



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**
JOE FOSS BUILDING
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**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8756-3, Redfield SCS Capture LLC**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Water Permit Application No. 8756-3, Redfield SCS Capture LLC, c/o James Powell, 2321 North Loop Drive Suite #221, Ames IA 50010.

The Chief Engineer is recommending APPROVAL of Application No. 8756-3 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 domestic water uses and water rights, 3) the proposed use is a beneficial use and 4) it is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board with the following qualifications:

1. The well approved under Water Permit No. 8756-3 is located near domestic wells and other wells which may obtain water from the same aquifer. Water withdrawals shall be controlled so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The well authorized by Permit No. 8756-3 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. The well approved under this Permit shall be valved and the flow reduced to the amount needed or to a minimum when not being used. If this well is abandoned or the Permit cancelled, the well must be plugged in accordance with Water Management Board Rules, Chapter 74:02:04.
4. The Permit holder shall report to the Chief Engineer annually the amount of water withdrawn from the Dakota aquifer.
5. Water Permit No. 8756-3 appropriates up to 64.5 acre-feet of water annually.

See report on application for additional information.

Eric Gronlund, Chief Engineer
June 29, 2023

NOTE: Any well constructed for this project must meet the adequate well definition as set forth in ARSD 74:02:04:20(6) and cannot use the alternative well construction standard ARSD 74:02:04:35.

REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 8756-3
FOR
REDFIELD SCS CAPTURE LLC
JUNE 29, 2023

Water Permit Application No. 8756-3 proposes to withdraw up to 64.5 acre-feet of water annually (ac-ft/yr) at a maximum instantaneous diversion rate of 0.10 cubic feet of water per second (cfs) from one well to be completed into the Dakota aquifer approximately 1,100 feet deep and to be located in the SE ¼ NW ¼ Section 26-T117N-R64W for industrial use. The well site is located approximately three miles north of Redfield, SD in Spink County.

AQUIFER: Dakota (DKOT)

Aquifer Characteristics:

The Dakota Formation is a regional bedrock formation underlying portions of South Dakota, North Dakota, Colorado, Kansas, Montana, Wyoming, Minnesota, Nebraska, and Iowa. The Dakota Formation is a Cretaceous age formation that underlies approximately 66,500 square miles of the 77,047 square miles that make up the State of South Dakota (Schoon, 1971). The Dakota Formation is equivalent to the Newcastle Formation that outcrops around the Black Hills and provides recharge to the Dakota aquifer (Fahrenbach et al, 2010; Schoon, 1971). The Dakota Formation is comprised of yellowish, reddish, and occasionally whitish sandstone with interbedded shales in lignite beds in some locations with both vertical and lateral variation in lithology (Schoon, 1971). In most of eastern South Dakota, the Dakota Formation is subdivided into three distinct units: 1) an upper layer of fine to medium grained, light to reddish brown quartz sandstone interbedded with minor gray to dark gray shale layers; 2) a middle unit of silty gray clay interbedded with minor sandstone layers; and 3) a lower unit of medium to coarse grained quartz sandstone (Schoon, 1971).

The Dakota aquifer consists of the porous and permeable portions of the Dakota Formation and is found under confined (i.e., artesian) conditions (Water Rights, 2023d and 2023f). Schoon (1971) estimated the volume of water stored in the South Dakota portion of the aquifer to be 1.1 billion ac-ft. Hedges et al (1982) estimated the portion of the aquifer east of the Missouri River in South Dakota contained 381,104,000 ac-ft of recoverable water in storage.

No test holes or well completion reports were submitted with this application. However, there is sufficient nearby data to determine general aquifer depth and static water level expected at the applicant's proposed well site (Water Rights, 2023f). The depth to the top of the Dakota Formation is likely 800 to 850 feet below land surface. The total thickness of the formation ranges from 200 to 300 feet thick. The proposed well is expected to be free flowing at land surface if not controlled. The closed in pressure of a controlled Dakota aquifer well is expected to be between 10 and 20 pounds per square inch (psi). That is the equivalent of 23.1 to 46.2 feet of water above land surface if additional casing above land surface was added to the well. Figure 1 is a map of the area including Dakota aquifer water rights/permits in the area of the proposed well site.

