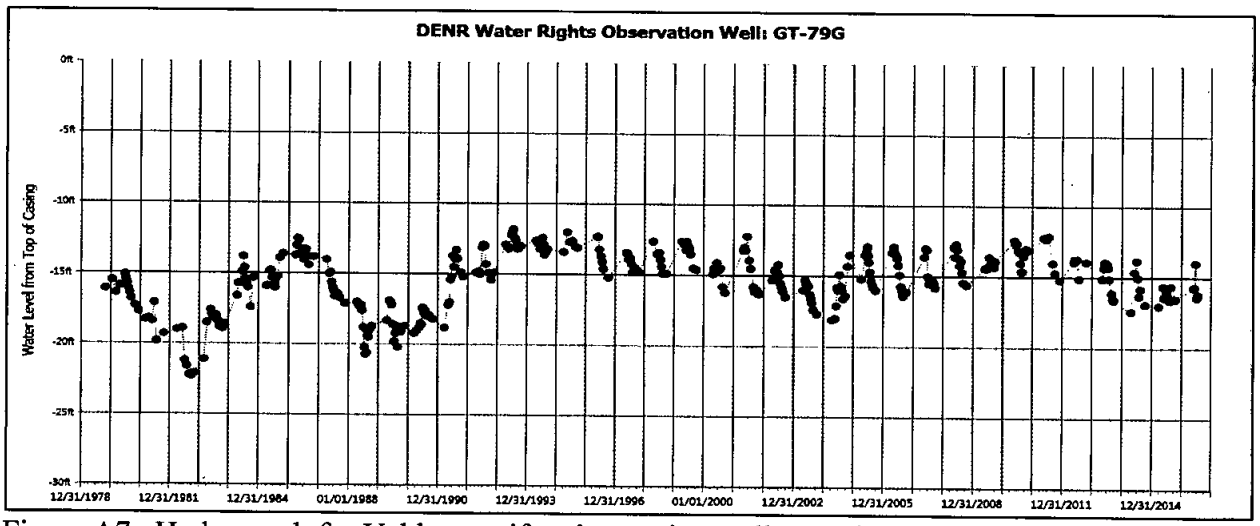

Figure A7. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

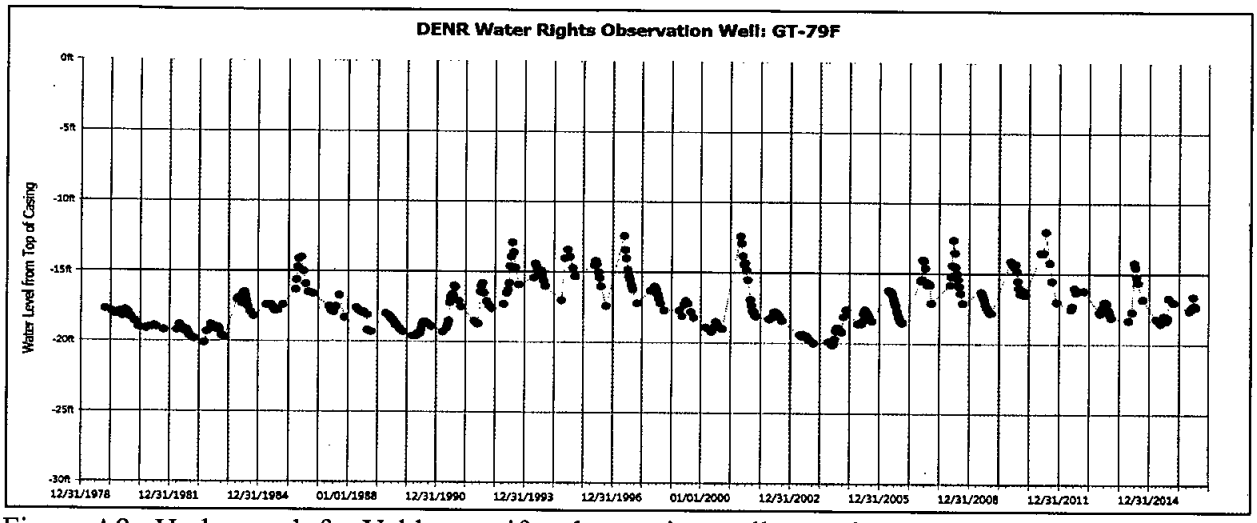

Figure A8. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

