DEPARTMENT of AGRICULTURE and NATURAL RESOURCES
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RECOMMENDATION OF ACTING CHIEF ENGINEER FOR WATER PERMIT APPLICATION NO. 8924-3, Ricky Miller

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Acting Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Water Permit Application No. 8924-3, Ricky Miller, 19524 398th Avenue, Hitchcock SD 57348.

The Acting Chief Engineer is recommending DEFERRAL of Application No. 8924-3 for up to two years for further study pursuant to SDCL 46-2A-2 and 46-2A-7. The deferral of Application No. 8924-3 is to allow time for the applicant to retain a hydrogeologist or other qualified consultant to conduct a suitable aquifer performance test with analysis to determine if pumping from the Niobrara aquifer in this area will induce recharge from the fully appropriated Tulare: Western Spink Hitchcock aquifer. Inducing inflow from a fully appropriated aquifer presents beneficial use and public interest concerns for consideration by the Water Management Board.

See report for further information.

Mark Mayer, PE
Director of Office of Water
March 20, 2025

NOTE: The applicant or their consultant shall consult with the Water Right Program regarding requirements for a suitable aquifer performance test. To discuss the requirements and recommendations for an aquifer performance test, please contact Adam Mathiowetz at (605) 773-3352.

As noted in the report, the water quality in the Niobrara aquifer may not be suitable for irrigation due the water's high sodium adsorption ratio. If this application proceeds and receives a favorable recommendation, the applicant is encouraged to consult with a qualified soil scientist to complete a soil-water compatibility analysis to determine whether the water is suitable for irrigation or, when used for irrigation, best management practices are followed to ensure water is placed to beneficial use in compliance with SDCL 46-2A-9.

Report to the Chief Engineer on
Water Permit Application No. 8924-3
Ricky Miller
11 March, 2025

Water Permit Application No. 8924-3 proposes to appropriate 1.89 cubic feet of water per second (cfs) from one well to be completed into the Niobrara aquifer (approximately 145 feet deep) located in the approximate center of the SE ¼ Section 26 for irrigation of 160 acres located in the SE ¼ Section 26; all in T113N-R62W. This site is located in Beadle County approximately 13 miles north of Huron, South Dakota.

Aquifer: Niobrara (NBRR)

Hydrogeologic Characteristics

The Niobrara aquifer is composed of the permeable and saturated portions of the upper-Cretaceous-aged Niobrara Formation. The Niobrara Formation is a "white to dark-gray argillaceous chalk, marl, and shale [1]" underlying most of South Dakota. Productivity in the Niobrara aquifer is mainly from secondary porosity features such as fractures, faults, and solution cavities [2]. Therefore, its characteristics vary greatly from location to location, and it is typically more productive in areas where weathering to the formation has occurred. The Niobrara Formation underlies approximately 29,054 square miles (18,594,560 acres) in South Dakota east of the Missouri River, including all 1,249 square miles (799,360 acres) of Beadle County and all 1,509 square miles (965,760 acres) of Spink County [2]. Some areas of the Niobrara Formation are separated from the main body of the formation by erosional channels. This application is located in the main body. The main body of the Niobrara Formation underlies approximately 27,500 square miles (17,600,000 acres) in South Dakota east of the Missouri River, including all of Spink and Beadle Counties [3]. The Niobrara Formation underlies the Cretaceous-aged Pierre Shale and the Quaternary-aged glacial deposits including the Tulare aquifer [4]. The Niobrara Formation directly overlies the Cretaceous-aged Carlile Shale [5]. In some places the Cretaceous-aged Pierre Shale is a confining layer between the Niobrara Formation and Tulare aquifer and in other places the Niobrara Formation is in direct contact with the Tulare aquifer. The contact between the Niobrara Formation and the Pierre Shale, and the Niobrara Formation, Pierre Shale, and glacial deposits is unconformable [7], which means there was a period of erosion between the deposition of each of those three deposits. Erosional periods can cause highly undulating surfaces of the bedrock formations which can be difficult to predict based on the available lithological information. Based on available information, including lithologic logs and bedrock mapped in the area of these applications, it is likely the Tulare aquifer comes into direct contact with weathered portions of the Niobrara aquifer at the site of this application which is supported by the well completion report submitted with this application. Consequently, withdrawals from wells completed into the Niobrara Formation could cause flow to go from the Tulare aquifer to the Niobrara aquifer when the two aquifers are in direct contact. The Tulare: Western Spink-Hitchcock aquifer is the directly overlying management unit of the Tulare aquifer at this site. The Tulare: Western Spink- Hitchcock aquifer management unit is fully appropriated [8].