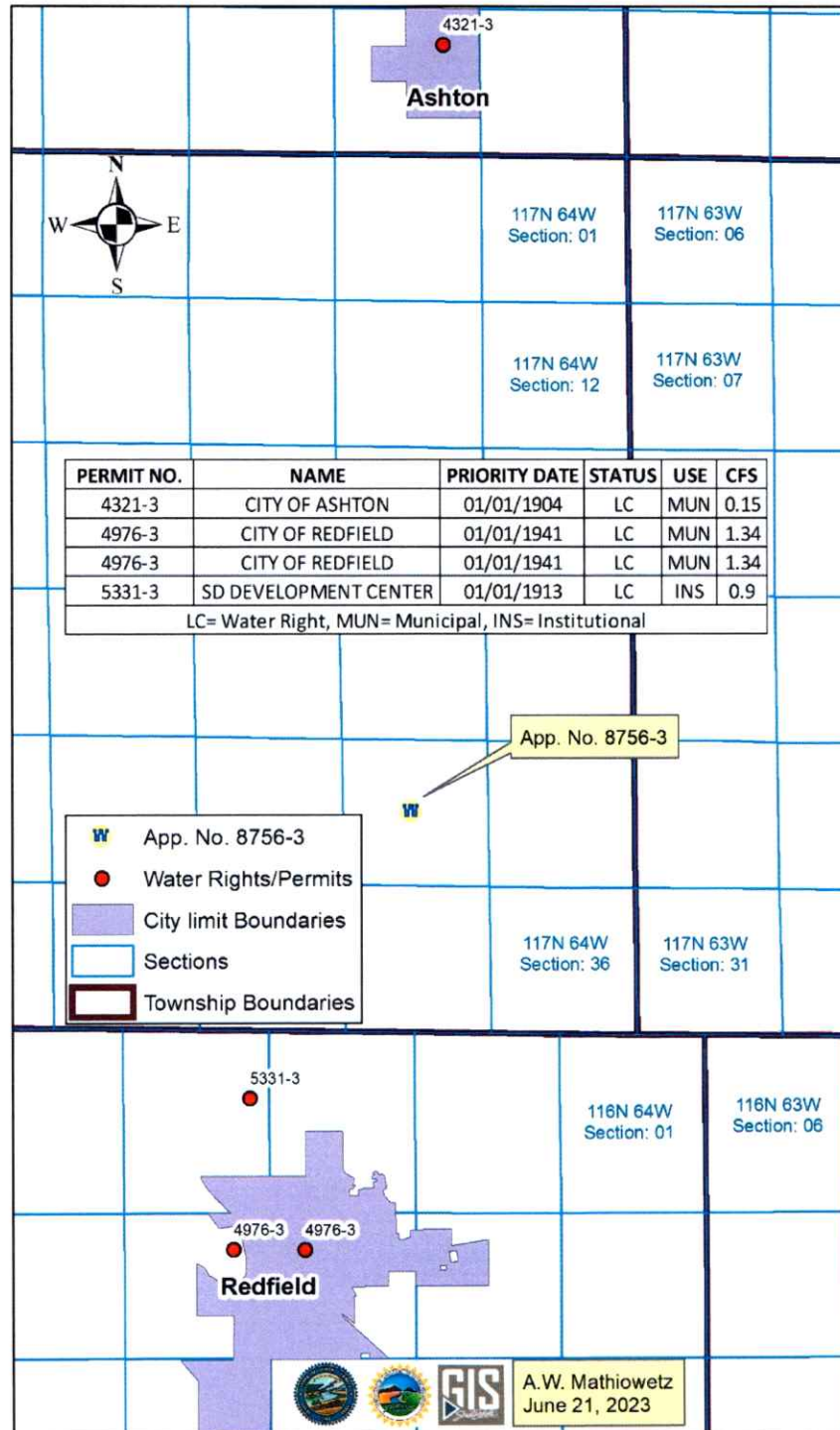


Figure 1- Location of Application No. 8756-3, and local Dakota aquifer water rights/permits (Water Rights, 2023e)

APPLICABLE SOUTH DAKOTA CODIFIED LAW (SDCL):

Pursuant to SDCL 46-2A-9, “A permit to appropriate water may be issued only if there is a reasonable probability that there is unappropriated water available for the applicant’s proposed use, that the diversion point 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 as defined by SDCL 46-2-9 and 46-2-11.” This report will address the availability of unappropriated water and the potential for unlawful impairment of existing domestic water uses and water rights within the Dakota aquifer.

This application proposes to appropriate water from the Dakota aquifer. The probability of unappropriated water being available from the 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. An application may be approved, however, for withdrawals of groundwater from any groundwater formation older than or stratigraphically lower than the greenhorn formation in excess of the average estimated annual recharge for use by water distribution systems.”

The Greenhorn Formation is Cretaceous aged Formation. The Dakota aquifer is older and stratigraphically lower than the Greenhorn Formation. However, the applicant is not a water distribution system as defined by SDCL 46-1-6(17). Therefore, the balance between recharge to and withdrawals from the Dakota aquifer must be considered for this application.

