DEPARTMENT of AGRICULTURE and NATURAL RESOURCES
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RECOMMENDATION OF ACTING CHIEF ENGINEER FOR WATER PERMIT APPLICATION NO. 8982-3, Century Swine RE, LLC.

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. 8982-3, Century Swine RE, LLC., 304 South Splitrock Blvd., Suite 205, Brandon SD 57005.

The Acting Chief Engineer is recommending APPROVAL of Application No. 8982-3 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. 8982-3 will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner must 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. Water Permit No. 8982-3 is subject to compliance with requirements of the Department's Water Pollution Control Permit issued pursuant to SDCL 34A-2-36 or 34A-2-36.2 or 34A-2-112 or 34A-2-124 for concentrated animal feeding operations.

3. Water Permit No. 8982-3 is 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 The Permit holder must report to the Chief Engineer annually the amount of water withdrawn from the Pierre Shale Aquifer.

5. Water Permit No. 8982-3 authorizes a total annual diversion of up to 30.68 acre-feet of water annually from the Pierre Shale Aquifer.

See report on application for additional information.

Mark Mayer, PE
Director of Office of Water
November 18, 2025

NOTE: If the applicant drills an observation well to monitor the effects of pumping and to have the well become part of the state's observation well network, DANR is willing to discuss suitable locations for such an observation well. For specific information regarding the details concerning completion of an observation well, please contact Adam Mathiowetz at (605) 773-3352.

Report to the Chief Engineer

On Water Permit Application No. 8982-3

Century Swine RE, LLC

November 18, 2025

Water Permit Application No. 8982-3 proposes to appropriate up to 30.68 acre-feet of water annually at a maximum pump rate of 0.11 cubic feet of water per second (cfs) from one well completed into the Pierre Shale aquifer (approximately 420 feet deep) located in the NW ¼ NW ¼ Section 9 for commercial use in a swine facility located in the NW ¼ Section 9; all in T121N-R71W. The site is located in Edmunds County, approximately ten miles southwest of Roscoe, SD.

AQUIFER: Pierre Shale (PIRR)

HISTORY AND HYDROGEOLOGY:

The Pierre Formation was first described by Hall and Meek in 1855 from exposures along the Missouri River valley in South Dakota (Gries, 1942). The formation was originally named the Fort Pierre Group by Meek and Hayden in 1861 and shortened to Pierre as early as 1896 (Gries, 1942; Searight, 1952). Searight (1952) explained the Pierre shale as a thick shale formation of Upper Cretaceous age which occurs widespread at and below the surface in South Dakota. Exclusive of glacial deposits, which conceal it east of the Missouri River over wide areas, it is the surface formation over a greater area in South Dakota than any other single formation. Near Pierre, South Dakota, on the east side of the Missouri River, Crandell (1958) reported up to 220 feet of glacial drift over the Pierre Shale. In many places in the state the formation is very thick, forming a blanket of shale over many square miles and can reach a maximum thickness of nearly 2,000 feet (Searight, 1952).

In the early 1900's, a U.S. geological survey was conducted by Darton (1909) to help better describe the Pierre Shale across South Dakota. In Edmunds County, a mantle of glacial drift overlies a thick mass of Pierre Shale and the underlying formations (Figure 1) (Darton, 1909). Much of the area is covered with glacial till, with the Pierre Shale lying below layers of topsoil and clay, with parts of the Pierre Shale being exposed on the east side of Edmunds County near Lake Parmley next to the Town of Mina (Christensen, 1975). Throughout the entire eastern one-third of McPherson, Edmunds, and Faulk counties, the Pierre Shale is very close to the land surface, ranging in depth from a few feet to about 60 feet (Christensen, 1975). The Pierre Shale can be broken up into individual members to better define the specific shales characteristics in different areas. In the Chamberlain area of southcentral South Dakota, the Sharon Springs, Gregory, Crow Creek, DeGrey, Verendrye, Virgin Creek, and Mobridge members are present in ascending order (Figure 2) (Gill and Cobban, 1965). It is likely the same members of the Pierre Shale found near Chamberlain are present at the site of this application. In South Dakota, the Pierre Shale is geologically described as "blue-gray to dark-gray, fissile to blocky shale with persistent beads of bentonite, black organic shale, and light-brown chalky shale" (Martin et al., 2004).

