



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
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PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8226-3, Jeffrey Albrecht**

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. 8226-3, Jeffrey Albrecht, 21749 435th Avenue, DeSmet SD 57231.

The Chief Engineer is recommending APPROVAL of Application No. 8226-3 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 and 4) it is in the public interest with the following qualifications:

1. The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The wells authorized by Permit No. 8189-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.
3. Pursuant to SDCL 46-5-6 which allows a greater diversion rate if the method of irrigation, time constraints, or type of soils so requires, Permit No. 8226-3 authorizes a maximum diversion rate of 1.78 cfs for the irrigation of 102.5 acres with an annual volume not to exceed 2 acre feet of water per acre per year.
4. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
July 25, 2016

REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 8226-3
JEFFREY ALBRECHT
JULY 11, 2016

Water Permit Application No. 8226-3 proposes to appropriate water from the Vermillion East Fork aquifer for the purpose of irrigating 102.5 acres located in the E $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 35, T110N-R56W. The applicant intends to divert water from two wells approximately 100 feet deep, located in the S $\frac{1}{2}$ SE $\frac{1}{4}$ of Sec.35, T110N-R56W, at a maximum diversion rate of 1.78 cubic feet per second (cfs). The applicant is requesting a diversion rate greater than the statutory limit of one cfs per 70 acres.

AQUIFER: Vermillion East Fork (VEF)

GENERAL:

The Vermillion East Fork aquifer was identified by Hedges and others (1982) as a surficial aquifer associated with the Vermillion East Fork River valley. The *First Occurrence of Aquifer Materials in Kingsbury County, South Dakota* (Schulz, 2007), indicates the uppermost aquifer material in the vicinity of the well sites proposed by this application as “Outwash: First occurrence is generally at land surface.” The Vermillion East Fork aquifer is a glacial meltwater deposit consisting of medium to very coarse sand and fine gravel. The aquifer extends from Clark County to Turner County where it blends into the Parker Centerville outwash (Hedges and others, 1982). Subsequent work by the United States Geological Survey in Kingsbury County defined the Vermillion East Fork aquifer as a generally unconfined aquifer with the top of the aquifer ranging from land surface to as much as 120 feet (Hamilton, 1989). The report for the test hole submitted with this application identifies sand and gravel from 59-125 feet below grade. The DENR-Water Rights Program and the SD Water Management Board has considered the source aquifer for nearby observation wells and wells supplying water rights/permits that are completed into outwash deposits encountered at elevations similar to the elevation of the outwash this application proposes to develop wells into, the Vermillion East Fork aquifer.

The Vermillion East Fork aquifer is estimated to underlie approximately 94 square miles of Kingsbury County along a northwest trending 2-4 mile wide band (Hamilton, 1989). Due to a groundwater flow divide identified in the aquifer approximately four miles north of DeSmet, SD, the portion of the aquifer north of the divide is considered the Spirit Lake management unit of the Vermillion East Fork aquifer. As a result of a constriction in the areal extent of the aquifer and a groundwater divide near the Kingsbury/Miner County line, Stonesifer (2014) postulated a separate management unit of the aquifer located south of Township 112 North and north of the Kingsbury/Miner County line could be considered. This postulated management unit of the Vermillion East Fork aquifer is estimated to have a total areal extent of approximately 42,500 acres and contain an estimated 127,000 acre feet of water in storage (Stonesifer, 2014). The aquifer is generally under unconfined conditions and groundwater movement is likely from the northwest to southeast (Hamilton, 1989). The aquifer is hydraulically connected to Lake Thompson. The hydraulic conductivity of the aquifer is estimated to range from 200 to 600 ft²/d and well yields may be as high as 1,000 gallons per minute (Hamilton, 1989).

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 water availability and existing rights issues only.

WATER AVAILABILITY:

Water Permit Application No. 8226-3 proposes to appropriate water from the Vermillion East Fork aquifer. Approval of this application is likely to result in an average annual water use of less than 85 acre-feet annually (ac-ft/yr). 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:

Recharge:

Recharge to the Vermillion East Fork aquifer occurs through infiltration of precipitation, leakage from adjacent and underlying till, and inflow from other management units (Hamilton, 1989). The average annual recharge for this unnamed management unit of the Vermillion East Fork aquifer has not been quantified. However, average annual recharge to the adjacent Spirit Lake management unit was estimated to be approximately 4.0 inches per year through observation well analysis (Hedges and others, 1985). Due to the proximity of the two management units and their similar characteristics, the recharge rate to the two management units is expected to be similar. Therefore, the average annual recharge to this postulated management unit is estimated to be approximately 14,200 acre-feet per year.

Discharge:

Discharge from this unnamed management unit of the Vermillion East Fork aquifer is through evapotranspiration, outflow to adjacent lakes, groundwater outflow to Miner County, and well withdrawals for domestic, commercial, rural water system, municipal, and irrigation use (Water Rights, 2016b and Water Rights 2016c). The water rights/permits appropriating water from the unnamed management unit of the Vermillion East Fork aquifer that Water Permit Application No. 8226-3 proposes to appropriate from are shown in Table 1.