A well completion report was submitted with this application for one well completed on November 25, 2024 in the SW ¼ SW ¼ Section 26 T113N-R62W. The driller reported encountering coarse sand from 30 to 45 feet below grade, sand and coal from 45 to 65 feet below grade, fine sand from 65 to 75 feet below grade, sand streaks from 75 to 85 feet below grade, and chalk from 85 to 145 feet below grade. The driller indicated he drilled to 300 feet below grade, but did not indicate what formations he encountered from 145 to 300 feet below grade in the well completion report. In the driller's notes which were submitted as an attachment, he indicates encountering light grey chalk with very little water from 97 to 300 feet. At the end of the drilling portion of the notes, he indicated "Chalk drills like it's wide open. Hardly getting any cuttings." On the well completion report, the driller indicated setting screen from 105 to 145 feet below grade. He indicated the well was dry and had no static water level. After pumping the well and finding it unproductive, the driller removed the pump and all casing materials.

The described formations are consistent with the presence of a glacial aquifer (the Tulare: Western Spink-Hitchcock aquifer) being present from 30 to 85 feet below grade and the Niobrara Formation lying below it from 85 to 300 feet below grade. A lack of flow in the Niobrara Formation in the SW ¼ Section 26 does not mean there will be no flow in the SE ¼ of the same section. However, it is likely the applicant may need multiple wells to provide the requested rate, if this application is developed.

Applicable South Dakota Codified Law (SDCL)

Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued 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 domestic water uses and water rights, and that the proposed use is a beneficial use and in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board. This report will only assess the availability of water and possibility of developing this application without unlawful impairment of existing domestic water uses and water rights.

Pursuant to SDCL 46-6-3.1, 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 the water to the groundwater source. An exception allows water distribution systems to withdraw from groundwater sources older or stratigraphically lower than the Greenhorn Formation regardless of the results of a hydrologic budget. The applicant is not a water distribution system as defined in SDCL 46-1-6(17) and the Niobrara aquifer is younger and stratigraphically higher than the Greenhorn Formation. Therefore, the Water Management Board must find that recharge to the aquifer exceeds withdrawals to approve this application.

Availability of Water

Hydrologic Budget

Recharge to the Main Body

Recharge to the Niobrara aquifer likely occurs by inflow from aquifers in contact with the Niobrara when the hydraulic head is higher in the other aquifers than in the Niobrara aquifer. No

estimate of the recharge to the Niobrara aquifer is available due to the extreme variability of aquifer characteristics across South Dakota. Observation well water levels in the Niobrara aquifer indicate that recharge exceeds withdrawals in the aquifer [9].

Discharge from the Main Body

Discharge from the Niobrara aquifer is likely by groundwater outflow to aquifers in contact with the Niobrara aquifer when the hydraulic head in the Niobrara aquifer is higher than that of the other aquifers and by withdrawals from domestic and appropriative wells [4]. Domestic wells are not a significant source of discharge in the Niobrara aquifer due to the presence of rural water systems and stratigraphically higher aquifers and the relatively limited diversion rates. There are 35 water rights/permits appropriating water from the main body of the Niobrara aquifer [10] [3]. Of those, 16 are for irrigation, seven are for commercial use, six for municipal use, four for institutional use, and one each for industrial use and fish and wildlife propagation.

Total irrigation reported in the main body of the Niobrara aquifer is shown in Figure 1. The average irrigation reported in the main body of the Niobrara aquifer over the period of record from 1979 through 2024 is 373 acre-feet per year (ac-ft/yr) [11]. However, multiple permits in the aquifer are relatively new and have not developed their systems yet. Table 1 lists each irrigation permit in the main body of the Niobrara aquifer, the number of years reporting, average reported volume, and other information. Permits with less than 10 years of reports are estimated to withdraw 10 inches per permitted acre. Permits with more than 10 years of reports are estimated to withdraw their average reported volume. Therefore, the estimated withdrawal by irrigation in the main body of the Niobrara aquifer is 1,346 ac-ft/yr.