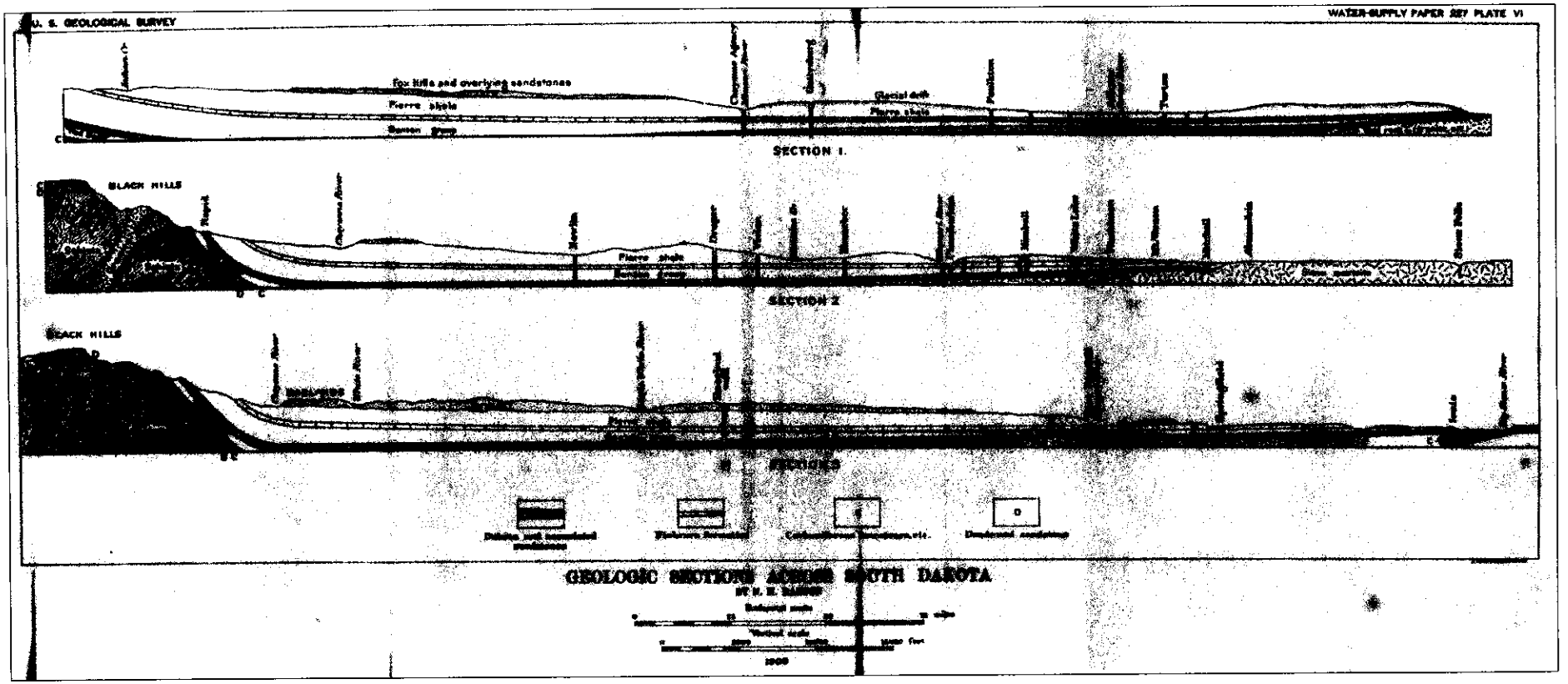

Figure 1. The Pierre Shale across South Dakota, as originally described by Darton in 1908 (Darton, 1909)