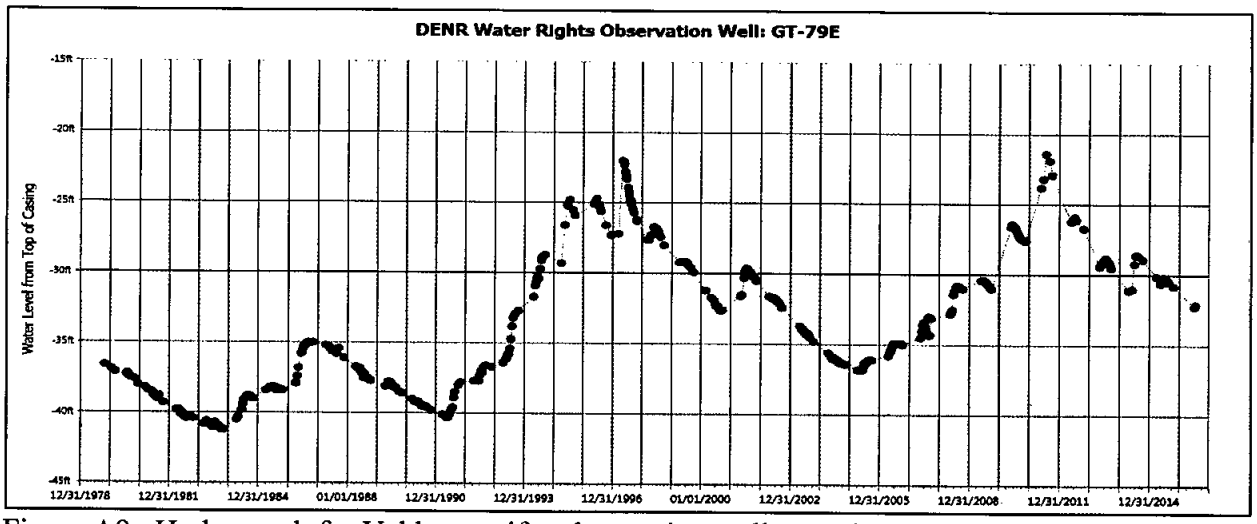

Figure A9. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

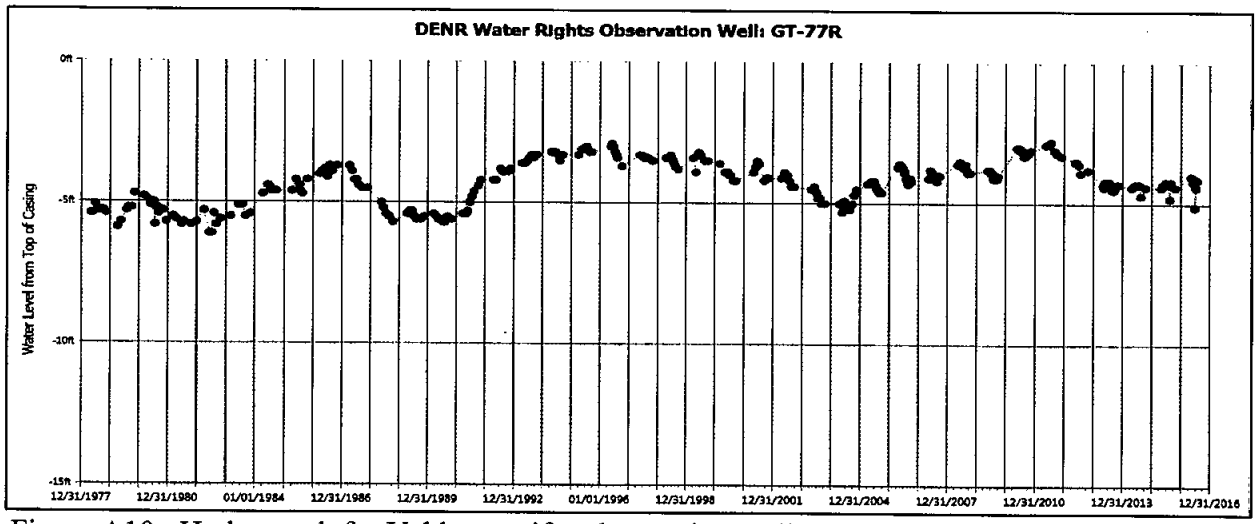

Figure A10. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