Of the non-irrigation water rights/permits, Water Right Nos. 4121A-3, 4264A-3, 4264B-3, and 4278-3 are held by municipalities that purchase their water from another water distribution system [12] [13]; therefore, these water rights are assumed to withdraw a negligible amount of water for the hydrologic budget. There are two non-irrigation water rights/permits required to report their annual withdrawal but are still developing their permits. Those permits are assumed to withdraw the maximum volume limit listed on their permit, for a combined withdrawal of 227 ac-ft/yr. The remaining 13 non-irrigation water rights/permits are assumed to withdraw at their maximum licensed or permitted diversion rate 60% of the time, for an estimated combined average annual withdrawal rate of 705 ac-ft/yr.

There are six water permit applications (Nos. 8721-3, 8722-3, 8749-3, 8750-3, 8751-3, and 8752-3) which were deferred in the December 2023 Water Management Board hearing due to the possibility of inducing flow from the fully appropriated Tulare aquifers which overlie them. Those six permits proposed to irrigate a total of 2,758 acres in Spink and Beadle Counties at a total maximum withdrawal rate of 36.350 cfs. If those permits are approved, they are estimated to withdraw 2,298 ac-ft/yr assuming they irrigate at a rate of 10 inches per acre.

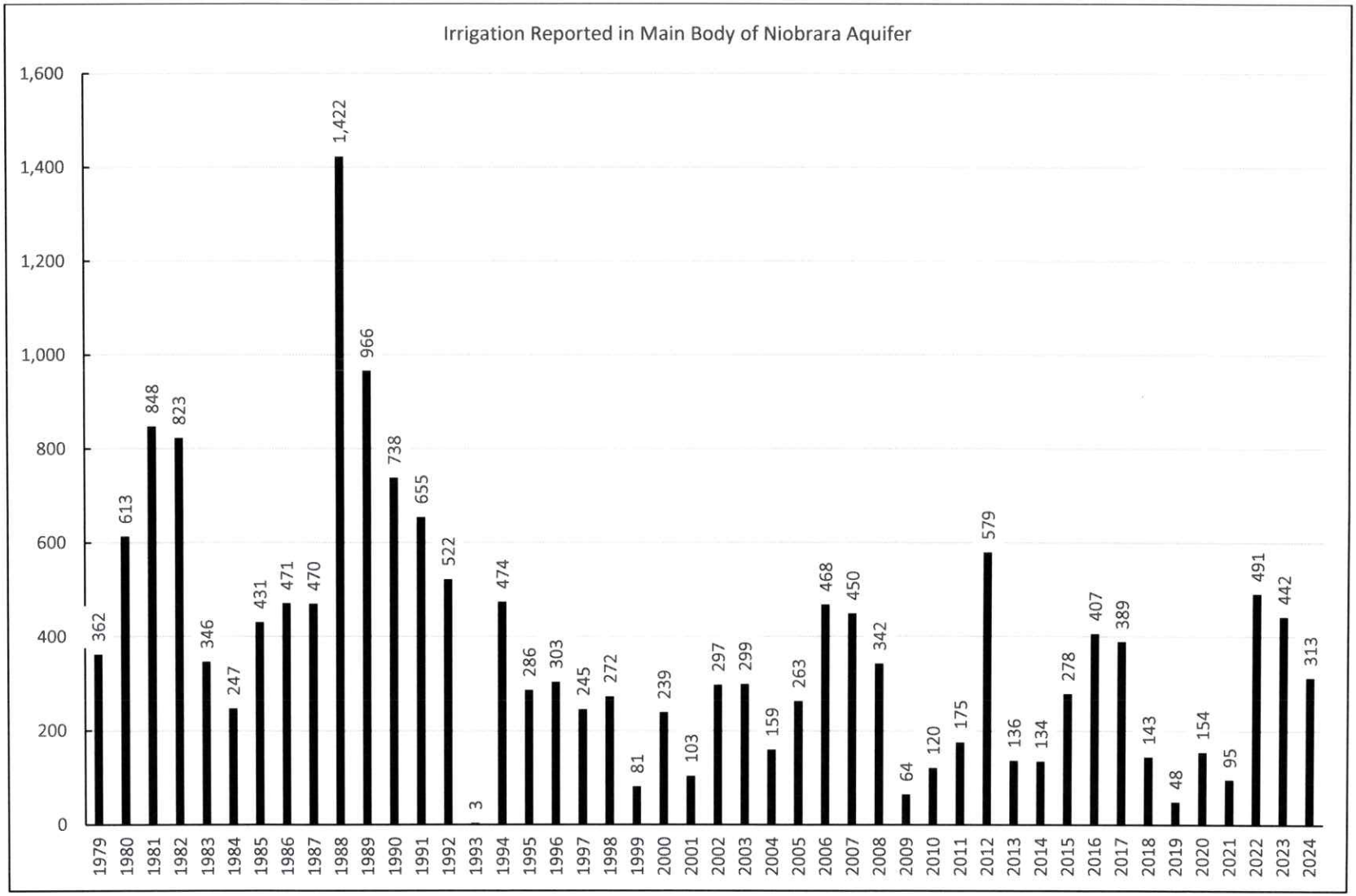

Figure 1: Irrigation reported in the main body of the Niobrara aquifer from 1979-2024 [11]

Table 1: Irrigation reported in the main body of the Niobrara aquifer by permit [11]

Permit No.	Name/Business	Status	County	Priority Date	Acres	Max. CFS	No. Years Reporting	Avg. Report (ac-ft)	Est. Use (ac-ft/yr)
1238-3	Lincoln Neugebauer	License	Davison	12/14/1965	386.0	1.880	46	55	55
1280-3	Marty Neugebauer	License	Davison	06/08/1966	152.0	2.040	46	76	76
3442-3	Robert Maeschen	License	Davison	09/01/1976	108.0	1.220	46	85	85
3788-3	Randal L Rumbolz	License	Davison	03/09/1977	120.0	1.330	46	11	11
3789-3	Randal L Rumbolz	License	Davison	03/09/1977	130.0	1.330	46	34	34
6532-3	Mitchell School District 17-2	Permit	Davison	07/19/2004	10.0	0.144	20	4	4
6615-3	Meadow Lawn Plaza LLC	License	Davison	03/24/2005	1.2	0.070	20	2	2
8005-3	Robert Maeschen	License	Davison	04/24/2014	132.0	1.340	10	41	41
8019-3	Mark Hohn	Permit	Davison	05/28/2014	145.0	1.730	10	55	55
8361-3	Mark Hohn	Permit	Davison	06/18/2018	145.0	0.170	6	38	121
8465-3	Robert Maeschen	License	Davison	12/21/2020	85.0	1.110	4	38	71
8579-3	Brett Guthmiller	Permit	Hutchinson	10/02/2024	32.0	0.890	0	N/A	27