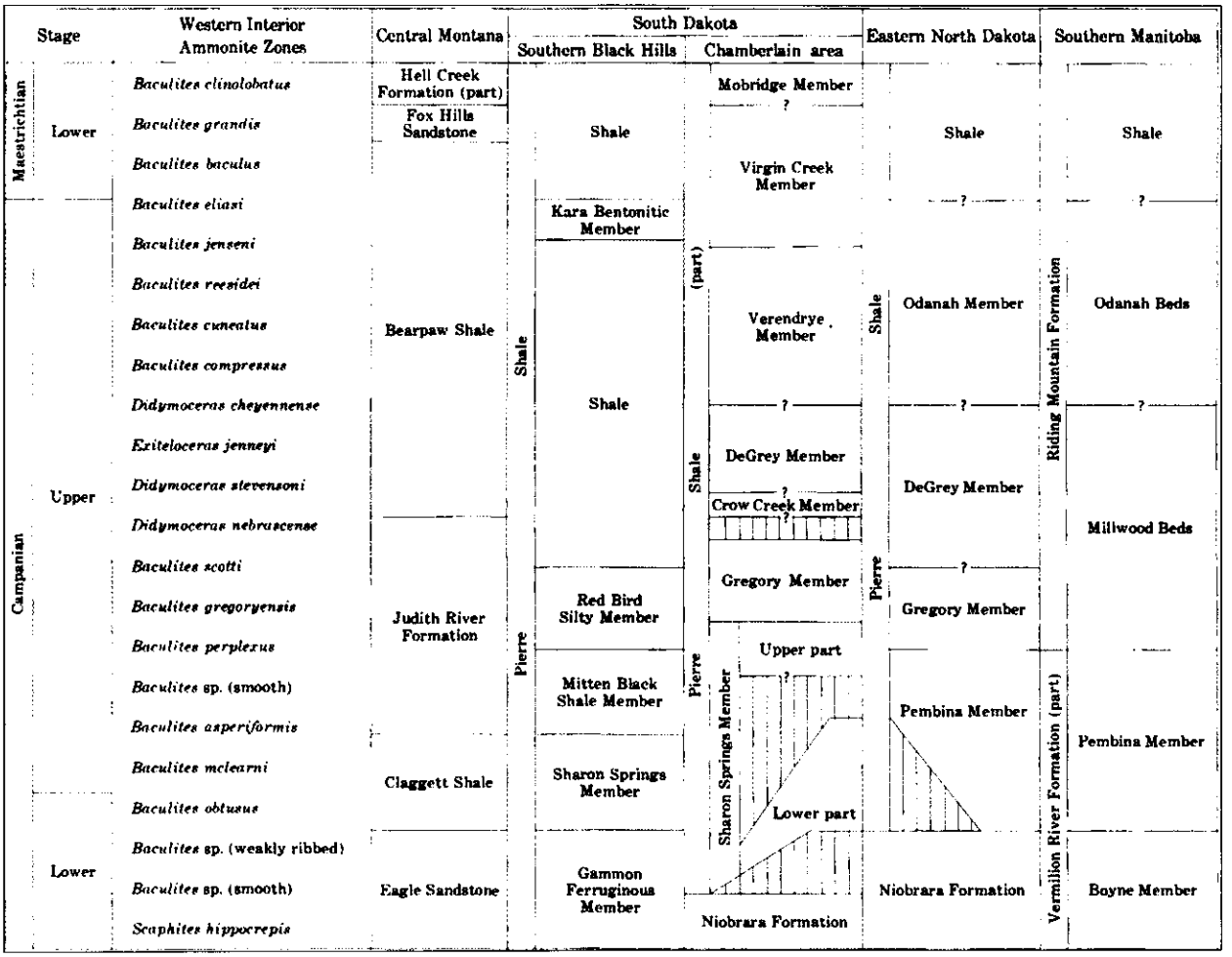

Figure 2. Stratigraphic nomenclature chart of the Pierre Shale in the northern Great Plains (Gill and Cobban, 1965)