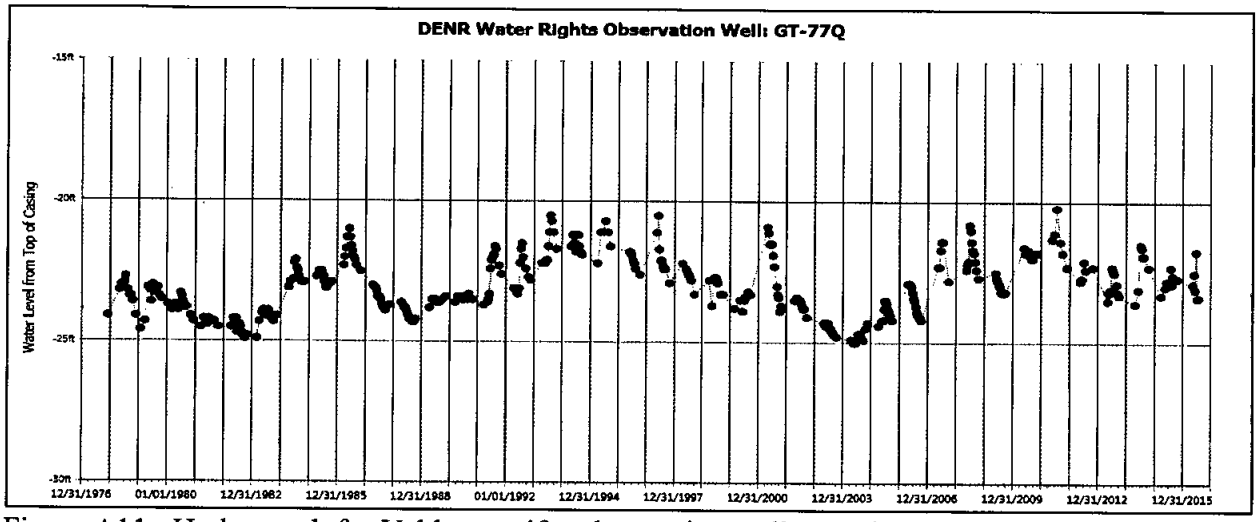

Figure A11. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

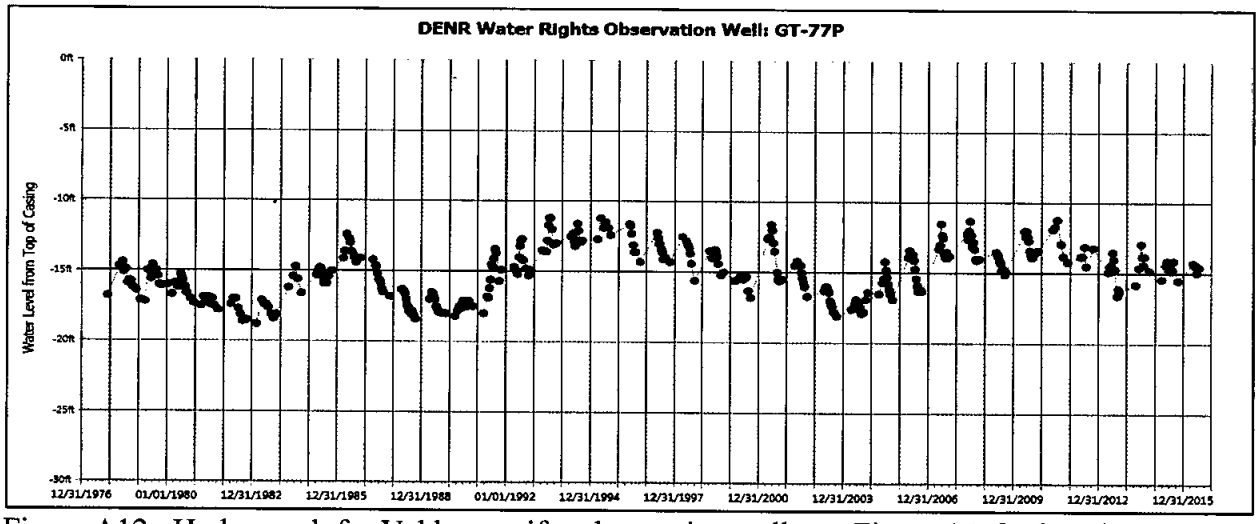