8678-3	Huron Hutterian Brethren	Permit	Beadle	11/21/2022	300.0	4.460	2	0	250
8748-3	Van Buskirk Farms LLP	Permit	Beadle	06/30/2023	136.0	1.940	1	0	113
8773-3	Danny R Peterson	Permit	Spink	06/20/2023	160.0	2.110	1	0	133
8909-3	Tim Neugebauer	Permit	Davison	11/14/2024	320.0	2.220	0	N/A	267
Total					2,362.2	23.984	304	440	1,346

Summary of Hydrologic Budget of the Main Body

There is no estimate available for the recharge to the Niobrara aquifer due to its highly variable aquifer characteristics. The estimated average annual withdrawal from the main body of the Niobrara aquifer, including deferred permits, is 4,576 ac-ft/yr (Table 2). This application proposes to irrigate 160 acres. By multiplying 160 acres by 10 inches of water per acre year, the estimated average annual withdrawal for this application is 133 ac-ft/yr. By dividing the estimated 4,709 ac-ft/yr of withdrawal by the 17,600,000 acres of the main body of the Niobrara Formation, the recharge to the formation would have to exceed 0.003 inches per acre for recharge to exceed withdrawals. Given the very small amount of recharge needed to exceed withdrawals, there is reasonable probability unappropriated water is available in the Niobrara aquifer for this application.

Table 2: Summary of estimated withdrawals from the main body of the Niobrara aquifer

Type	Number	Est. Withdrawal (ac-ft/yr)
Irrigation	16	1,346
Non-irrigation, Standby	4	0
Non-irrigation, Volume	2	227
Non-irrigation, Sixty percent	13	705
Subtotal, authorized to withdraw	*35*	*2,278*
Deferred applications	6	2,298
Grand total	**41**	**4,576**

Beadle County Hydrologic Budget

Because the Niobrara aquifer has highly variable aquifer characteristics, it is appropriate to consider a more localized hydrologic budget. Lacking distinctive hydrogeological boundaries smaller than the extent of the main body of the aquifer, the hydrologic budget concerning only the area of Beadle County is considered. There are five water rights/permits authorized to withdraw from the Niobrara aquifer and four deferred applications in Beadle County. Using the same methods as in the statewide section, the estimated withdrawal for water rights permits authorized to withdraw from the Niobrara aquifer in Beadle County is 1,787 ac-ft/yr. This application would add an estimated 133 ac-ft/yr of withdrawals. By dividing the 1,920 ac-ft/yr of proposed or actual withdrawal over 809,600 acres in Beadle County, the necessary recharge rate for the Niobrara aquifer in Beadle County would be 0.03 inches per year.