Dakota Aquifer Declining Artesian Head Pressure

The long-term decline of artesian head pressure in the Dakota aquifer over large areas of South Dakota has been a point of concern since the early 1900’s. Some investigators of the Dakota aquifer concluded the decrease in artesian head pressure is an indication of withdrawals exceeding recharge to the Dakota aquifer. The Water Management Board has considered this issue several times. The Water Management Board has found that declines in artesian head pressure do not automatically indicate withdrawals from have exceeded recharge to the Dakota aquifer (Water Rights, 2010). The Water Management Board concluded whether withdrawals have exceeded recharge cannot be determined solely based on a decline in artesian head pressure and, in theory, head pressure in the Dakota aquifer is stabilizing in relation to discharges (e.g., uncontrolled flowing wells, natural discharge, etc.) and withdrawals (Water Rights, 1987). In the Findings of Fact and Conclusions of Law for Application No. 5136-3, the Water Management Board concluded, “The primary reason for declines in the Dakota Formation head pressure is due to water being discharged without beneficial use through uncontrolled flowing wells” (Water Rights, 1987). The Water Management Board further concluded:

“When defining withdrawal for the purpose of interpreting the meaning of withdrawal pursuant to SDCL 46-6-3.1, there is a difference between withdrawal of water for beneficial use and water discharged without beneficial use through uncontrolled flowing wells. Water discharged from uncontrolled flowing wells does not constitute withdrawal (appropriation) pursuant to SDCL 46-6-3.1.”

The position of the Water Management Board has ultimately been to optimize the development of the Dakota aquifer for beneficial use.

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 Water Rights Program maintains 46 observation wells completed into the Dakota aquifer (Water Rights, 2023d). Measurement of 13 of those observation wells has been temporarily suspended due to significant maintenance needs or access issues. The nearest observation wells are ED-85A, located 37.2 miles north-northwest, and HD-87A, located 4.38 miles south-southwest. All other Dakota aquifer observation wells are 90 or more miles away from the proposed well site. The hydrographs for these two observation wells are shown in Figures 2 and 3, respectively. Note that HD-87A is among the 13 Dakota aquifer observation wells not currently being measured. This is due to significant access issues. The last measurement was taken in 2019 (Water Rights, 2023d).

The hydrographs for ED-85A and HD-87A show very different scenarios occurring in the aquifer. The hydrograph for HD-87A agrees with a number of Dakota aquifer observation wells in more western counties (Aurora, Brule, Gregory and Jackson Counties). The observation wells in Lincoln County show stable conditions, declining then stabilizing to increased localized pumping, or declining then having a slower decline rate (i.e., starting to stabilize) to localized pumping. The other southeastern Dakota aquifer observation wells, Hutchinson, Yankton, and Union Counties, show relatively stable water levels over their respective periods of record in agreement with the hydrograph for ED-85A. These differences across the extent of the Dakota aquifer demonstrates the aquifer is still equilibrating to recharge and discharge from the aquifer. Furthermore, different areas of the aquifer are in different stages of equilibration.