Figure A12. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

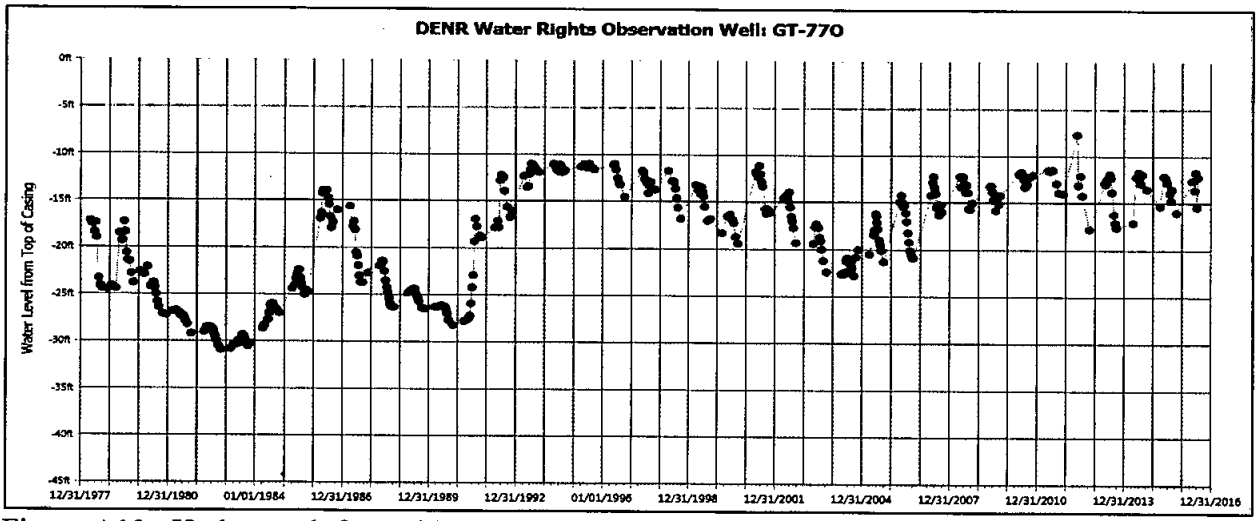

Figure A13. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

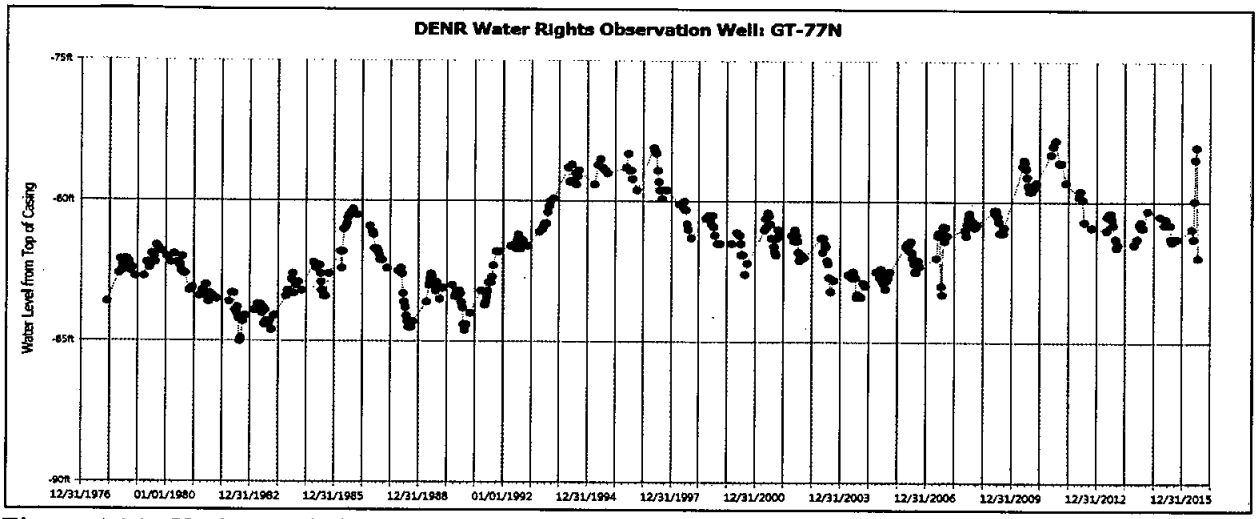