Observation Wells

Administrative Rule of South Dakota 74:02:05:07 requires that the Water Management Board rely upon the record of observation wells, in addition to other information, to determine the availability of unappropriated water. The Water Rights Program maintains 63 observation wells completed into the Niobrara aquifer, 40 of which are completed into the main body of the aquifer [9] [3]. The nearest observation well completed into the Niobrara aquifer to this application is BD-2023A, which is located approximately 3.7 miles northeast of the proposed well for this application. The period of record for Observation Well BD-2023A is limited and does not reflect fluctuations in the aquifer through wet and dry periods. The next nearest observation wells are SP-2023A, BD-2023B, and SP-77D, shown in Figure 2 [9]. Figure 3 shows water elevations in

those observation wells over their entire periods of record [9]. Water levels in observation wells completed into the main body of the Niobrara aquifer all have stable or increasing trends [9]. Observation Well SP-77D is representative of the general behavior of the Niobrara aquifer, although at the distance from the proposed well site, it does not reflect changes that would be specific to the area of this application. In general, water levels rise during periods of higher-than-average precipitation and decline during periods of lower-than-average precipitation. The fluctuation due to natural influences indicates water is naturally discharged from the Niobrara aquifer. The Water Management Board historically has considered natural discharge to be available for capture. Therefore, based on observation well analysis, there is reasonable probability unappropriated water is available in the Niobrara aquifer for these applications.