A well completion report was submitted with this application. The well was completed on June 9, 2025, with an approximate static water level 180 feet below the ground surface (Water Rights, 2025d). The water well completion report shows the top of the shale is 260 feet below the ground surface. The well was screened from 340 feet to 420 feet below ground surface. Because of the limited details regarding the lithology encountered while drilling, it is unclear where the saturated and permeable portion of the formation is located. Therefore, the "top of aquifer materials" should be considered to be at the top of the shale at 260 feet even though the practical aquifer is likely contained near the bottom of the well where the screen is located. Based on the top of aquifer material, the static water level, and total well depth (420 ft), the aquifer is confined with a saturated aquifer thickness of at least 160 feet (Water Rights, 2025b). The upper portion of the shale is likely to be the confining layer since the entirety of the formation was not screened. Although lithologic details in the well completion report are limited, the aquifer appears to be confined by shale, with the upper portion of the formation likely serving as the confining layer since the well was screened at 340 feet and the top of aquifer materials lie at 260 feet. This is similar to the nearest well completion report showing screening past the top of aquifer material (Water Rights, 2025d)

South Dakota Codified Law (SDCL)

Water Permit Application No. 8982-3 proposes to appropriate water from the Pierre Shale aquifer. The probability of unappropriated water being available from the aquifer can be evaluated by considering SDCL 46-6-3.1 and SDCL 46-2A-9.

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 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 Pierre Shale aquifer is not older than or stratigraphically lower than the Greenhorn Formation and the applicant's proposed use is not for use in a water distribution system as defined by SDCL 46-1-6(17). Therefore, the average annual recharge and average annual withdrawal rates to and from the Pierre Shale aquifer must be considered.

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 Pierre Shale aquifer.

Recharge

The Pierre Shale is a major confining unit in eastern Montana and in most of North Dakota and South Dakota and is not generally described as an aquifer. The Pierre Shale underlies the Fox Hills Sandstone and separates it from deeper aquifers (Whitehead, 1996). Locally, the Pierre Shale can yield small volumes of water from thin sandstone beds or from highly weathered or fractured zones in the uppermost shale beds (Whitehead, 1996). The Pierre Shale, while predominantly a confining unit, exhibits variability in its hydraulic properties across different regions. In a recent study conducted by the USGS in cooperation with the U.S. Air Force Civil Engineer Center, slug-tests derived hydraulic conductivity estimates for wells completed entirely or partially in the Pierre Shale near Elsworth Airforce Base ranged from 0.04 to 0.09 ft per day (Medler et al., 2023). While some information is known about the Pierre Shale in the western part of South Dakota, little is known about the hydraulic conductivity of the Pierre Shale aquifer on the eastern side of the Missouri River. Based off the study by Medler et al. (2023), it is

assumed that the transmissivity of water is low throughout the Pierre Shale aquifer near the land surface (Medler, 2022; Medler et al., 2023). In general, the Pierre Shale transmits water very slowly due to its role as a confining layer, and in areas east of the Missouri River the shale's permeability can vary due to factors such as fracturing, weathering, and the presence of interbedded sandstones. Given the lack of information on recharge for deeper and more eastern parts of the Pierre Shale aquifer in South Dakota, and the lack of well monitoring data in Edmunds County completed into the Pierre Shale, determining the recharge estimate is difficult without extensive further study. For this application, the well is assumed to behave confined, is likely drilled into a fracture(s) or interbedded sandstone layers within the Pierre Shale and may have a limited supply of water with low transmissivity. The Pierre Shale is very expansive and therefore would receive a large amount of recharge. However, due to the low transmissivity, all of the recharge is not available everywhere.