Although there are a number of domestic wells on file, considering rural water has replaced most domestic wells as a primary source and the relatively low amount of water used by a typical domestic well, the amount of water withdrawn annually for domestic use is not significant to the hydrologic budget for this management unit.

Appropriations from this unnamed management unit of the Vermillion East Fork aquifer for uses other than irrigation include: four water rights appropriating water for rural water system use, three municipal water rights, and two future use permits. Water use by these non-irrigation uses is estimated assuming water rights/permits limited by diversion rate only will divert at the maximum authorized diversion rate 60 percent of the time and water rights limited to an annual volume of water will divert the entire allotment. It is assumed that future use permits can be fully developed.

Kingbrook Rural Water System, Inc. has four water rights authorizing a total diversion rate of 5.76 cfs and a total annual appropriation of 1,350 ac-ft/yr, and one future use permit reserving 1,100 ac-ft/yr (Water Rights, 2016b). The amount of water that can be expected to be withdrawn through these appropriations is estimated to be 2,450 ac-ft/yr.

The City of DeSmet has three water rights authorizing a total diversion rate of 4.334 cfs and one future use permit reserving 625 ac-ft/yr. The amount of water that can be expected to be withdrawn through these appropriations is estimated to 2,508 ac-ft/yr.

Historic irrigation use from the Vermillion East Fork aquifer is shown in table 2.

Table 1. Water Rights/Permits appropriating water from the Vermillion East Fork aquifer in Kingsbury County

PERMIT NO	NAME	PRIORITY DATE	STATUS	USE	CFS	ACRES
1456A-3	H T ALBRECHT & SONS INC	11/09/1967	LC	IRR	1.33	124
1487-3	IRA ALBECK	12/29/1967	LC	IRR	1.85	130
1533-3	RUSTIN E & AUSTIE LEE ALBRECHT	11/09/1967	LC	IRR	2.66	293
1652-3	CITY OF DESMET	12/24/1968	LC	MUN	2.22	0
2037-3A	TIM SULLIVAN	12/17/1973	LC	IRR	1.89	132
3312-3	CLARENCE STUBBE	12/07/1976	LC	IRR	1.88	132
3478-3	FARRON PRATT	12/10/1976	LC	IRR	1.33	110
3499A-3	WILLIAM POPPEN	12/28/1976	LC	IRR	1.77	132
3822-3	JOAN A JENCKS	02/15/1977	LC	IRR	1.34	126
3825-3	SHIRLEY ALLEN	03/04/1977	LC	IRR	1.31	92
3937-3	WENDELL SCHUBLOOM	04/27/1977	LC	IRR	0.4	28.7
3960-3	WALLUM FARMS INC	03/09/1977	LC	IRR	0.94	66
4137-3	KINGBROOK RWS INC	03/04/1977	LC	RWS	1.06	0
4245-3	ALAN AUGHENBAUGH	02/27/1978	LC	IRR	1.77	205
4795-3	CITY OF DESMET	01/01/1922	LC	MUN	2.11	0
5186-3	KINGBROOK RWS INC	03/29/1988	LC	RWS	0.7	0
5258-3	KINGSBURY CO COUNTRY CLUB	12/07/1988	LC	IRR	0.52	37
5426-3	KINGBROOK RWS INC	08/15/1988	LC	RWS	1.4	0
6731-3	KINGBROOK RWS INC	06/05/2006	LC	RWS	2.6	0
6759-3	CITY OF DESMET	09/27/2006	LC	MUN	0.004	0
7279-3	H T ALBRECHT & SONS INC	11/17/2011	PE	IRR	1.92	135
7307-3	WESLEY TOEWS FAMILY TRUST	01/17/2012	PE	IRR	4	296
7674-3	BOB TIMP	01/24/2013	PE	IRR	4.44	360
7855-3	WILLIAM POPPEN	07/08/2013	PE	IRR	0.89	40
7981-3	FARRON PRATT	03/06/2014	PE	IRR	0.58	24
8050-3	RONALD BENSON	09/19/2014	PE	IRR	2.22	172
8168-3	NORMAN LEE	06/09/2015	PE	IRR	2.49	195.6
8169-3	LYLE ANDERSON	06/09/2015	PE	IRR	0.85	67.3

LC= Water Right, PE= Water Permit, IRR= Irrigation, MUN= Municipal, RWS= Rural Water System

Table 2. Irrigation appropriation and pumpage from the Vermillion East Fork aquifer (Modified from Capen, 2015, Water Rights, 1980-2016)