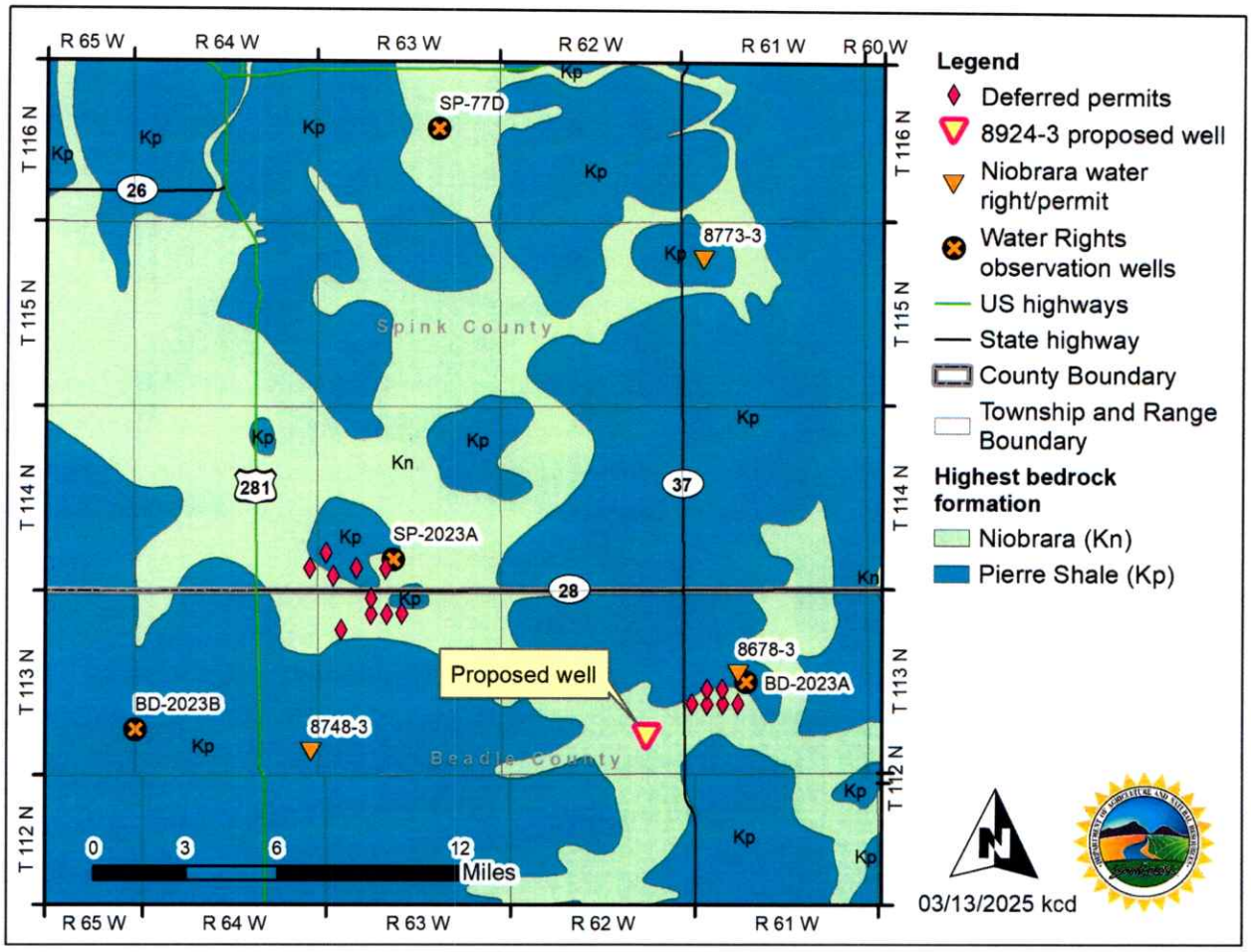

Figure 2: Map of nearby water rights, deferred permits, observation wells, and bedrock formations