Figure A14. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

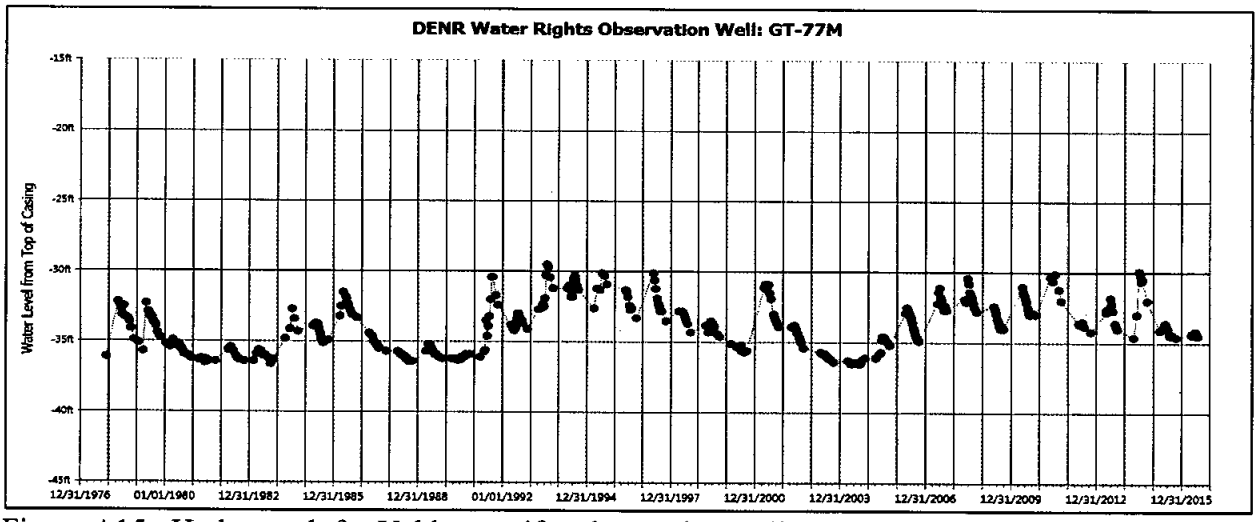

Figure A15. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

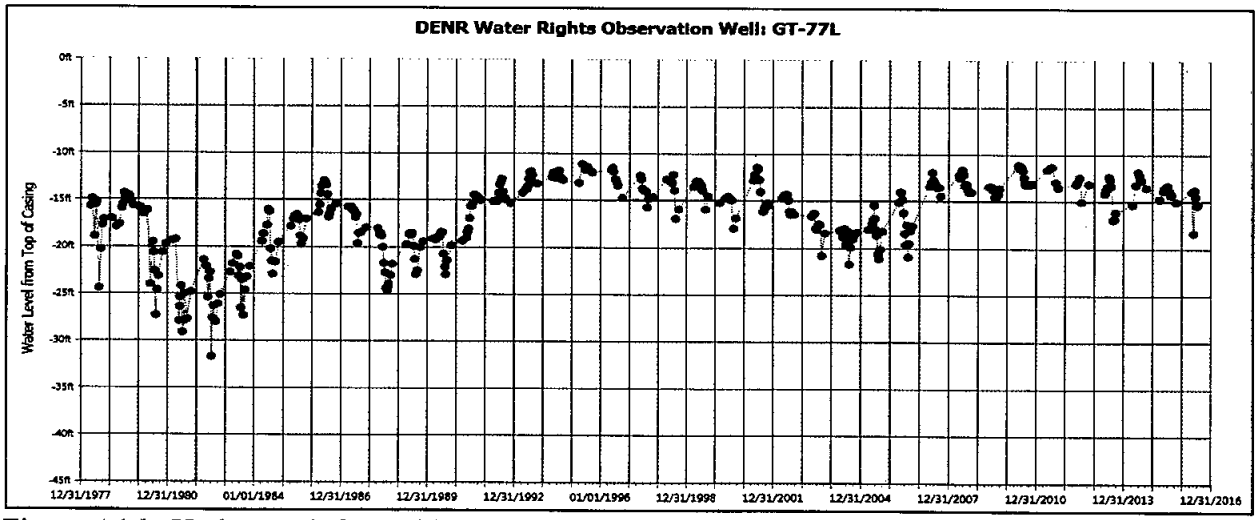