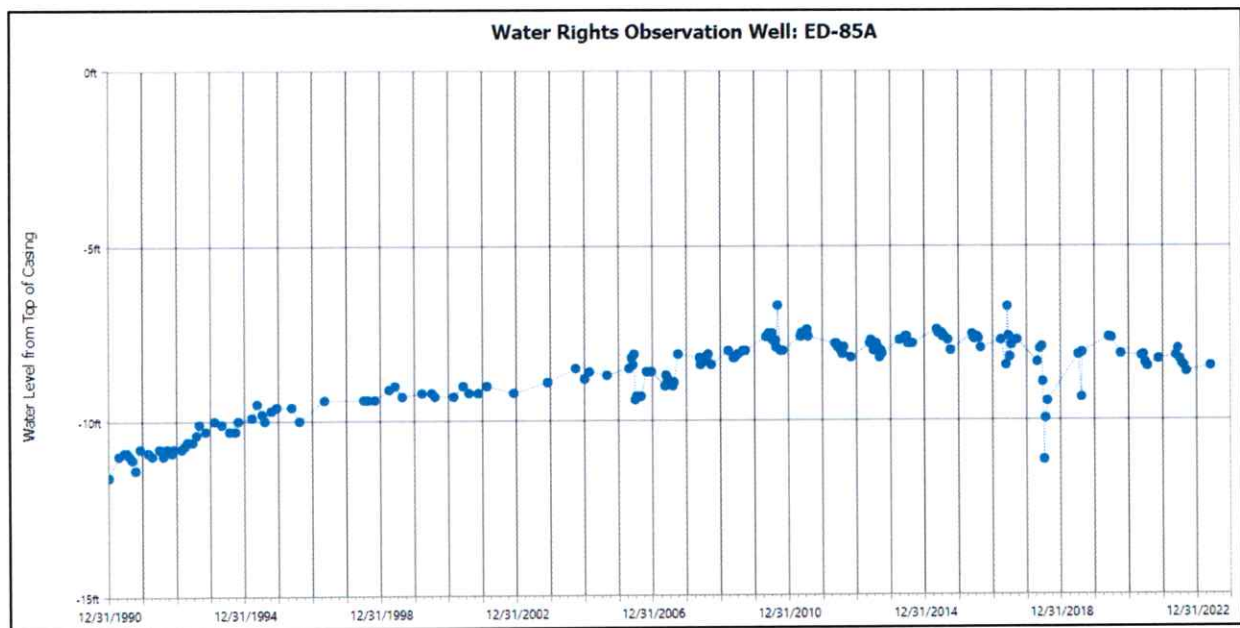


Figure 2- Hydrograph for observation well ED-85A (Water Rights, 2023d)

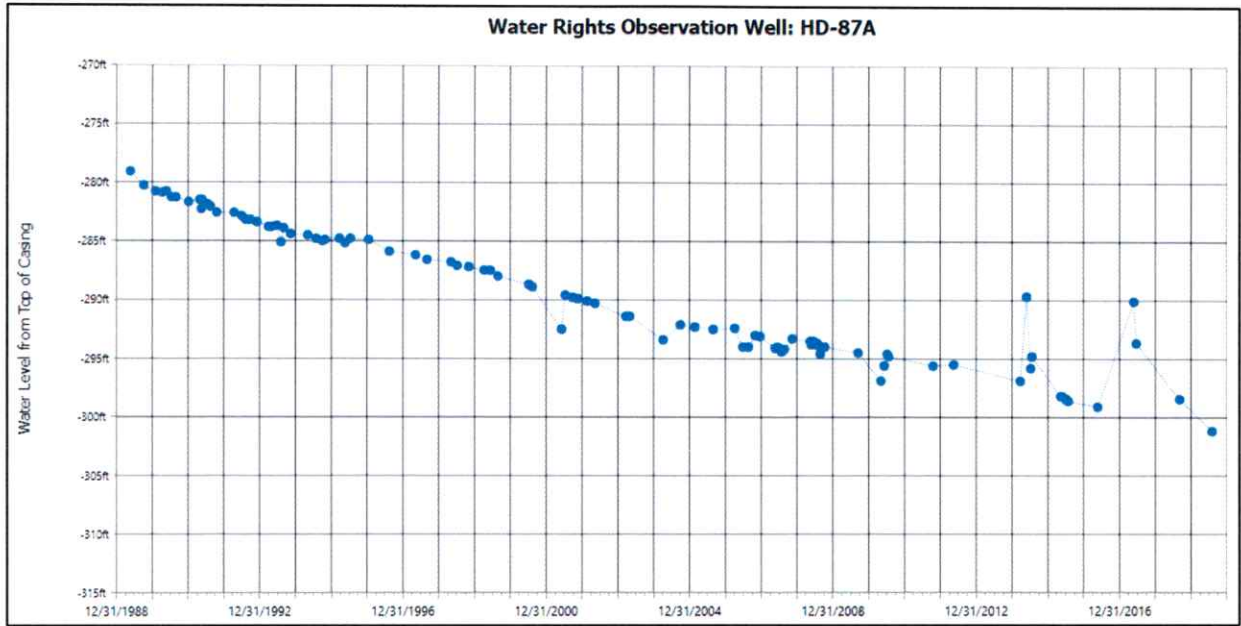


Figure 3- Hydrograph for observation well HD-87A (Water Rights, 2023d)

Potentiometric data for the Dakota aquifer in the area of the applicant’s proposed well site is shown in Table 1. This data shows the approximate water level elevations within approximately three miles of the applicant’s proposed well site over a longer period of time. The estimates are based on statewide potentiometric surface maps from Schoon (1971) and existing well completion reports (Water Rights, 2023f). The potentiometric surface data shows, locally, the decline in the Dakota aquifer has stabilized and the aquifer is likely nearing equilibrium between recharge and discharge.