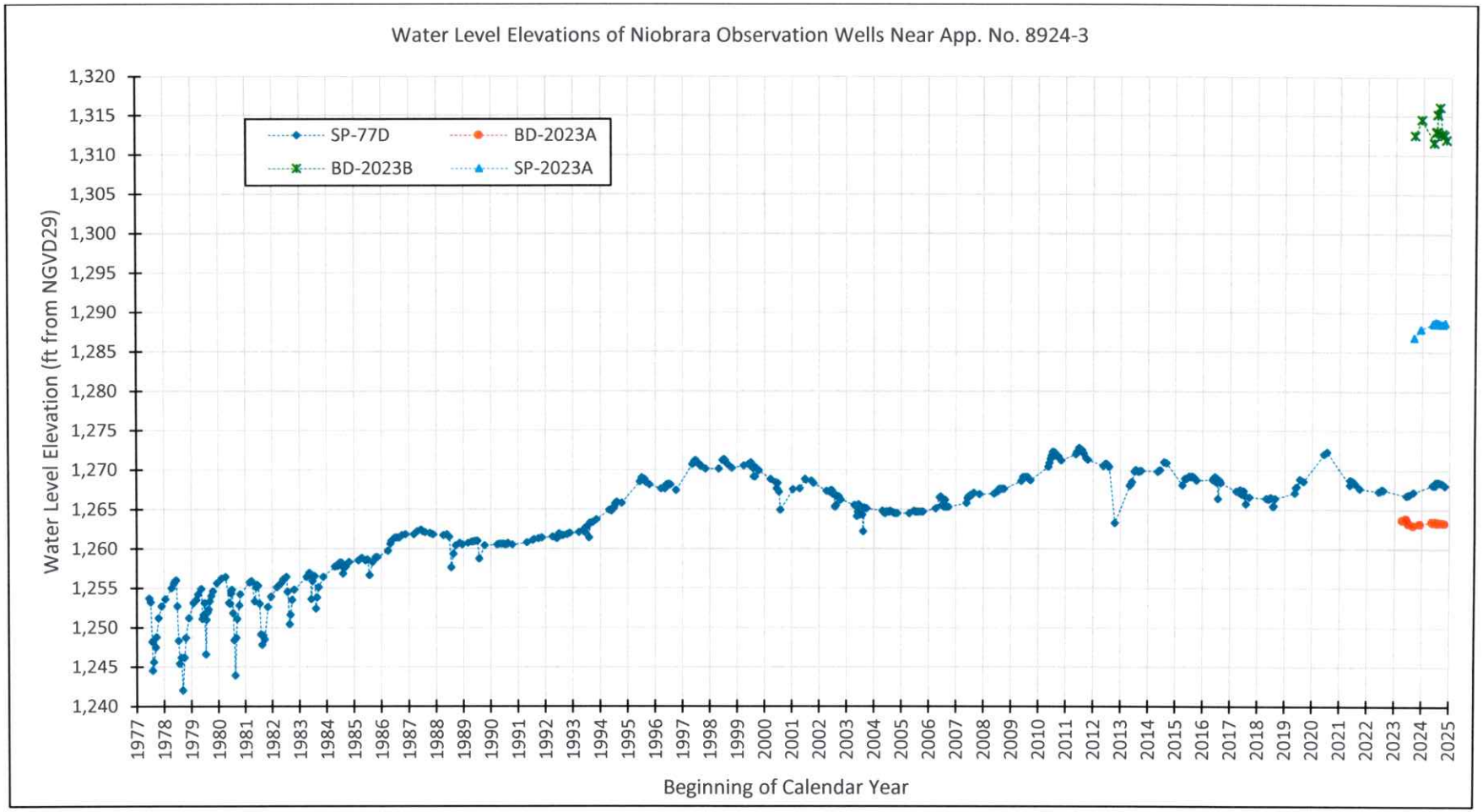

Figure 3: Observation well data for Niobrara aquifer observation wells near this application [9]

Possibility of Unlawful Impairment of Existing Water Rights

The nearest water right/permit to this application that is completed into the Niobrara aquifer is Water Permit No. 8678-3, located approximately 3.6 miles east-northeast of the proposed well for this application [10]. Deferred Water Permit Application Nos. 8721-3 and 8722-3 are between this application and Water Permit No. 8678-3 as shown in Figure 2. If the deferred permits are approved, they would have senior priority to this application. There are no domestic wells on file with the Water Rights Program that are likely to be completed into the Niobrara aquifer within three miles of this application [14]. The Water Rights Program has historically interpreted an unlawful impairment of existing water rights to occur if a junior water right/permit causes a nearby adequate well with a senior water right/permit to become unable to withdraw at the rate it is entitled to or, if a domestic well is impacted, a water right/permit causes an adequate domestic well to be unable to withdraw at the rate needed to supply reasonable domestic use of water. Administrative Rule of South Dakota (ARSD) 74:02:04:20(6) defines an adequate well as:

> *...a well constructed or rehabilitated to allow various withdrawal methods to be used, to allow the inlet to the pump to be placed not less than 20 feet into the saturated aquifer or formation material when the well is constructed, or to allow the pump to be placed as near to the bottom of the aquifer as is practical if the aquifer thickness is less than 20 feet*

If these applications are approved, some drawdown in the aquifer will occur in the proximity of the pumping wells. There are no complaints concerning unlawful impairment of existing water rights in the Niobrara aquifer in Beadle County [15]. If this application is approved, the applicant should control their withdrawals so that an unlawful impairment of adequate wells does not occur. Based on the distance of the proposed well to the nearest water right, and lack of complaints concerning well interference in the Niobrara aquifer on file in Beadle County, there is reasonable probability these applications can be developed without unlawful impairment of existing domestic uses and water rights in the Niobrara aquifer. However, if this application is developed, it may induce withdrawal from the Tulare: Western Spink-Hitchcock aquifer which is a fully appropriated aquifer. Over time induced withdrawals from the Tulare aquifer may create conditions that could be considered an unlawful impairment of existing water rights in the Tulare: Western Spink-Hitchcock aquifer.

Special Consideration – Induction of Water from a Fully Appropriated Management Unit

As discussed in the Hydrogeologic Characteristics section, the area of Niobrara aquifer from which this application seeks to appropriate water directly underlies the fully appropriated Tulare: Western Spink-Hitchcock aquifer management unit. Consequently, pumping from the Niobrara aquifer may induce inflow from a fully appropriated management unit of the Tulare aquifer. The potential impact to a fully appropriated aquifer may pose a beneficial use and public interest consideration for the Water Management Board which is beyond the technical review provided in this report. To aid in decision-making by the Board, the applicant should conduct an aquifer performance test monitoring both the Niobrara aquifer and the Tulare: Western Spink-Hitchcock aquifer prior to approval of this application to determine whether pumping from the Niobrara

aquifer under the local hydrogeologic conditions will induce inflow from the Tulare: Western Spink-Hitchcock aquifer.