Discharge

Currently, there are four water rights/permits authorized to appropriate water from the Pierre Shale aquifer. The four water rights/permits are all for non-irrigation purposes. Table 1 summarizes the four non-irrigation water rights/permits with the estimated annual use for each water right/permit as determined by their permitted maximum diversion rate because none have a permitted volume limit. 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 for estimating annual withdrawals by non-irrigation appropriations from an aquifer when the permits are limited only by permitted diversion rate and do not report annual pumping (Water Rights, 2025c). This method is likely an overestimation of average annual withdrawals. Overall, the estimated average annual withdrawal rate from the Pierre Shale aquifer by the non-irrigation water rights/permits is approximately 241 acre-feet per year (Table 1) (Water Rights, 2025c).

Table 1. Summary of the non-irrigation water permits/rights for the Pierre Shale aquifer.

Permit No.	Name	Status	Use Type	Authorized Diversion Rate (cfs)	Estimated Diversion Rate Total (ac-ft/yr)
1775-1	Alben Inc	LC	COM	0.011	4.8
2352-2	USAF Ellsworth Afb	PE	GWR	0.22	95.6
5572-3*	Elm Lake Resort	LC	COM	0.044	0
6342-3	Sjovall	LC	COM	0.324	140.7
LC: License; PE: Permit; COM: Commerical; GWR: Groundwater Remediation; * Identified as being connected to rural water and currently maintains well for standby use				**TOTAL:**	**241.1**

There are domestic wells completed into the Pierre Shale aquifer that do not require a water right/permit, so the withdrawal amount from those wells is unknown (Water Rights, 2025d). Due to their relatively low diversion rates, withdrawals from domestic wells are generally not considered to be a significant portion of the hydrologic budget. Additionally, with the

development of rural water systems in areas where the Pierre Shale aquifer is the uppermost aquifer available; it is likely some domestic users may have transitioned to rural water. This is further supported by the fact that water in the Pierre Shale is generally of poor quality. Also, since the Pierre Shale does not typically act as an aquifer, its use is not widespread. Poor porosity in the Pierre Shale limits transmission of water to a relatively localized area in the aquifer. The closest domestic well on file with the Water Rights Program drilled into the Pierre Shale is approximately 2.2 miles west of the diversion point for this application. The next two closest are approximately 5.3 miles to the southeast and approximately 6.3 miles to the northeast of the proposed diversion point. At those distances, it is likely that sufficient water is available locally to supply this application and the existing domestic wells. However, if there is an issue, this application, if approved, may need to limit withdrawals. Because these domestic wells have operated for many years without reported issues and given the relatively limited volume requested by this application, localized pumping from the Pierre Shale is not expected to substantially affect aquifer conditions or water availability.

Hydrologic Budget Summary

The estimated average annual withdrawal rate from the Pierre Shale aquifer is approximately 272 acre-feet per year (non-irrigation: 241.1 acre-feet/year; Water Permit Application No. 8982-3 (if approved, assuming full volume): 30.68 acre-feet/year). Based on the small amount of water appropriated out of the Pierre Shale aquifer, the low annual volume requested by this application, and the very expansive areal extent of the Pierre Shale, there is a reasonable probability unappropriated water is available from the Pierre Shale aquifer.

OBSERVATION WELL DATA:

Administrative Rule of South Dakota (ARSD) 74:02:05:07 requires the Water Management Board to 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.

Observation wells provide data on how the aquifer reacts to regional climatic conditions and local pumping. The DANR-Water Rights Program does not have any observation wells completed into the Pierre Shale aquifer. Observation wells provide data showing recharge to and natural discharge from an aquifer, historical long-term pumping effects, and regional climatic conditions. Given the low transmissivity of the Pierre Shale aquifer, any observation well would need to be located near the project site for long-term monitoring of the aquifer and to assess any effects to any other nearby wells.