Table 1- Approximate historic potentiometric surface elevations near the proposed diversion point for Application No. 8756-3

Date	Approx. Potentiometric Surface (feet mean sea level)	Source
1909	1,700	Schoon, 1971
1914-1915	1,350	Schoon, 1971
1936-1953	1,350	Schoon, 1971
1984	1,307	Water Rights, 2023f
2005	1,285+ (flowing well, no psi)	Water Rights, 2023f
2012	1,305	Water Rights, 2023f
2015	1,323	Water Rights, 2023f

Hydrologic Budget:

Recharge

The Dakota aquifer is recharged through upward leakage from underlying aquifers with higher artesian head pressure than the Dakota aquifer, downward seepage through overlying confining layers, and through infiltration of precipitation on the Newcastle Formation outcrops in the Black Hills (Bredehoeft et al, 1983). Bredehoeft et al (1983) attempted to match Darton’s (1909) potentiometric surface map of the Dakota aquifer using computer modeling and estimated

approximately 79.4 cfs (57,500 ac-ft/yr) of recharge to the Dakota aquifer prior to the beginning of extensive development of the aquifer in South Dakota. The assumptions used in Bredehoeft et al (1983) are now outdated. For example, the recharge estimates used for the Madison and Inyan Kara aquifers in the Bredehoeft et al (1983) analysis are much lower than estimates calculated by more recent research conducted by Carter et al (2001). While outdated, Bredehoeft et al (1983) provides the best reasonable estimate available to determine a sense of scale of the recharge to the Dakota aquifer in South Dakota. It is unknown whether the true recharge rate to the Dakota aquifer is higher or lower than Bredehoeft et al’s (1983) estimate.

Discharge

Discharge from the Dakota aquifer in South Dakota occurs through domestic and appropriative well withdrawals, uncontrolled flowing wells, outflow through corroded well casings, and outflow to overlying adjacent aquifers where the Dakota aquifer has a higher potentiometric surface (Bredehoeft et al, 1983; Water Rights, 2023e and 2023f). Appropriative withdrawal of water in South Dakota is by 261 water rights/permits plus 7 future use permits reserving water (Water Rights, 2023e). Future use permits are assumed to be fully developable. Table 2 lists the future use permits and the volume reserved by each permit holder.

Table 2- Dakota aquifer future use permits (Water Rights, 2023e)

Future Use Permit Holder	Amount Reserved (ac-ft)
City of Canton (1262C-3, 5219-3)	1,849
City of Lennox (5101-3, 5101A-3)	0*
South Lincoln RWS (4817-3)	1,448
Lincoln RWS (5155-3)	440
City of Harrisburg (8400-3)	500
Total	4,237
*City of Lennox has allocated all reserved water for use.	

Table 3 represents estimated average annual water use from the Dakota aquifer by non-irrigation appropriations. Fifteen of these water rights/permits are also authorized to withdraw from other aquifers (Water Rights, 2023e). Those that have specific Dakota aquifer annual volume limits are assumed to use that limit and those without specific volume limits are assumed to withdraw all of their water from the Dakota aquifer. There are a number of municipal water rights/permits that are connected to rural water systems and maintain their wells for standby and fire suppression purposes (Drinking Water, 2023; Friedeman, 2023; Water Rights, 2023e). As such, the estimated average annual use under those permits is assumed to be zero. The use type determined for each water right/permit was based on the primary use categorized for each water right/permit as some permits have additional uses (Water Rights, 2023e). Water rights/permits limited by an annual volume are assumed to withdraw their entire respective annual volume limitation. Historically, average water use by non-irrigation appropriations limited by an instantaneous diversion rate have been assumed to be pumping 60% of full time at the respective permitted diversion rate. This is a standard method used by the DANR-Water Rights Program that has been determined to be reasonable and a somewhat overestimate for average annual use by non-irrigation appropriations from an aquifer (Water Rights, 2023c). This method has been accepted by the Water Management Board in the past.

Table 3- Summary of non-irrigation water rights/permits estimated average annual use from the Dakota aquifer (Water Rights, 2023e)

Primary Use Type	No. of Water Rights/Permits	Volume Limited Appropriations (ac-ft/yr)	Diversion Rate Limited Appropriations (cfs)	Total Estimated Use (ac-ft/yr)
COM	110	2,254.57	11.74	7,356.7
DOM	11		1.753	762.0
FWP	4		2.733	1,188.0
GEO	2		2.33	1,012.8
IND	6	160	0.844	526.9
INS	2		1.34	582.5
MUN	89	3274	8.01	6,755.7
REC	3	3.1	0.45	198.7
RWS	6	2,005	2.2	2,961.3
SHD	7		3.33	1,447.5
TOTAL	240	7,696.67	34.728	22,791.9
COM= Commercial, DOM= Domestic, FWP= Fish & Wildlife Propagation, GEO= Geothermal, Ind= Industrial, INS= Institutional, MUN= Municipal, REC= Recreational, RWS= Rural Water System, SHD= Suburban Housing Development				

Currently, there are 21 water rights/permits authorized to appropriate water primarily for irrigation from the Dakota aquifer (Water Rights, 2023e). Irrigation water rights/permits have typically been required to report annual usage on an irrigation questionnaire since 1979. The average reported use for each active irrigation water right/permit is shown in Table 4. Several of the irrigation water rights/permits from the Dakota aquifer are authorized to irrigate acres from other water sources and reported irrigation represents total irrigation across all water sources. Water Right Nos. 394-3 and 762-3 are not required to submit an irrigation questionnaire and collectively authorize the irrigation of 31.2 acres (Water Rights, 2023e). They are assumed to use 1 ac-ft of water per acre. Thus, the annual use is 31.2 ac-ft/yr. Water Permit Nos. 8423-3, 8510-3, 8560-3, and 8727-3 have all been issued since 2020 and are either not constructed or have too short a period of record to use for average annual pumpage. Since these permits are all for turf irrigation, it is assumed they will apply two feet of water per permitted acre. Thus, average annual irrigation application rate is 764.3 ac-ft/yr.