Year	Number of Permits Reporting	Appropriation	Pumpage Reported
		(ac-ft/yr)	(ac-ft/yr)
1979	23	10193.0	1553.36
1980	23	10193.0	1531.92
1981	23	10193.0	982.46
1982	22	8691.6	393.15
1983	22	8691.6	710.13
1984	21	9783.8	694.00
1985	20	9303.8	865.00
1986	21	9500.6	485.00
1987	21	9270.6	661.00
1988	21	9270.6	973.00
1989	22	9270.6	1147.60
1990	22	9670.6	1969.00
1991	22	8696.6	877.00
1992	17	6147.1	619.60
1993	17	6192.1	146.20
1994	16	5602.1	439.12
1995	16	5602.1	253.59
1996	16	5602.1	835.64
1997	16	5582.1	802.00
1998	16	5602.1	850.36
1999	16	5602.1	588.69
2000	16	5602.1	950.39
2001	16	5602.1	891.71
2002	16	5416.1	985.08
2003	16	5416.1	1141.42
2004	15	5152.1	839.32
2005	15	5152.1	966.60
2006	15	5152.1	1090.45
2007	14	4966.1	1178.74
2008	14	4966.1	1253.00
2009	14	4966.1	464.11
2010	14	4966.1	277.89
2011	14	4966.1	517.48
2012	16	5828.1	1644.78
2013	17	6548.1	1603.63
2014	19	6676.1	1229.64
2015	21	6840.1	1478.1
<i>Max</i>	23	10193	1969
<i>Min</i>	14	4966.1	146.2
<i>Average</i>	17.97	6942.62	915.95

Water Balance:

The annual average withdrawal from this postulated management unit of the Vermillion East Fork aquifer through current appropriations is expected to be approximately 6,180 ac-ft/yr. Expected average annual usage includes: (1) Kingbrook RWS water rights/permits and future use permit (2450 ac-ft/yr); (2) City of DeSmet water rights/permits and future use permit (2508 ac-ft/yr); (3) average irrigation withdrawals from table 2 (915.95 ac-ft/yr); (4) development of Water Permit Nos. 8168-3 and 8169-3, with an average application rate of 10 inches per acre per year (219 ac-ft/yr); and (5) development of Water Permit 8226-3, with an average application

rate of 10 inches per acre per year (85 ac-ft/yr). The average annual recharge is estimated to be 14,200 ac-ft/yr. Therefore, there is a reasonable probability that unappropriated water is available to support the proposed appropriation.

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 nine observation wells completed into the this postulated management unit of the Vermillion East Fork aquifer. Hydrographs for the observation wells are shown in Figures 1-9.

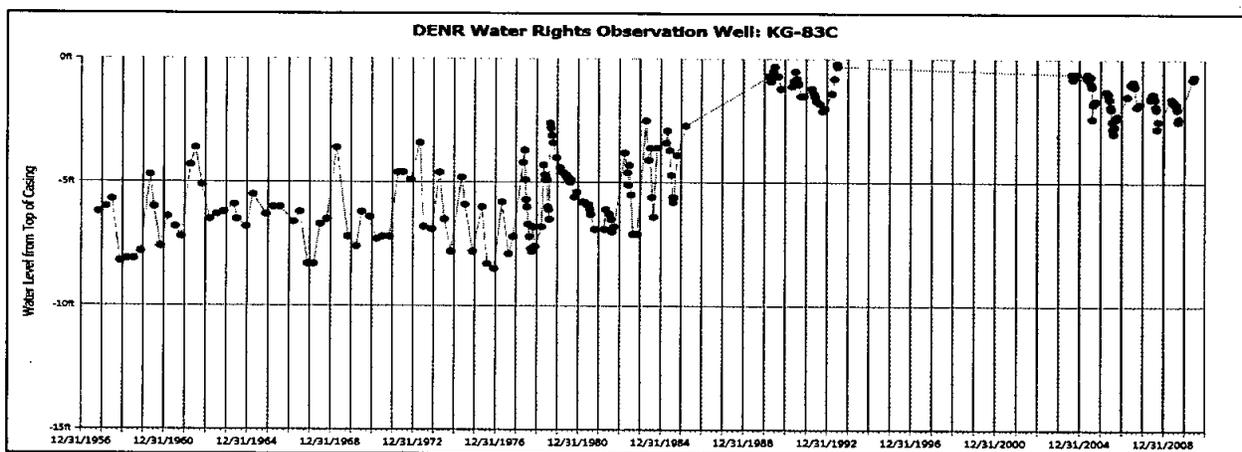


Figure 1. Hydrograph for Vermillion East Fork aquifer observation well located approximately two miles northeast of the well sites proposed by Water Permit Application No. 8266-3.