POTENTIAL FOR UNLAWFUL IMPAIRMENT OF EXISTING WATER RIGHTS:

Given the vast distance the Pierre Shale covers across South Dakota, most of the water rights/permits are spread far apart from one another across both the east and west portions of the state. The closest water right/permit to the proposed diversion point is Water Right No. 5572-3, which is held by Elm Lake Resort and is not currently in use. The diversion point for Water Right No. 5572-3 is located approximately 54 miles northeast of the proposed diversion point for

this application (Figure 3) (Water Rights, 2025c). The diversion points for the other water rights/permits appropriating from the Pierre Shale are Water Right No. 6342-3 (Ivan Sjovall), located approximately 86 miles northeast of the proposed diversion point; Water Right No. 1775-1 (Alben Inc.), located approximately 198 miles southwest of the proposed diversion point; and Water Permit No. 2352-2 (Ellsworth Air Force Base), located approximately 198 miles southwest of the proposed diversion point.

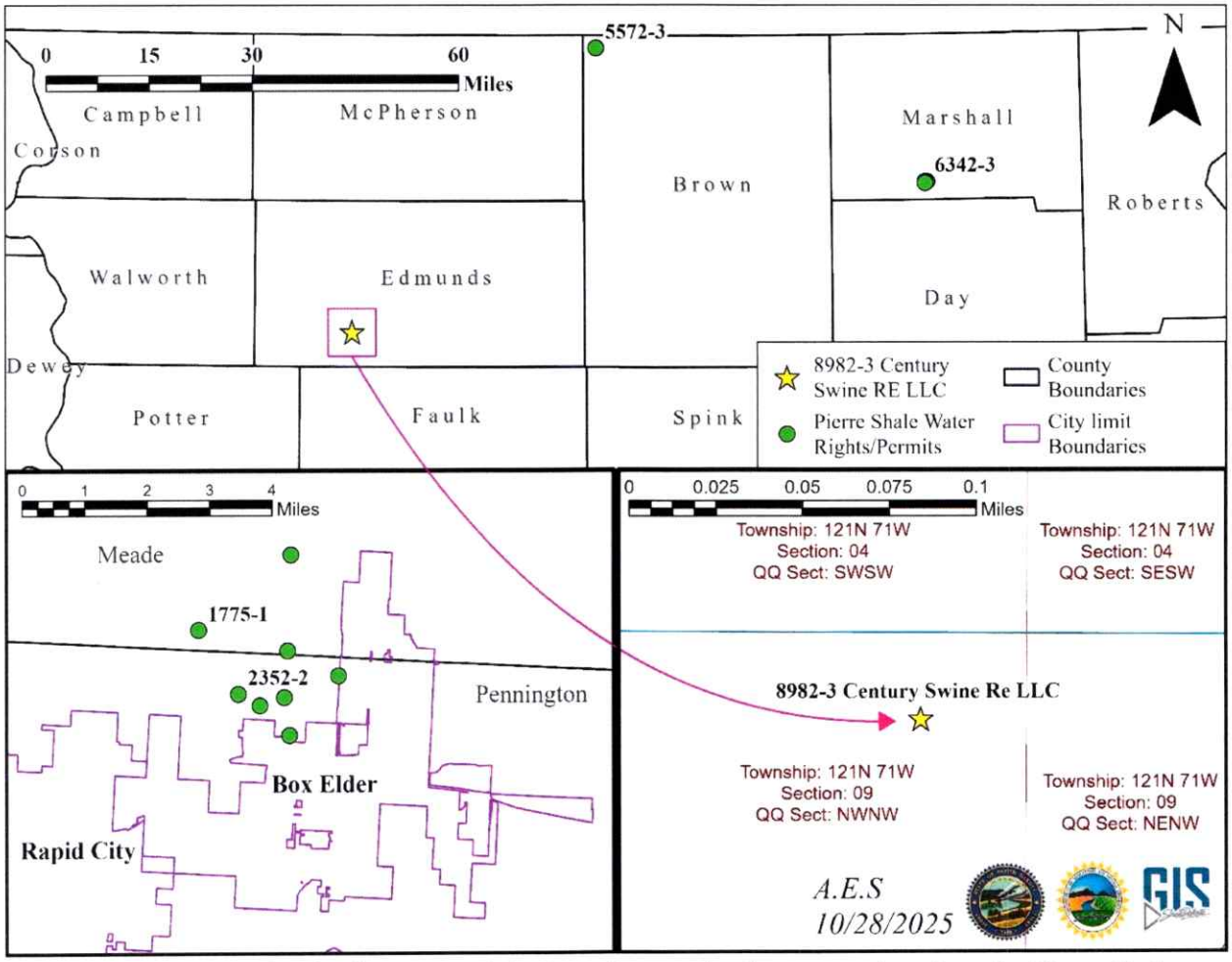

Figure 3. A map showing the four water rights/permits permitted to appropriate from the Pierre Shale aquifer and the location of Water Permit Application No. 8982-3 (Water Rights, 2025c)

There are domestic wells on file with the DANR-Water Rights Program that are completed into the Pierre Shale aquifer, with the closest domestic well on file (not held by the applicant) located approximately 2.2 miles west of the proposed diversion point (Water Rights, 2025d). There could potentially be other domestic wells completed into the Pierre Shale aquifer near the well the applicant proposes to use that are not on file with the DANR-Water Rights Program. The location of the domestic wells in the well completion report database maintained by the Water Rights Program is based on the location listed by the driller on the well completion report.

The Water Management Board recognizes that putting water to beneficial use requires a certain amount of drawdown to occur. The Board has developed 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. The Board adopted the Findings of Facts 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 Pierre Shale aquifer at their location. However, the generally limited transmissivity of the Pierre Shale and the distance to the nearest known Pierre Shale wells means this application has a reasonable chance to pump its own well dry before causing well interference in other Pierre Shale wells. However out of an abundance of caution, it is recommended that an observation well be installed to monitor drawdown for potential unlawful impairment.