There are a large number of water well completion reports on file for use types (e.g., domestic, livestock) at rates that are not required to obtain a water permit for wells completed into the Dakota aquifer (Water Rights, 2023f). Furthermore, there are also a significant number of wells completed into the Dakota aquifer that do not have a well completion report on file with the DANR-Water Rights Program. The current status of many of these wells is unknown and could range from controlled and being put to beneficial use to uncontrolled with some beneficial use. There are also a number of uncontrolled flowing Dakota aquifer wells that flow to waste. The volume of water flowing to waste from the Dakota aquifer has not, and likely cannot, be accurately quantified due to the location of all such wells not being known. The amount of water flowing to waste from uncontrolled flowing wells is likely a significant portion of the discharge from the Dakota aquifer. In the 1960's, it was reported 46 uncontrolled flowing wells (no specific water source was mentioned) had a rate of 16 million gallons per day, approximately 17,900 ac-ft/yr (Davis et al, 1961). These 46 wells had a rate approximately equivalent to 3,054 controlled flowing wells

completed into the Dakota aquifer (Davis et al, 1961). While the flowing wells are not necessarily all completed into the Dakota aquifer, this shows the potential for the scale of how much water can be flowing to waste from uncontrolled flowing wells. However, the Water Management Board has determined water discharged from uncontrolled flowing wells without beneficial use is not considered to be an appropriation pursuant to SDCL 46-6-3.1. Therefore, water discharged from uncontrolled flowing wells should be available for capture and appropriative use.

Hydrologic Budget

Although somewhat outdated, Bredehoeft et al's (1983) estimated recharge rate of 57,500 ac-ft/yr provides a sense of scale for the recharge to the Dakota aquifer in South Dakota. The estimated average annual appropriative withdrawal from the Dakota is 27,793.2 ac-ft/yr (764.3 for irrigation; 22,791.9 for non-irrigation; 4,237 for future use). This application requests to appropriate up to 64.5 ac-ft/yr. Therefore, based on this analysis of the hydrologic budget for the Dakota aquifer in South Dakota, there is a reasonable probability unappropriated water is available for this proposed appropriation.

Table 4- Dakota aquifer irrigation water rights/permits estimated average annual use (Water Rights, 2023b)

PERMIT NO.	NAME	PRIORITY DATE	STATUS	COUNTY	ACRES	AVG. REPORTED USE (ac-ft/yr)	Period of Record	Remarks
394-3	KORY STANDY	01/01/1912	LC	CHARLES MIX	3.20	does not report		also for DOM use
762-3	O L BUSSMUS FARMS INC	01/10/1961	LC	DAVISON	28.00	does not report		also for FWP use
1054-3	ROLLING HILLS GOLF DEV	01/01/1951	LC	BROWN	43.84	30.9	1981-2022	
2328-2	MICHAEL KIRWAN	02/21/1995	LC	GREGORY	31.00	2.6	1995-2022	last irrigated in 2008
2566A-2	CHAMBERLAIN COUNTRY CLUB	08/29/2005	LC	LYMAN	63.00	9.6	2011-2022	
4769-3	JAMES LEHESKA	06/01/1981	LC	BRULE	130.00	23.5	1979-2022	last irrigated in 1993
5703-3	CHARLES A LONG	07/20/1992	LC	UNION	2.00	0.5	1993-2022	
5905-3	CITY OF GROTON	12/14/1995	LC	BROWN	30.00	66.9	1998-2022	
5947-3	FISH LAKE COUNTRY CLUB	09/23/1974	LC	AURORA	33.00	17.2	1998-2022	
5994-3	RICHARD & PAULA VERZANI	04/17/1997	LC	UNION	3.00	6.2	1997-2022	
6110-3	DAKOTA DUNES COMM IMPROVEMENT DISTRICT	10/06/1998	LC	UNION	11.00	49.8	1999-2022	
6527-3	CITY OF BERESFORD	07/22/2004	LC	UNION	37.00	23.2	2005-2022	
6575-3	DAKOTA ALLIANCE SOCCER CLUB	01/19/2005	LC	LINCOLN	15.00	6.2	2005-2022	
6734-3	AVERA SACRED HEART HEALTH SERVICES	06/14/2006	LC	YANKTON	11.90	5.6	2007-2022	
7123-3	HARRISBURG SCHOOL DISTRICT	04/02/2009	PE	LINCOLN	30.00	7.7	2009-2022	
7916-3	JOHN H THOMPSON	10/18/2013	PE	UNION	150.00	30.9	2014-2022	
8043-3	ROBERT P WALSH	08/27/2014	PE	CLAY	391.90	158.4	2015-2022	not constructed until 2022
8423-3	CITY OF PLATTE	02/10/2020	PE	CHARLES MIX	42.00	84*	2022	not constructed
8510-3	TR GOLF LLC	03/26/2021	PE	UNION	30.00	60*	2022	143.3 ac-ft reported in 2022 for 8510-3 and 8560-3 combined
8560-3	TR GOLF LLC	10/25/2021	PE	UNION	65.00	130*	2022	
8727-3	TR GOLF LLC	02/27/2023	PE	UNION	10.00	20*		too new to report
				Total	1,160.84	733.1		