Special Consideration – Suitability for Irrigation

In a letter to the holder of Cancelled Water Permit No. 1286-3 dated November 27, 1978, then Chief Engineer Hatch indicated the permit holder had abandoned use of that irrigation permit because the water was ruining his land [10]. Hamilton and Howells [16] indicate "The large sodium concentration in the Niobrara aquifer makes the water unsuitable for irrigation use." It is recommended the applicant complete a soil-water compatibility analysis by a qualified soil scientist to determine whether the water is suitable for irrigation, or when used for irrigation, what best management practices are needed to ensure water is placed to beneficial use in compliance with SDCL 46-2A-9.

Conclusions

1. Water Permit Application No. 8924-3 proposes to appropriate 1.89 cfs from one well to be completed into the Niobrara aquifer located in the approximate center of the SE ¼ Section 26 for irrigation of 160 acres located in the SE ¼ Section 26; all in T113N-R62W.
2. Based on the hydrologic budget and observation well analysis, there is reasonable probability unappropriated water in the Niobrara aquifer is available for this application.
3. There is reasonable probability this application can be developed without unlawful impact to other water users within the Niobrara aquifer.
4. If this application is approved, the applicant should follow best management practices as recommended by a qualified soil scientist to prevent damage to the soil from poor water quality in the Niobrara aquifer. The permit may include a qualification requiring regular testing of the soil salinity.
5. Based on the lithologic information available, this application should be deferred to allow for an aquifer performance test to determine whether Niobrara aquifer withdrawals potentially impact the Tulare: Western Spink-Hitchcock aquifer at the site location.

Kimberly C. Drennon, E.I.
DANR Water Rights Program
Natural Resources Engineer III

References

[1] J. E. Martin, J. F. Sawyer, M. D. Fahrenbach, D. W. Tomhave and L. D. Schulz, "Geologic Map of South Dakota," SD DANR Geological Survey Program, Vermillion, South Dakota, 2004.

[2] L. S. Hedges, S. L. Burch, D. L. Iles, R. A. Barari and R. A. Schoon, "Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa Tasks 1-4," SD DANR Geological Survey Program, Vermillion, South Dakota, 1982.

[3] N. Steen and A. Mathiowetz, "Report to the Chief Engineer on Water Permit Application No. 8624-3," SD DANR Water Rights Program, Joe Foss Bldg., Pierre, South Dakota, 2022.

[4] L. W. Howells and J. C. Stephens, "Geology and Water Resources of Beadle County South Dakota Part II: Water Resources," SD DANR Geological Survey Program, Vermillion, South Dakota, 1968.

[5] D. W. Tomhave and L. D. Schulz, "Bedrock geologoic map showing configuration of the bedrock surface in South Dakota east of the Missouri River," DANR Geological Survey Program, Vermillion, SD, 2004.

[6] SD DANR Geological Survey Program, "Lithologic Logs," Vermillion, South Dakota, 2025.

[7] F. M. D., F. V. Steece, J. F. Sawyer, K. A. McCormick, G. L. McGillivray, L. D. Schulz and J. A. Redden, "South Dakota Stratigraphic Correlation Chart," SD DANR Geological Survey Program, Vermillion, South Dakota, 2010.

[8] J. Farmer, "First Report on the Five Year Review of Water Availability Western Spink Hitchcock Management Unit of the Tulare Aquifer," SD DANR Water Rights Program, Joe Foss Bldg., Pierre, South Dakota, 2020.

[9] SD DANR Water Rights Program, "Observation Wells," SD DANR Water Rights Program, Pierre, South Dakota, 2025.

[10] SD DANR Water Rights Program, "Water Right Permit Files," SD DANR Water Rights Program, Pierre, South Dakota, 2025.

[11] SD DANR Water Rights Program, "Irrigation reports," Joe Foss Bldg., Pierre, South Dakota, 2024.

[12] SD DANR Drinking Water Program, "Drinking Water Reports," SD DANR Drinking Water Program, Pierre, South Dakota, 2024.

[13] B. Friedeman, Interviewee, *Environmental Scientist II, SD DANR Drinking Water Program.* [Interview]. 12 March 2025.

[14] SD DANR Water Rights Program, "Well Completion Reports," SD DANR Water Rights Program, Pierre, South Dakota, 2025.

[15] SD DANR Water Rights Program, *County Files,* Pierre, South Dakota: SD DANR Water Rights Program, 2025.

[16] L. J. Hamiltion and L. W. Howells, "Water Resources of Spink County, South Dakota," United States Geological Survey, Rapid City, South Dakota, 1996.