Therefore, when considering the statutes (SDCL 46-1-4 and 46-6-6.1), rules (ARSD 74:02:04:20(6) and (7)), the small amount of water currently appropriated out of the Pierre Shale aquifer over a very large area, the low diversion requested in this application, and the lack of complaints of well interference in the Pierre Shale aquifer in Edmunds County, any drawdown created from the proposed diversion is not expected to cause an unlawful impairment to existing water right/permit holders or domestic users with adequate wells. Thus, there is a reasonable probability that any interference from the proposed appropriation will not impose unlawful impairments to existing users with adequate wells.

CONCLUSIONS:

1. Water Permit Application No. 8982-3 proposes to appropriate up to 30.68 acre-feet of water annually at a maximum pump rate of 0.11 cfs from one well completed into the Pierre Shale aquifer (approximately 420 feet deep) located in the NW ¼ NW ¼ Section 9 for commercial use in a swine facility located in the NW ¼ Section 9; all in T121N-R71W. The site is located in Edmunds County, approximately ten miles southwest of Roscoe, SD.

2. Based on the small amount of water appropriated out of the Pierre Shale aquifer and the low diversion requested in this application, there is a reasonable probability unappropriated water is available from the Pierre Shale aquifer.

3. Given the low transmissivity of water within the Pierre Shale aquifer, there is reasonable probability that the proposed diversion by Water Permit Application No. 8982-3 will not unlawfully impair adequate wells for existing water rights/permit holders and domestic users.

4. It is recommended that an observation well be installed for long-term monitoring of Pierre Shale aquifer water levels near the site and for any effects on other nearby wells.

Austin Settje
Natural Resources Engineer I
SD DANR - Water Rights Program

Reviewed by:

Adam Mathiowetz, PE
Natural Resources Engineer IV
SD DANR -Water Rights Program

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