LC= Water Right, PE= Water Permit, DOM= Domestic, FWP= Fish & Wildlife Propagation, *- Assuming 2 feet per acre

POTENTIAL FOR UNLAWFUL IMPAIRMENT OF EXISTING WATER RIGHTS:

The nearest well for a Dakota aquifer water right/permit is Water Right No. 5331-3 for the SD Development Center located approximately 2.25 miles southwest of the applicant's proposed well site (see Figure 1) (Water Rights, 2023e). However, based on documentation in the file, these wells are capped, and the facility is supplied by WEB RWS (Water Rights, 2023e). The next nearest actively used water rights/permit is Water Permit No. 8235-3 approximately 13.9 miles east (Water Rights, 2023e). There are a number of municipal water rights that are closer to the applicant's proposed well, but those permits are currently only being held as backup to water purchased by the municipalities or citizens of those municipalities from WEB RWS (Drinking Water, 2023; Water Rights, 2023e). The nearest domestic well on file with the Water Rights Program that appears to be completed into the Dakota aquifer is located approximately 0.58 miles northeast of the applicant's proposed well site (Water Rights, 2023f). The locations of domestic wells are based on the location provided by the well driller on the water well completion report. It is likely there are other domestic use Dakota aquifer wells in the area of the applicant's proposed well site that are not on file with the Water Rights Program.

The Dakota aquifer is under confined conditions at the applicant's proposed well site (Water Rights, 2023f). Since the aquifer is confined, drawdown can extend some distance from a well. However, the exact drawdown behavior cannot be determined without an aquifer performance test. The Water Management Board recognizes that putting water to beneficial use requires a certain amount of drawdown to occur. The Board has promulgated rules to allow water to be placed to maximum beneficial use without the necessity of maintaining artesian head pressure for domestic use. The Water Management Board defined an "adversely impacted domestic well" in ARSD 74:02:04:20(7) as:

"A well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs."

The Water Management Board considered the delivery of water by artesian head pressure versus maximum beneficial use during the issuance of Water Right No. 2313-2 for Coca-Cola Bottling Company of the Black Hills (Water Rights, 1995). The Board adopted the Findings of Fact and Conclusions of Law that noted the reservation of artesian head pressure for delivery of water would be inconsistent with SDCL 46-1-4 which states, "general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable..." (Water Rights, 1995). Furthermore, the Water Management Board found if increased cost or decreased production as a result of impacts on artesian head pressure by legitimate users is to be considered as an unlawful impairment, it would also conflict with SDCL 46-1-4 (Water Rights, 1995). With that in mind, some existing well owners may need to install or lower pumps depending on the specific characteristics of the Dakota aquifer at their location. A review of the Water Rights Program complaint file for Spink County shows two complaints regarding flowing wells, one 17.9 miles north and one 19.7 miles southeast of the applicant's proposed well site (Water Rights, 2023a). Both complaints were regarding the fact that the wells were flowing uncontrolled and not regarding impairment of adequate domestic or appropriate wells. There have been complaints filed with

the Water Rights Program regarding well impairment of Dakota aquifer wells in other counties (Water Rights, 2023a). However, a vast majority of these complaints were for non-adequate wells with reduced pressure/flow rate for free-flowing wells or that required pumps to be lowered. As previously stated, pump placement using artesian head pressure as a means of delivery of water has been determined by the Water Management Board to not be protected. When considering the statutes (SDCL 46-1-4 and 46-6-6.1, rule (ARSD 74:02:04:20(7))), the amount of artesian head pressure at the proposed well site for this application (10 to 20 psi closed in pressure on a free-flowing well), and the lack of well interference complaints in the area of this application from the Dakota aquifer, there is a reasonable probability that any drawdown created by using this proposed diversion will not cause an unlawful impairment on existing water rights/permits with adequate wells or adequate domestic wells.