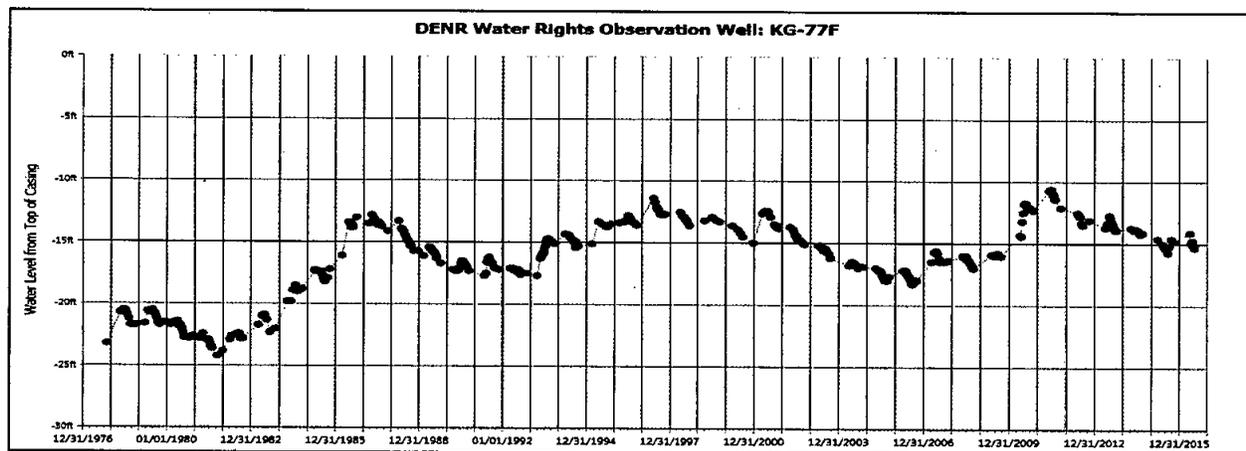


Figure 2. Hydrograph for Vermillion East Fork aquifer observation well located approximately four miles north-northwest of the well sites proposed by Water Permit Application No. 8266-3.

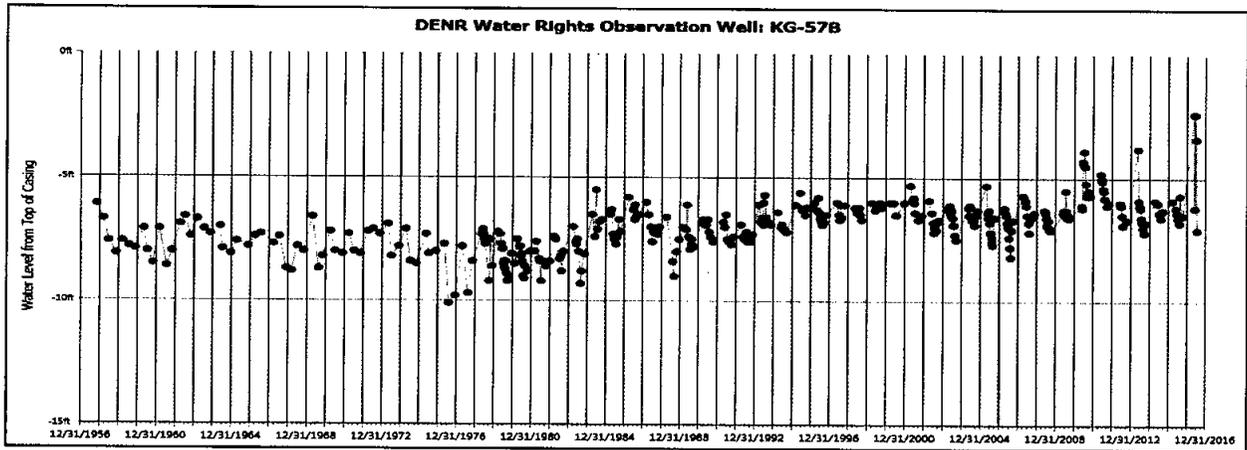


Figure 3. Hydrograph for Vermillion East Fork aquifer observation well located approximately six miles north-northwest of the well sites proposed by Water Permit Application No. 8266-3.