Figure A16. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.

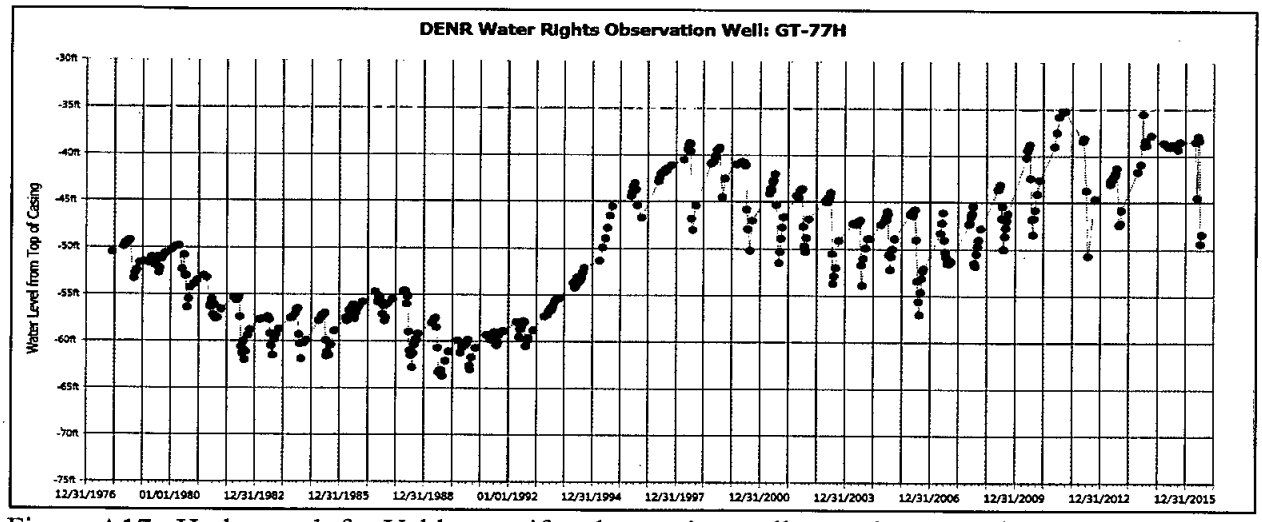

Figure A17. Hydrograph for Veblen aquifer observation well, see Figure 1A for location.