SPECIAL CONSIDERATION: WELL CONSTRUCTION

The well to be constructed for this proposed appropriation must meet the adequate well construction standards as defined in ARSD 74:02:04:20, specifically defined in 74:02:04:20(6):

“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.”

The alternative well construction requirements for certain Dakota aquifer wells (74:02:04:35) are not permitted for appropriative uses. Furthermore, any future additional or replacement wells shall meet the adequate well construction standard as defined in ARSD 74:02:04:20.

CONCLUSIONS:

1. Water Permit Application No. 8756-3 proposes to appropriate up to 64.5 ac-ft/yr at a maximum instantaneous diversion rate of 0.10 cfs from the Dakota aquifer from a well to be constructed in the SE ¼ NW ¼ Section 26-T117N-R64W for industrial use. This site is located in Spink County approximately three miles north of Redfield, SD.
2. Based on the analysis of hydrologic budget and observation well data for the Dakota aquifer, there is a reasonable probability unappropriated water is available for this application.
3. There is a reasonable probability that use from this proposed diversion will not unlawfully impair existing appropriative or domestic users with adequate wells.
4. Any well(s) constructed for this project must meet the adequate well definition as set forth in ARSD 74:02:04:20(6) and cannot use the alternative well construction standard 74:02:04:35.



Adam Mathiowetz, PE
SD DANR-Water Rights Program

REFERENCES:

- Bredehoeft, J.D., Neuzil, C.E. and Milly, P.C. 1983. Regional Flow in the Dakota Aquifer: A Study of the Role of Confining Layers. U.S. Geological Survey Water-Supply Paper 2237. Alexandria, VA.
- Carter, J.M., Driscoll, D.G., Hamade, G.R., and Jarrell, G.J. 2001. Hydrologic Budgets for the Madison and Minnelusa Aquifers Black Hills of South Dakota and Wyoming, Water Years 1987-96. Water-Resources Investigations Report 01-4119. U.S. Geological Survey. Rapid City, SD.
- Darton, N.H. 1909. Geology and Underground Waters of South Dakota. Water-Supply Paper 227. U.S. Geological Survey. Washington D.C.
- Davis, R.W., Dyer, C.F., and Powell, J.E. 1961. Progress Report on Wells Penetrating Artesian Aquifers In South Dakota. Water-Supply Paper 1534. U.S. Geological Survey. Washington D.C.
- Drinking Water. 2023. DANR-Drinking Water Program "My System Information". Accessed: June 23, 2023. <<https://danr.sd.gov/OfficeOfWater/DrinkingWater/default.aspx>>.
- Fahrenbach, M.D., Steece, F.V., Sawyer, J.F., McCormick, K.A., McGillivray, G.L. and Redden, J.A. 2010. South Dakota Stratigraphic Correlation Chart. Oil and Gas Investigation 3. DANR-Geological Survey Program. Vermillion, SD.
- Friedeman, B. 2023. *Personal Communication*. DANR-Drinking Water Program Environmental Scientist. Pierre, SD.
- Hedges, L.S., Burch, S. L., Iles, D. L., Barari, R. A., and Schoon, R. A. 1982. Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota, and Iowa. Task 1: Bedrock Topography and Distribution, Task 2: Extent of Aquifers, Task 3: Ground-Water Storage, Task 4: Computerized Data Base, Final Report. U.S. Army Corps of Engineers Contract DACW 45-80-C-0185.
- Schoon, R.A. 1971. Geology and Hydrology of the Dakota Formation in South Dakota. Report of Investigations No. 104. SD DANR-Geological Survey. Vermillion, SD.
- Water Rights. 2023a. County Files. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD
- Water Rights. 2023b. Irrigation Questionnaire Files. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD.
- Water Rights. 2023c. Non-irrigation Questionnaire Files. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD.
- Water Rights. 2023d. Observation Well Files. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

Water Rights. 2023e. Water Right/Permit Files. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

Water Rights. 2023f. Well Completion Reports. SD DANR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

Water Rights. 2010. Water Rights File No. 7165-3 Paul Buckneberg. SD DANR-Water Rights Program. Pierre, SD.

Water Rights. 1995. Water Rights File No. 2313-2 Coca-Cola Bottling Company of the Black Hills. SD DANR-Water Rights Program. Pierre, SD.

Water Rights. 1987. Water Rights File No. 5136-3 Farmland Industries. SD DANR-Water Rights Program. Pierre, SD.