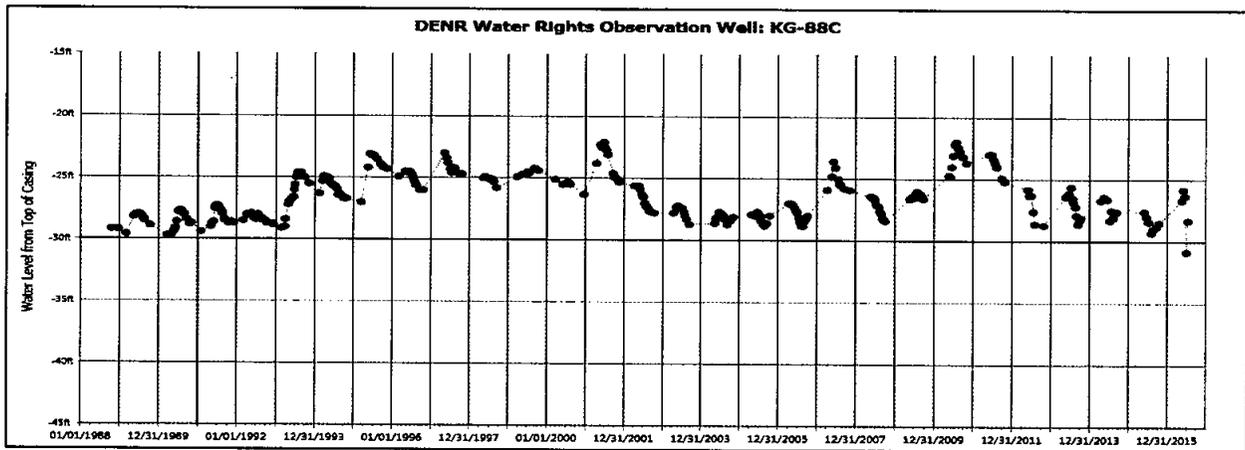


Figure 4. Hydrograph for Vermillion East Fork aquifer observation well located approximately nine miles northwest of the well sites proposed by Water Permit Application No. 8266-3.

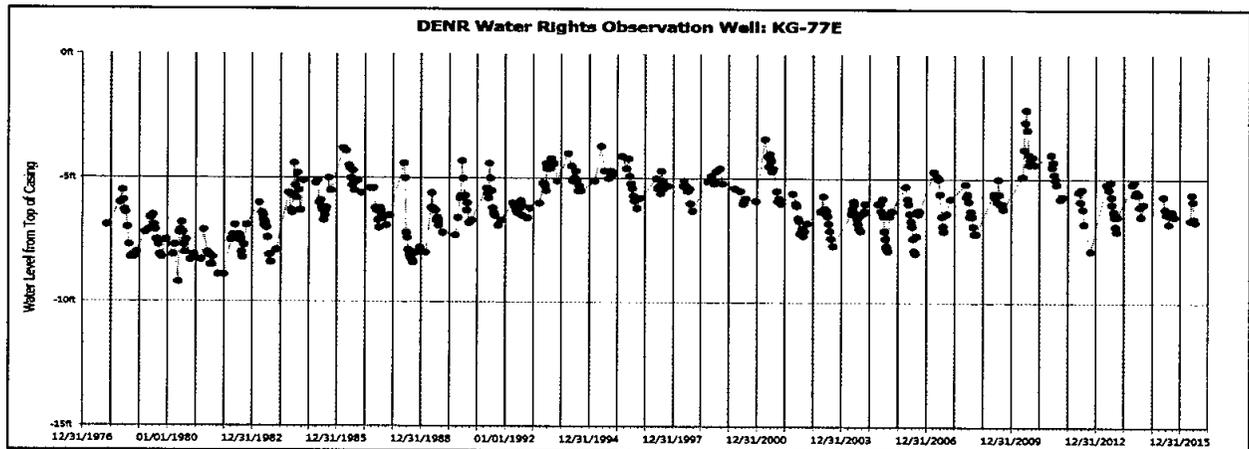


Figure 5. Hydrograph for Vermillion East Fork aquifer observation well located approximately nine miles north-northwest of the well sites proposed by Water Permit Application No. 8266-3.

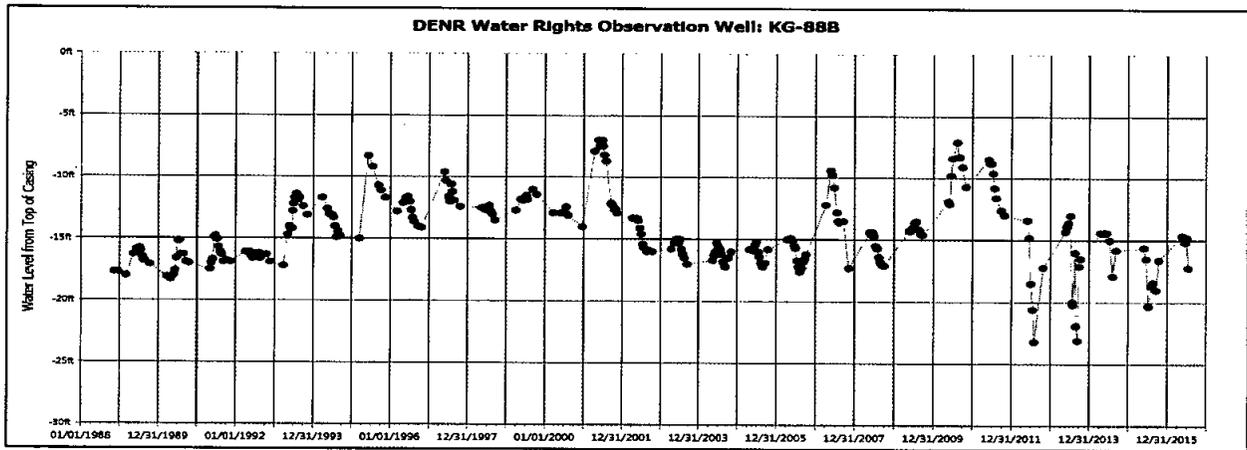


Figure 6. Hydrograph for Vermillion East Fork aquifer observation well located approximately nine miles northwest of the well sites proposed by Water Permit Application No. 8266-3.

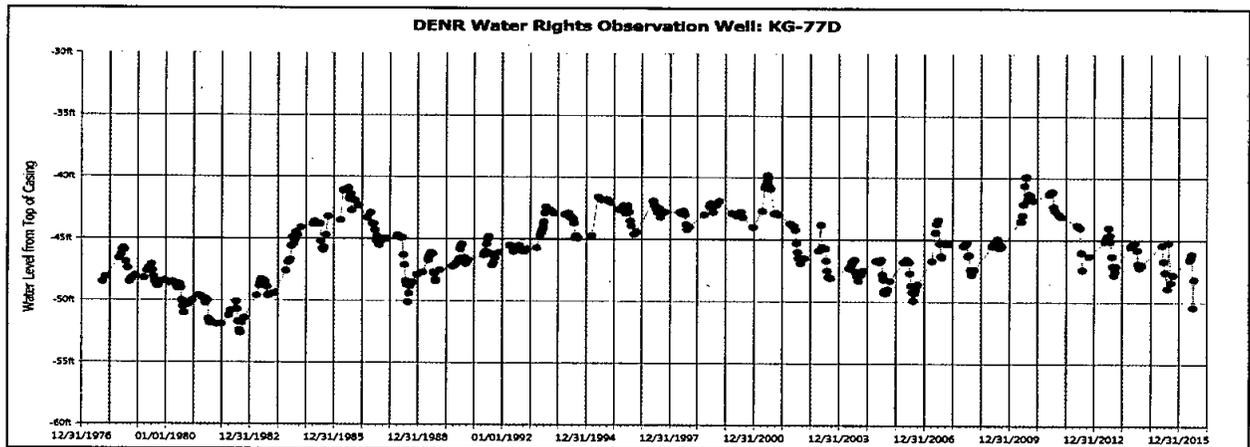


Figure 7. Hydrograph for Vermillion East Fork aquifer observation well located approximately 10 miles northwest of the well sites proposed by Water Permit Application No. 8266-3.

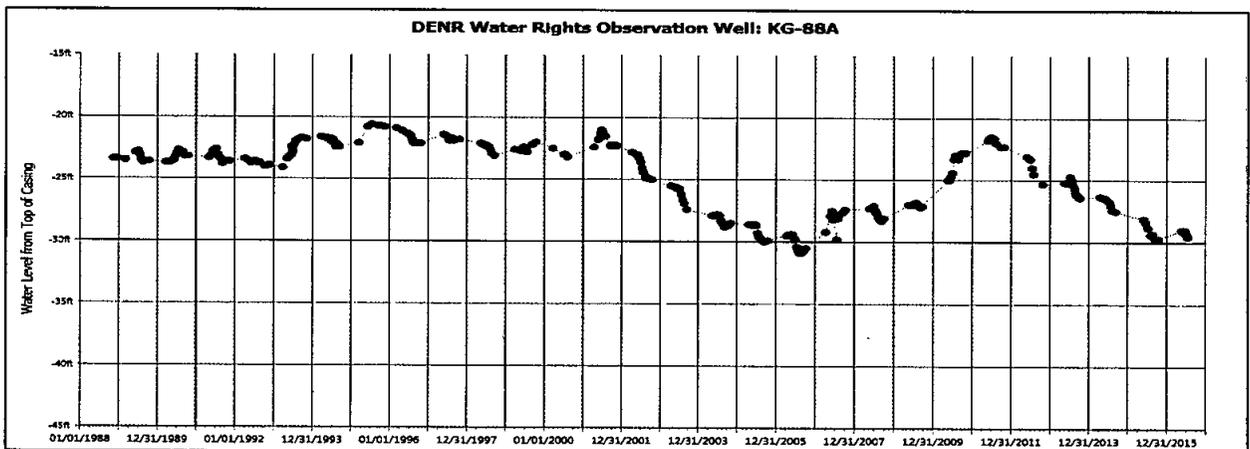


Figure 8. Hydrograph for Vermillion East Fork aquifer observation well located approximately 12 miles northwest of the well sites proposed by Water Permit Application No. 8266-3.

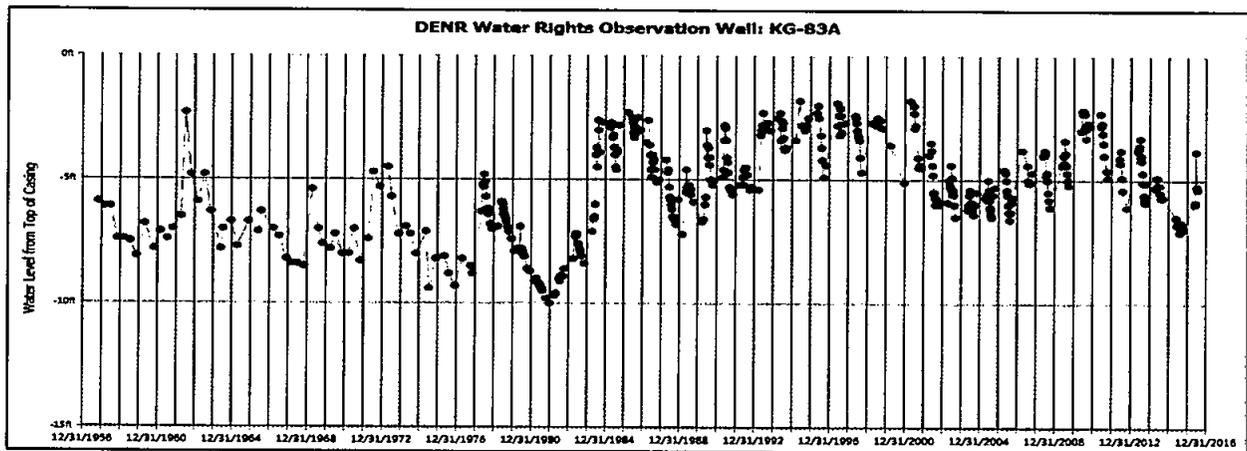


Figure 9. Hydrograph for Vermillion East Fork aquifer observation well located approximately 12 miles north-northwest of the well sites proposed by Water Permit Application No. 8266-3.

In general, the hydrographs show stable or upward trending water levels over the period of record. The hydrograph for KG-88A (Figure 8) is an exception due to the proximity and influence of the Kingbrook Rural Water System well field. Note the break in data shown in the hydrograph for observation well KG-83C (Figure 1) is the result of the well's inaccessibility for a number of years. In addition to the period from 1993-2004, the well has been inaccessible since June 15, 2010. The hydrographs document that the aquifer responds well to climatic conditions with rising water levels during wet years and declining water levels during dry years. The data documents that at the current level of development temporal well withdrawal is masked by climatic conditions. Therefore, recharge to and natural discharge from the aquifer greatly exceeds well withdrawal, so water is available for capture before natural discharge. Therefore, unappropriated water is available from the Vermillion East Fork aquifer to support the proposed appropriation.

AFFECTS ON EXISTING RIGHTS:

The approximate location of wells supplying water rights/permits appropriating water from the Vermillion East Fork aquifer in the vicinity of the well sites proposed by this application are shown in Figure 10, and identified in Table 3.

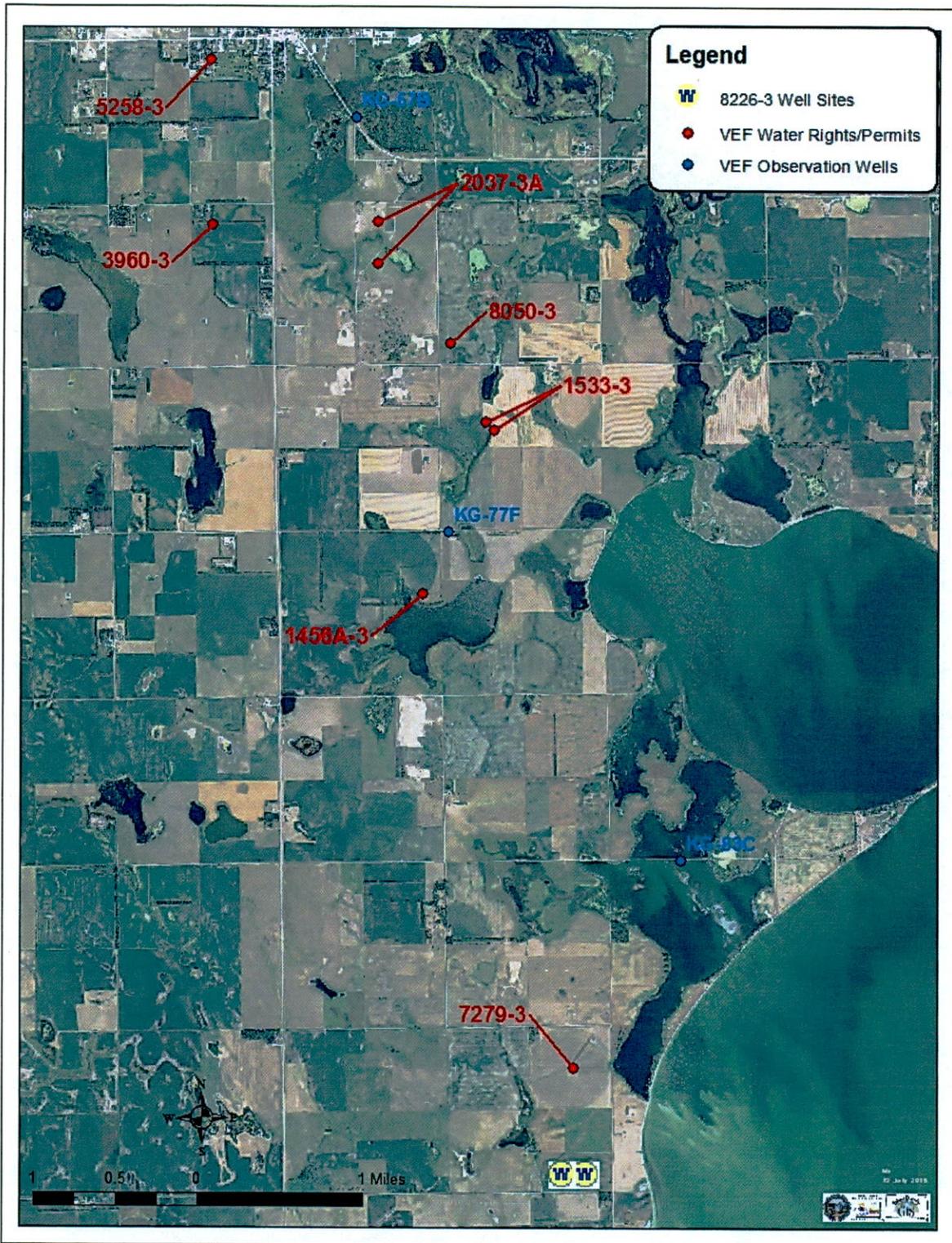


Figure 10. Map showing the approximate location of: (1) the well sites proposed by Application No. 8226-3; (2) wells supplying water rights/permits appropriating water from the Vermillion East Fork aquifer in the vicinity of the proposed well sites; and (3) DENR-Water Rights observation wells completed into the Vermillion East Fork aquifer in the area (Water Rights, 2016b).

Table 1. Water Rights/Permits shown in Figure 10(Water Rights, 2016b).

PERMIT NO	NAME	PRIORITY DATE	STATUS	USE	CFS	ACRES
1533-3	RUSTIN E & AUSTIE LEE ALBRECHT	11/09/1967	LC	IRR	2.66	293
2037-3A	TIM SULLIVAN	12/17/1973	LC	IRR	1.89	132
3960-3	WALLUM FARMS INC	03/09/1977	LC	IRR	0.94	66
5258-3	KINGSBURY CO COUNTRY CLUB	12/07/1988	LC	IRR	0.52	37
1456A-3	H T ALBRECHT & SONS INC	11/09/1967	LC	IRR	1.33	124
7279-3	H T ALBRECHT & SONS INC	11/17/2011	PE	IRR	1.92	135
8050-3	RONALD BENSON	09/19/2014	PE	IRR	2.22	172

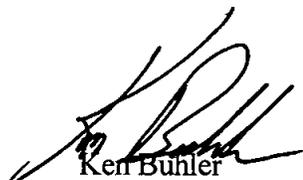
Since the Vermillion East Fork aquifer is under unconfined conditions, drawdown does not extend very far from individual production wells. This is shown by the observation well hydrographs (Figures 1-9). Except for KG-88C (Figure 4), and KG-83C (Figure 1) the observation wells are located within one-half mile of one or more high production wells (either irrigation or RWS) yet the effects of pumping are not significant on the water levels of the observation wells. Precise drawdown estimates have not been quantified at this time, however, the Water Management Board has consistently recognized that to place water to maximum beneficial use a certain amount of drawdown will occur. Adequate wells defined by ARSD 74:02:20(7) are not expected to be adversely impaired due to the additional diversion from the well.

SDCL 46-5-6

Pursuant to SDCL 46-5-6, the diversion rate for an irrigation appropriation cannot be in excess of one cfs for every 70 acres, or “the equivalent thereof.” The statute does provide that the Water Management Board may allow a greater diversion rate if the method of irrigation so requires. Water Permit Application No. 8226-3 proposes to divert up to 1.78 cfs from the Vermillion East Fork aquifer for the irrigation of 102.5 acres, or the equivalent of 1.22 cfs per 70 acres. The applicant indicates “Additional water requested due to windshield wipe pivot irrigation machine and soil type.”

CONCLUSIONS:

1. The Vermillion East Fork aquifer is a viable aquifer in this area.
2. There is a reasonable probability that unappropriated water is available from the Vermillion East Fork aquifer for this proposed appropriation.
3. There is a reasonable probability that this appropriation can be developed without an adverse impact on existing users.



Ken Bühler
SD DENR-Water Rights Program

REFERENCES:

- Capen, B., 2015, Report to the Chief Engineer Water Permit Application Nos. 8168-3 and 8169-3, Norman Lee and Lyle Anderson C/O Kevin Toews, July 31, 2015: SD DENR-Water Rights Program, Joe Foss Building, Pierre, SD
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- Water Rights, 2016a, Observation Well Files, SD DENR-Water Rights Program, Joe Foss Bldg, Pierre, SD.
- 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.